




**ABSTRACTS**




2014 burgos  
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**uispp**

Union International  
de Sciences Préhistoriques  
et Protohistoriques

**ATAPUERCA**

XVII World UISPP Congress  
XVIIe Congrès Mondial de l'UISPP  
XVII Congreso Mundial de UISPP





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# A1 Silicious rock extraction and prehistoric lithic economies

(Organisers: Jacek Lech, Alan Saville, Xavier Terradas, Andreas Zimmermann)  
The UISPP Commission on Flint Mining in Pre-and-Protohistoric Times

Tuesday 2nd (9:00 to 13:30 15:00 to 19:30)  
C15-C16 Meeting Room  
Introduction by Jacek Lech and Xavier Terradas



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PART 1 – PRESIDENT FRANÇOISE BOSTYN

ORAL

**1. RAW MATERIALS IN THE CANTABRIAN REGION: DIALECTICS BETWEEN QUARTZITE AND FLINT IN THE ARCHAEOLOGICAL RECORD**

*Prieto, Alejandro (Universidad del País Vasco)*

*alejandro.prieto@ehu.es*

*Arrizabalaga, Álvaro (Universidad del País Vasco)*

*alvaro.arrizabalaga@ehu.es*

*Yusta, Iñaki (Universidad del País Vasco) i.yusta@ehu.es*

The both qualitative and quantitative increase of studies on raw materials in the Cantabrian Region is changing the view on the management of the territory by prehistoric societies. Most of the studies about the lithological varieties in the archaeological and geological record focus on flint, a clastic rock of sedimentary origin. This is due to two reasons: On one hand, the preferential use of this stone by Palaeolithic societies and, on the other, the existence of a corpus of geoarchaeological studies on which allow to characterize this material. This situation has generated a biased picture about the management of raw materials by prehistoric groups, because quartzite, a metamorphic rock containing almost exclusively quartz, is the second type of stone more used in the Cantabrian Palaeolithic. This study is a reflection on the need of deeper knowledge about quartzite, as this will modify the current paradigm on territorial management by Palaeolithic societies.

The basis of this work is a selection of the most representative sites of the Palaeolithic along different areas and chronologies whose lithic tools have been studied at raw material level. The information about the main raw materials (flint and quartzite) has been broken down for each archaeological level and it has been chronologically and geographically contextualised. Finally, we reflect about the relationship between both raw materials and their geographical and chronological context through dual and dialectic understanding and dialectic reasoning.

The results of this work show general trends in the use of each type of raw material. In addition, they are a reflection about the chronological and geographical relationship between quartzite and flint based on the concepts coming from the catchment of these lithic resources. The most innovative results are the geographical relationship of quartzite with the Western Cantabrian Region and that of flint with the Eastern area, the chron-

ological analogy of quartzite with the earlier phases of Palaeolithic and flint with the more recent ones, and the association of the concepts of recurrent and occasional mobility with each type of lithic raw material.

This work offers a wide perspective on lithic resource exploitation by the societies who populated the Cantabrian Region during the Palaeolithic and demonstrate an unequal state of the art for each raw material. As a solution, we propose to intensify the methodological studies to characterize quartzite and its different types.

ORAL

**2. RAW MATERIAL CIRCULATION FROM SOUTH OF FRANCE TOWARDS NORTH-EASTERN OF IBERIAN PENINSULA THROUGHOUT PREHISTORY: EVIDENCES, LACKS AND HISTORICAL SIGNIFICATION**

*Xavier Terradas (CSIC-IMF, Barcelona) terradas@imf.csic.es*

*David Ortega (CSIC-IMF, Barcelona) ortega@imf.csic.es*

The North-east of the Iberian Peninsula is an area with a significant diversity in terms of availability of siliceous rocks for production of stone tools. These differences in the geographic representation of raw materials are also linked to other differences in their properties. Thus, some raw materials have disadvantages to be exploited by means of the application of certain knapping methods, especially with reference to blade production during Upper Palaeolithic and Neolithic times.

This context led to the search for alternative raw materials -especially in northern areas- more suitable for blade knapping. Most of these materials come from the north, from different parts of Southeast France -some of them several hundred kilometres away-, and their presence is profusely confirmed in the archaeological record of sites from NE Iberian, becoming often the more exploited rocks. Throughout the Upper Palaeolithic and Neolithic changes are observed in the provenance of raw materials, their morphology (as raw material, cores, blanks, tools, etc.), the intensity of their exploitation, and in its role within the subsistence activities of groups that used them.

We illustrate this process with examples provided by four concrete raw materials: Precambrian jasper from the Têt Basin, Oligo-Miocene flint native to the Narbonne-Sigean Basin, and two types of flint coming from the Provençal area (one Bedoulian, the other Oligocene). We have attempted to understand the scope of its distribu-

tion, which were the aims that led to their exploitation, as well as the activities in which they were incorporated within the social dynamics of societies from the North-east of the Iberian Peninsula.

ORAL

### 3. PALEOLITHIC CHERT MINES IN THE AVAS HILL OF MISKOLC IN NORD-EST HUNGARY

*Árpád, Ringer (University of Miskolc) bolringa@uni-miskolc.hu*

The first chert mine excavation on the Avas Hill of Miskolc, in NE Hungary, was conducted by Jenő Hillebrand, between 1928 and 1935. Hillebrand, originally, classified the phenomena to the Hungarian Solutrean. Later the dating became totally uncertain.

The first real Paleolithic chert mine were unearthed since 1988 at the part of the Avas called "Tzköves". These belong to both two transitional industries, Middle to Upper Paleolithic. The first is a Bohunician-like industry with Levallois technique and the second is similar to the Denticulate Mousterian.

The letter occurs also in Szeleta Cave at several levels. In 2004-2005 at the western part of "Tzköves" any others chert mine and workshops have been explored.

The interpretation of this chert mine objects exploited by fire-aided stopping and heat treatment, as well as that of the attached processing and camp sites are in progress. The heat-treated chert was used by some kind of prehistoric trade. The typical brown-grey striped, translucent, heat-treated chalcedony of Tzköves was found in many sites of Bükk Mountain.

ORAL

### 4. FLINT MINING, HANDICRAFT, AND THE NEOLITHIC REVOLUTION

*Lech, Jacek (Institute of Archaeology, Cardinal Stefan Wyszyński University in Warsaw) lech@iaepan.edu.pl*

Flint mining among the hunter-gatherer communities, in the later periods of the Palaeolithic and during the "Mesolithic prelude" (using the term coined by Graham Clark) is well documented. Its significance, and the spreading of various flint rocks and artefacts over great distances from the mines, clearly increased together with the in-

roduction of farming – the most important feature of the "Neolithic Revolution" according to V.G. Childe's classic concept. Only the Neolithic economy provided the basis for the rise of periodically functioning systems of developed underground flint mining and the, associated with it, high quality handicraft, long-distance distribution of flint and flint knapping products. The paper will try to point to the factors stimulating development of the most advanced forms of flint mining.

In prehistoric Europe at least several hundred mining fields were exploited, providing various flint rocks. The general conclusions arising from the study of those sites have a bearing on the theses presented in this paper. The Defensola A mine in Italy and the mines of the Danubian communities in Central and Western Europe will illustrate the influence of the "Neolithic Revolution" on the development of flint mining.

This will be followed by a discussion of the most advanced forms of flint mining, at Spiennes (Belgium), Krzemionki Opatowskie (Poland), Harrow Hill and Grimes Graves (England), which arose as a result of the cumulating of expertise and the work of late Neolithic communities, more populous and with a more developed food economy. Together with the advanced mining technology went improvements in handicrafts associated with flint knapping and working of other raw materials.

We have shown the relationship between systematic growth of food surpluses and the development of underground mining and high quality handicrafts based on the mined flint, but it seems that purely economic and technological explanations cover only some of the facts. It can be supposed that the most developed forms of flint mining, to which the "Neolithic Revolution" gave rise, were not only the effect of complex long-distance networks being established for the exchange of products of flint handicrafts, but of unknown myths and symbolic values, emotions and feelings associated with the origin of this raw material, its coming from the depths of the earth and remote regions. It was not only the matter of the raw material's "exotic" character, although this factor should not be underestimated. Especially in the case of deep underground mining, the Neolithic Universum – the *Weltanschauung* of the time – was equally important for the popularity and value of flint, as were purely economic and technological reasons.

Learning of the true factors, which decided about the establishing of the most developed and spectacular forms of underground exploitation, continues to be a difficult

problem for archaeology. It seems that certain opportunities now arise in this area, in connection with new, outstanding discoveries and wide-ranging comparative studies, utilizing social and cultural anthropology.

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ORAL

## 5. FLINT MINING, HANDICRAFT, AND THE 'URBAN REVOLUTION'

*Zimmermann, Andreas (Institute for Prehistoric Archaeology, University of Cologne) a.zimmermann@uni-koeln.de*

More than 70 years ago, Gordon Childe proposed to distinguish four epochs divided by three revolutions: the "Neolithic revolution" with introduction of producing economy, the "Urban revolution" with division of work between craftsmen and farmers. While the older term "Industrial revolution" described an economy with high energy consumption – at the beginning mostly coal. One of the arguments for this periodization he found in the increase of population density. *"...in the economic sphere ... it will be possible to recognize radical and indeed revolutionary innovations, each followed by such increases in population that, were reliable statistics available, each would be reflected by a conspicuous kink in the population graph. These revolutions can accordingly be used to mark off ... stages in the historical process ..."* (Childe 1941 / edition of 1946, 22).

Within the last dozen of years, it was possible to work out reliable estimations of population-densities from hunter-gatherers onwards for Central Europe by a group of projects (LUCIFS, CRC 806). Because data and methods were homogenised it is possible to compare these estimations with each other. The results validate the hypothesis of Gordon Childe at least for this area. Therefore, the question arises: Why do population density increases dramatically during these revolutions while during each epoch only minor cyclical fluctuations are to be observed?

In this talk, factors contributing to the urban revolution will be analysed and handicraft is identified as probably the most important factor. Should Friedrich Engels be right when claiming division of labour as the relevant development? *„Die zweite große Teilung der Arbeit trat ein: Das Handwerk sonderte sich vom Ackerbau.“* (Engels 1884, edition from 1984, 188). Therefore, the importance of raw material procurement, mining, and artefacts production are discussed.

There is evidence that the economic sectors handicraft

and raw material procurement are not as important for the development of cities and states as long as they are not more accurately differentiated. Flint mining as well as Copper mining is practised already during subsistence oriented societies in Central Europe. Moreover, at the very beginning of the early Neolithic in western Germany already a division of work between different regions dependent on raw material availability as well as "trade" of specific kinds of flint is to be observed. There are even indications of different intensity of flint working in contemporary and neighbouring settlements.

Therefore, it is necessary to differentiate several sectors of handicraft, being either important or unimportant for the urban revolution. Mass products as tiles, stones for architecture, ceramics as well as textiles are economic sectors documenting existence of full time specialists necessary for state societies. While so called "elite consumption" is only a minor part of production already present in Chiefdoms according to Service (1971). However, part time specialists in less differentiated societies already carried out mining and even elaborate artefact production seasonally.

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ORAL

## 6. BASALT AXE PRODUCTION SITES IN THE BAKONY MOUNTAINS

*Biró, Katalin T. (Hungarian National Museum) tbk@ace.hu*  
*Antoni, Judit – c/o alfred falchetto (HNM-NÖK Budapest)*  
*Wolf, Ern (HNM-NÖK Szombathely) wolferno2@gmail.com*

The Bakony Mountains is one of the prehistoric "industrial" centres of Hungary. Siliceous raw material exploitation sites are known and published from the area (Biró & Regenye 1995, 2003). Recent study on polished stone artefacts of the region resulted in the recognition of intensive artisan activity on Late Neolithic sites of the area in respect of local basalt resources.

So far, the best evidence is known from survey material from the sites of Pénezsgyőr, Zirc and Porva, from the collection of E. Wolf. The collected evidence involves large quantities of workshop evidence – half products, technological tool types and fabrication debris, various grinders and polishers.

Artefacts were identified by routine macroscopic methods and documented accordingly. Magnetic susceptibility (MS) data were equally registered. A few selected samples were subjected to standard petrographical

analysis.

The finds represent various polished stone tools and fabrication debris as well as tools of their production.

Similar evidence was observed and described in Hungary only on Late Neolithic sites of the Lengyel Culture at Aszód (Biró 1992) and Zengvárkony (Biró et al. 2003). An exceptional find assemblage of polished stone artefact half-products (Antoni 2012), probably also dated to the same period on the strength of the analogies of the survey material.

The utilisation of basalts of the region (Balaton Highlands and Little Hungarian Plain) has been the subject of petroarchaeological investigation in the context of polished stone raw material characterisation from Hungary (Füri et al. 2004, Szakmány 2009). The publication of the surface collected evidence of polished stone artefact workshops hopefully supports the systematic study of these important sites.

ORAL

## 7. PRODUCTION OF AXE BLADES AND EXPEDIENT TOOLS AT THE MIDDLE NEOLITHIC FLINT MINING SITE OF MESNIL-SAINT-LOUP (CHAMPAGNE, FRANCE)

*Hauzeur, Anne (Royal Belgian Institute of Natural Sciences, Paléotime) ahauzeur@yahoo.fr*  
*Collin, Jean-Philippe (Université Paris I, Université de Namur) collin.jeanphilippe@gmail.com*

Important and very dense extraction features have been excavated at Mesnil-Saint-Loup (Champagne) in 2010. This new mining site belongs to the « Pays d'Othe » mining complex of the Vanne valley, partly excavated 25 years ago. A preventive excavation at Mesnil was an opportunity to point out a production of axe blades as well as the making of expedient tools or « débitage » dated from the Middle Neolithic (3700-3650 cal BC).

The former set of tools (N = 380) is characterised by their high percentage of abandoned rough-outs, mainly at the first steps of their making off. Dimensions and morphology are extremely variable. Those observations could fit with the mechanical quality of the local flint which is often freeze-fractured but other arguments suggest the existence of learning/training exercises.

The other assemblage from Mesnil is the high amount

of knapped flint nodules (N = 1420) which have been poorly exploited. The alternative hypotheses of a real « débitage » or expedient tools is asked.

ORAL

## 8. APPLICATION OF REMOTE SENSING TECHNIQUES FOR THE LOCALISATION OF PREHISTORIC FLINT MINING EVIDENCES IN THE ARCHAEOLOGICAL COMPLEX OF TREVIÑO (BASQUE-CANTABRIAN BASIN, SPAIN)

*Tarriño Vinagre, Antonio (UPV/EHU) antonio.tarriño@gmail.com*  
*Orúe Beltrán de Heredia, Íñigo (UPV/EHU) innigo.orue@gmail.com*  
*Elorrieta Baigorri, Irantzu (UPV/EHU) i\_lobai@hotmail.com*  
*García-Rojas, Maite (UPV/EHU) maitensx@gmail.com*  
*Sánchez López de Lafuente, Aitor (UPV/EHU) aitor.sanchez@ehu.es*  
*Benito-Calvo, Alfonso (CENIEH) alfonso.benito@cenieh.es*  
*Junguitu Íñiguez de Heredia, Iosu (UPV/EHU) iosujun@gmail.com*

The prehistoric flint mining complex is located in the "Sierra de Araico" (South-Pyrenean Syncline) of the Western Pyrenees (Spain), situated in Treviño County (Burgos) and in the municipality of Berantevilla (Álava). In the last years investigations have been carried out for the detection of prehistoric mining activity, some of them dated from the Neolithic. Nonetheless, the vast extension of the Sierra has prevented, until the moment, from locating and delimiting all the vestiges associated to mining that exist there.

In this way, the objective of this work is to continue with the preliminary definition of the archaeological mining area by the localization of flint extraction structures.

For this aim, in this study we will use the obtained data from the remote sensors and the observation of the morphological and geomorphologic variables of the terrain. This will allow us to explore the area for the subsequent development of archaeological investigations in the new mining evidences that we find.

We propose the interpretation of the earth's surface by using the data obtained from the aerial photography, satellite images and Digital Terrain Models (DTM), derived from the LiDAR data (Light Detection and Ranging). The objective is to examine the structures that could be observed in the earth's surface and its relation with the

different types of exploited flints.

This methodology will allow the design of prospection works that will make possible to overcome the self difficulties of the extension of the archaeological complex—about 2,000 hectares—, providing a general vision of the areas subject to mining activity and of the geological characteristics of the South flank of the Miranda-Treviño syncline.

ORAL

### 9. RAW MATERIALS SUPPLY FROM REDEPOSITED SEDIMENTS OF QUATERNARY ORIGIN. A CASE STUDY FROM NORTH-EASTERN POLAND

*Budziszewsk, Janusz (Institute of Archaeology, Cardinal Stefan Wyszyński University in Warsaw)*

*budziszewski.janusz@gmail.com*

*Szubski, Michał (Institute of Archaeology, Cardinal Stefan Wyszyński University in Warsaw)*

*michal.szubski@gmail.com*

*Jakubczak, Michał (Institute of Archaeology, Cardinal Stefan Wyszyński University in Warsaw)*

*michal.jakubczak87@gmail.com*

*Gruźdź, Witold (Institute of Archaeology, Cardinal Stefan Wyszyński University in Warsaw)*

*wittold@gmail.com*

*Zalewski, Marek (State Archaeological Museum in Warsaw)*

*epoka.kamienia@pma.pl*

Most of the studies carried out in Poland on prehistoric flint mining were aimed at investigating sites where raw materials were extracted from the bedrock. Even though erratic flint dominates in lithic inventories from archaeological sites located in the Polish Plain it is still not well known how it was extracted. The main goal of our studies was to identify the flint mining sites in the quaternary deposits covering north-eastern Poland.

In 2013 we started with researches of flint mining sites in Knyszyńska (N-E Poland) with the use of airborne laser scanning (ASL). Digital Terrain Model of 34 km<sup>2</sup> was made on the neighbourhood of already known mining site "Krzemianki" and then we carried out field survey in the region densely covered with forest.

We discovered 3 concentrations of mining fields consisting of 11 sites which surface covers altogether 8 hectares. On the basis of the anthropomorphically changed relief of terrain on the mining field we can presume that the exploitation was taking place with the use of few methods. This may be due to the fact that this outcrop was visited in prehistory couple of times by different

mining groups. Unfortunately at this stage of project we were unable to collect enough of distinctive materials to specify chronology of these sites.

Our research is new evidence of flint mining carried out in the moraines of Warta glaciation. The surface dimension of mining exploitation of the erratic flint from quaternary deposits is surprisingly large. In this case the size of flint mines may be a result of poor quality of raw materials which caused more extensive extraction economy.

ORAL

### 10. WHY MAN DUG A FLINT - FROM EXTRACTION TO DISTRIBUTION. FAITH, ECONOMY AND SOCIAL RELATIONS: SOME REMARKS ABOUT THE FLINT-MINING ACTIVITY IN THE PREHISTORIC EUROPE.

*Boguszewski, Andrzej (Archaeological engineer INRAP and CEDARC associated member)*

*andrzej.boguszewski@inrap.fr*

The flint mining activity is practice in Europe already in the Late Paleolithic, the Mesolithic and the Early and Middle Neolithic time. However, it was in Chalcolithic when this activity grew in size and, in evidence oversteps the simple and pure economical activity. The flint-mines became more elaborated and the underground exploration system improved and extremely exhaustive. The hundred of thousands polished axes have produced and ... "this is the question" ... where this axes were go towards? Certainly, a lot of them were engaged for a common activity of every day, but the other seems to be reserved for quite other destination: gift, exchange, ritual, mark of prestige...

We want to look through the distribution of some finished axes and try to understand their intention.

PART 2 – POSTER SESSION. PRESIDENT XAVIER TERRADAS

POSTER

### 11. THE ROLE OF GEOLOGICAL CONSTRAINTS ON THE DEVELOPMENT OF PREHISTORIC QUARRY MODELS

*LaPorta, Philip (The Center for the Investigation of Native and Ancient Quarries and Pace University, Department of Chemistry and Physical Sciences)*

*plaporta@laportageol.com*  
*Brewer-LaPorta, Margaret (The Center for the Investigation of Native and Ancient Quarries and Pace University, Depart-*

*ment of Chemistry and Physical Sciences)*  
*mbrewer-laporta@laportageol.com*  
*Minchak, Scott (The Center for the Investigation of Native and Ancient Quarries) sminchak@laportageol.com*

A model for task subdivision and chain of operations at prehistoric chert quarries was developed in polydeformed, Cambrian/Ordovician, chert bearing carbonates of the Wallkill River Valley (LaPorta, 1990; 1994; 1996; 2004; 2009) and tested at several quarries in equivalent (tectonic cycle 1) rocks (LaPorta et al., 2010). Extreme deformation of tectonic cycle 1 rocks is expressed in quarry task subdivision. The quarry model exhibits a minimum of five spatially discrete task areas and an elongate chain of operation of comminution between each stage of refinement. Tectonic cycle 1 quarries reveal similar strategies of chert extraction and refinement toward a chain of operation and as many as 40 refinement steps are present at some quarries. Polyphase deformation renders tectonic cycle 1 quarries the most complex in the Appalachians. In order to apply the models to the second and third tectonic cycles, or other geological terrains such as the Hudson Valley quartz quarry districts, derivative models must be constructed after appropriate geological baseline data are gathered. That does not mean that no elements of quarry task subdivision and chain of operation are shared with Hudson Valley quartz quarries. The quartz quarries of the Hudson River Valley share some aspects of their extraction technologies with tectonic cycle 1 quarries to the west. Beaked hammers, large impact objects, milling instruments and curated elastic hammers are present at the quartz quarries as well. A central theme that runs through all quarries, irrespective of tectonic domain, is that rock is broken along planes of weakness/foliation. Similarities must exist, regardless of tectonic domain, if a model is valid and reliable. However, forced overprinting of tectonic cycle 1 models on unrelated geological terrains is a logical fallacy.

Use of lithic classifications such as chunk, block, shatter, waste flake, trim do not relate form of quarry debris to causative geological characteristics. Usage of such terms typically leads to the de-evaluation and eventual dismissal of quarry resources. Lack of causative understanding leads to misinterpretation, or failure to recognize, characteristics unique to extraction. One example in the first tectonic cycle is that Hertzian cones are rare to absent in the early/intermediate stages of quarry production. Hertzian cones are present in later stages of refinement when ore is comminuted to the microlithon free from tectonic weakness. Petrofabric explains why Hertzian cones are lacking in certain phases of the chain of operation, but are present in others. Astronomical numbers of excavated quarry

debris are ignored because the investigator assumes the absence of taxonomic cones is justification for classifying debris as naturally occurring or the result of freeze-thaw weathering processes. To have meaningful analysis of quarry debris, a petrofabric approach is necessary. Hudson Valley quartz quarries are analyzed using a petrofabric approach, which gives meaning to quarry/mine tailings despite their location outside of tectonic cycle 1. Hudson Valley quartz quarries contain many elements of the tectonic cycle 1 model; however, it is recognized that organization of quarries on the landscape varies due to geologic constraints, and resulting topographic expressions, which are measured accordingly

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POSTER

**12. SILICEOUS RAW MATERIALS IN THE PALAEO-LITHIC OF ASTURIAS. RAW MATERIAL PROCUREMENT IN MOUSTERIAN AND AURIGNACIAN LEVELS OF LA VIÑA SITE (ASTURIAS, SPAIN)**

*Duarte Matía, Elsa (Universidad de Oviedo)*  
*elduarma@gmail.com*  
*Santamaría Álvarez, David (Universidad de Oviedo)*  
*santamariadavid@uniovi.es*  
*Tarriño Vinagre, Antonio (Universidad del País Vasco/EHU)*  
*antonio.tarrinno@gmail.com*  
*de la Rasilla Vives, Marco (Universidad de Oviedo)*  
*mrasilla@uniovi.es*

Asturian palaeolithic sites contain siliceous raw materials such as flint, quartz, quartzite and sandstone which occur in several geological floors all along the region. Even though, flint presents a more detailed concentration of outcrops and most of them had gone unnoticed for the previous geological studies.

Current research has consisted of fieldwork, geomorphological studies, macroscopic classification of geo-archaeological samples and petrological and geochemical analysis. It has allowed us to attest the siliceous rocks available in the environment and to determine which of them have been procured. Furthermore, it has been possible to establish source areas and management patterns in several sites.

The procured flints are lidite (Ordovician), chert (Devonian), lidite, radiolarite, grey flint and chert (Carboniferous), jasper (Permo-Triassic), Piloña flint (Cretaceous and Paleogene) and Piedramuelle flint (Neogene). The quartzites more used in the sites are the fine-grained and microcrystalline ones, such as the Carboniferous

and Cretaceous quartzites that come from the conglomerates. Quartz and sandstone are less procured and need more studies. Given that they are more ubiquitous rocks than flint and quartzite.

Procurement of these rocks focuses on secondary outcrops such as fluvial terraces, alluvial and slope deposits, but for Piloña and Piedramuelle flints we have documented open air primary outcrops and workshops.

In the Mousterian and Aurignacian levels of the western sector of La Viña site the acquired rocks are quartzite, flint, quartz and sandstone. The most procured one in both cultural episodes is quartzite. Concerning this raw material, the main difference between Mousterian and Aurignacian resides in the use of local-semilocal Carboniferous and Cretaceous quartzites. During the Aurignacian the quartzite came mainly from local Carboniferous conglomerates, while flint procurement increased notably focused on bladelet production. The semilocal Piedramuelle flint predominates over other flint, but allochthonous Piloña flint has a notable presence.

In conclusion, current research shows an important proximity between source areas and archaeological sites as we can see in La Viña, where there is a preferential procurement of local quartzite and alternatively of semilocal and allochthonous flint. For the moment, flint is the only source in track record in the region. Whereas Piedramuelle flint is mainly procured in the Nalón basin, Piloña flint does it in the Sella basin and Carboniferous flint predominate in Las Cabras valley and in Cares-Devan basin.

*Genova (Italy) fabio.negrino@unige.it*  
*Scaramucci, Sem (Department of Physical, Earth and Environmental Sciences - R.U. Prehistory and Anthropology, University of Siena) semscara@yahoo.it*

The here presented project concerns radiolarite quarries/workshops exploited mainly during the Copper Age for the production of semi-worked pieces (preforms) used in the manufacture of leaf-shaped arrows, javelin points, daggers as well as other flat-retouched artefacts. This research focuses on the sites of La Pietra (Grosseto, Tuscany) and Ronco del Gatto (Parma, Emilia) and aims to reconstruct preforms production systems and to identify the circulation routes of these semi-worked products by analysing raw material samples and archaeological artefacts from the surrounding territories.

A study of the lithic assemblages from both sites by means of technological analysis is underway.

At the same time a detailed study of the outcrops object of quarrying activities is being carried out. This includes their mapping as well as detailed descriptions of the sedimentary series and in particular of the most exploited radiolaritic horizons and their possible large scale correlations. The data acquired from the geological sources, will be used as a basis for study and comparison with the archaeological artefacts. The latter will be studied by non-destructive methods (petrographic descriptions with direct observation through a stereomicroscope, possibly combined with geochemical analysis namely SEM-EDS, Raman).

Surveys carried out at La Pietra led to detect an area of more than 3 hectares covered with waste knapped material, fragments of lithic hammers and impressive traces of quarrying activity on a vertical cliff of the outcrop. During the past two years, a knapping area used for the manufacture of preforms was partially investigated. The preliminary technological study allowed to reconstruct the main stages of the transformation process of radiolarite slabs into preforms.

Comparable evidence has been reported at Ronco del Gatto, a locality similarly close to a radiolarite outcrop, about two hundreds kilometres north of La Pietra, in Emilia. Fieldworks carried out between 1997 and 2001 revealed several lithic workshops of different ages, dating from the Middle Palaeolithic to the Copper Age. To this latter period are attributable some workshops devoted to the production of artifacts with a flat blunted retouch as well as some sub-circular features, interpreted as radiolarite quarry fronts. The study of the lithic finds is un-

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## POSTER

### 13. COPPER AGE RADIOLARITE QUARRIES IN ITALY: THE SITES OF LA PIETRA (TUSCANY) AND RONCO DEL GATTO (EMILIA).

*Bertola, Stefano (Working Group, High Mountain Archaeology and Quaternary Ecology, Institute of Geology, Innsbruck University, Innrain 52, A-6020 Innsbruck)*

*Stefano.Bertola@uibk.ac.at*

*Gambassini, Paolo (Department of Physical, Earth and Environmental Sciences - R.U. Prehistory and Anthropology, University of Siena) paolo.gambassini@unisi.it*

*Moroni, Adriana (Department of Physical, Earth and Environmental Sciences - R.U. Prehistory and Anthropology, University of Siena) adriana.moroni@unisi.it*

*Negrino, Fabio (Department of Antiquities, Philosophy and History, DAFIST, University of Genova, Via Balbi, 2, I-16126,*

derway, but a preliminary analysis allowed to highlight many similarities with the *chaîne opératoire* of La Pietra. Similar and coeval radiolarite quarries are known in Eastern Liguria, at Valle Lagorara and Boschi di Liciorno (La Spezia). It is also important to stress that the use of jasper quarries was contemporary to that of copper mines, dated with radiocarbon methods to the same period. This is the case of the Monte Loreto mine (Genova, Liguria), less than ten kilometers away as the crow flies from the exploited radiolarite outcrops. The beginning of quarry activities in Liguria, Emilia and Tuscany must have played an important socio-economic role and a thorough study of this evidence would increase our knowledge of the processes that transformed the late Neolithic agro-pastoral communities in the more complex societies of the Metal Age.

**BREAK**

PART 3 – PRESIDENT ANDREAS ZIMMERMANN

## ORAL

**14. SYSTEMATIC CHARACTERIZATION OF PREBETIC CHERT FROM SERRETA AS PRIMARY RAW LITHIC MATERIAL IN MIDDLE PALAEOLITHIC SITES OF EL SALT AND ABRIC DEL PASTOR (ALICANTE, SPAIN)***Tarriño Vinagre, Antonio (UPV/EHU)**antonio.tarrinno@gmail.com**Tamayo Hernando, Aitana (ICV-CSIC) aitanath@icv.csic.es**Molina Hernández, Francisco Javier (Univ. Alicante)**jammonite@gmail.com**Machado Gutiérrez, Jorge (Univ. La Laguna)**jorgemachado85@gmail.com**Hernández Gómez, Cristo Manuel (Univ. La Laguna)**chergomw@gmail.com**Galván Saltos, Bertila (Univ. La Laguna)**bertilagalvan@telefonica.net*

lledian deposits of back-reef limestones (Early Eocene), in the Prebetic zone, SE of Spain, present significant silicifications. As a consequence of the presence of diagenetic chert, a subsequent deposit occurs in Oligocene conglomerates in the Alcoi region (Alicante).

These detritic deposits are revealed as the potentially more accessible and the more exploited along the Prehistory in the region, as evidenced by its presence in the archaeological sites and the large number of workshop areas found in this territory. The encountered industries correspond primarily to Middle Palaeolithic tools directly

associated to detritic deposits.

The systematic prospection of both primary chert and archaeological one that was carried out from a geoarchaeological point of view, led as a result a direct correlation between the conglomerate outcrops and the existence of prehistoric workshop areas. The encountered chert possesses a wide macroscopic variability as a result of the geological evolution and thus, different structures within the nodule must be expected.

The microscopic texture of selected samples has been analyzed through the thin sections in petrographic microscope, whereas the mineralogical components and the presence of crystalline phases have been identified by means of X-ray diffraction (XRD). Thermogravimetric analysis has been used for the distinction among crystalline and non crystalline silica phases. The geochemical characterization has been carried out by means of both X-ray fluorescence (XRF) and Inductively Coupled Plasma (ICP-OES), allowing a quantitative determination of the chemical elements. The surface properties and the presence of undetectable pores with optical or electronical methods have been studied through nitrogen adsorption at 77 K. The physical characterization comprises the identification of the color, which was studied with visible-light spectrophotometry and the mechanical properties, obtained through microindentation test and three point flexural test.

The characterization of the chert samples allows the identification of a new type which has been revealed as essential raw material in the lithic industry, at least, of the Prebetic region. The systematic approach to the structure, composition and properties of these materials provides an unequivocal definition and description of the raw materials used as well as the alteration processes that have taken place.

The results obtained suggest that the large amount of amorphous or non crystalline silica present in the materials affect somehow their porosity and thus, the mechanical properties, which are more similar to a vitreous material rather than quartz or other crystalline phase of silicon oxide.

The comparative study of chert samples coming from two Middle Palaeolithic sites, El Salt and el Abric del Pastor, both of them in Alcoi (Alicante), indicate the preferential use of the same type of chert, the so called *Serreta* flint type. With this study, it has been also established a new systematic methodology for the characterization of the geological and archaeological specimens based on



the interpretation of analytical results that are applicable to a wide variability of materials.

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ORAL

### 15. DIRECT-ACCESS BEDROCK QUARTZ QUARRIES WITHIN MID- AND LOWER-HUDSON RIVER VALLEY, NEW YORK

*LaPorta, Philip (The Center for the Investigation of Native and Ancient Quarries and Pace University, Department of Chemistry and Physical Sciences) [plaporta@laportageol.com](mailto:plaporta@laportageol.com)*

*Minchak, Scott (The Center for the Investigation of Native and Ancient Quarries) [sminchak@laportageol.com](mailto:sminchak@laportageol.com)*

*Brewer-LaPorta, Margaret (The Center for the Investigation of Native and Ancient Quarries and Pace University, Department of Chemistry and Physical Sciences)*

*[mbrewer-laporta@laportageol.com](mailto:mbrewer-laporta@laportageol.com)*

A working assumption of archaeological studies (Brennan, 1977:427; Eisenberg, 1978:36; Latham, 1978[1958]:13; Ritchie, 1959:30) in the New York-New Jersey-Pennsylvania region is that quartz artifacts are derived from an expedient and technologically simple, bipolar crushing of glacially derived quartz cobbles. In some studies, weathered joint surfaces and foliation planes exposed during the lithic refinement process have been misinterpreted as cobble cortex instead of the internal fabric of the geological material. These misinterpretations have been embedded in archaeological research designs throughout the Hudson River Valley and require considerable revision.

Along the eastern side of the mid- to lower Hudson River Valley, a Paleozoic thrust fault exposes a linear belt of quartz outcrops on the modern-day erosional surface. This linear belt of quartz crops out intermittently for approximately 70 miles (110 km) from Sylvan Lake, NY southward toward Manhattan Island. Cropping out in this geological context are several types of quartz systems; Precambrian pegmatitic quartz (both simple and complex) and a plexus of Cambrian-Ordovician joint infillings (pneumatolitic, hydrothermal and metasomatic), pressure solution halos above quartzite beds, and metamorphosed quartz sand interbedded with marble. Field and hand sample observations elucidate clear to milky white, rose, and light to extremely dark gray/ black varieties of the quartz. Color is not specific to the formative setting of the quartz. However, each type of quartz can be differentiated utilizing environmental setting interpretation at the outcrop and correct use of the light transmitting petrographic microscope.

Geological mapping and archaeological excavation has revealed adits and evacuated conjugate joints associated with crushed and comminuted quartz and associated country rock. Workshops and associated subsistence sites are spatially proximal (range less than 30 feet (10 meters)) to the quarry face. Zones of extraction, processing and milling are spatially organized and archaeological excavations indicate maintenance of tailings debris. Present also are curated quarry tools and mining instruments fashioned from Cambrian Poughquag and Lowery metaquartzites, Lower Ordovician Cortlandt Complex ultramafics, and hornfelsic rocks created by intrusion of the Triassic Palisades Sill complex.

The close spatial relationship of direct-access quartz quarries, workshops and open-air subsistence sites with *Crassostrea virginica* shell middens points to the establishment of the marine pycnocline within the Lower Hudson River Valley. The establishment of the salt-water wedge ushers in stable *Crassostrea virginica* oyster mound accumulations and provided a reliable source of protein for prehistoric occupants. Examination of the shell middens reveals quartz flake debris derived from the bedrock quarries. The flake debris is interpreted as tools employed for the husking of shellfish. A cultural chronology constructed for this region reveals intermittent usage of the quartz and associated shell fisheries during the Paleo-Indian (12,000-9,000 B.P.); Early, Middle and Terminal Archaic (9,000-3,000 B.P.) into the Early Woodland (3,000-1,800 B.P.) periods. Diagnostic materials found in the related workshops indicate that quartz mining may have reached its acme of development during the Terminal Archaic/Transitional periods (4,300-3,000 B.P.). Lithic analysis of Early Woodland flake tool assemblages indicate that recycling of quartz from tailings piles may have continued through the Woodland Period after quarry face depletion

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ORAL

### 16. QUARRY INSTRUMENTS ASSOCIATED WITH DIRECT-ACCESS QUARTZ BEDROCK QUARRIES

*LaPorta, Philip (The Center for the Investigation of Native and Ancient Quarries and Pace University, Department of Chemistry and Physical Sciences) [plaporta@laportageol.com](mailto:plaporta@laportageol.com)*

*Minchak, Scott (The Center for the Investigation of Native and Ancient Quarries) [sminchak@laportageol.com](mailto:sminchak@laportageol.com)*

*Brewer-LaPorta, Margaret (The Center for the Investigation of Native and Ancient Quarries and Pace University, Department of Chemistry and Physical Sciences)*

*mbrewer-laporta@laportageol.com*

Success of prehistoric quarry endeavors is partially determined by the availability of elastic and very dense rock types that serve as raw materials for mining instruments. For direct-access quartz quarries of the Hudson River Valley, such raw materials are present in Wisconsin-age glacial till veneering the region. Petrologic/petrographic sampling of the till, and analysis of quarry tools/instruments excavated at quartz quarries, infer the following interpretations.

The Hudson Valley quartz quarry district not only varies along trend in terms of the type of quartz available and the country rock hosting it, but varies in raw materials used as mining instruments. In the northernmost trend, the quarry-tool assemblage consists of high percentages of metaquartzite, and lesser amounts of metasedimentary and metaigneous boulders/cobbles. Southward, the tool assemblage is metasedimentary and metaigneous rocks, as well as orthoquartzites. In the south-central sector of the district, basalt and hornfels were glacially eroded from the Palisades Sill. Ultramafic rocks eroded from the Cortland Complex were also present at quarries. In the southernmost extremity of the district, Palisades hornfels, Cortland mafics and smaller concentrations of ortho- and metaquartzites are mixed in the till. While considerable overlap in the tool/instrument raw materials occurs, there are also spatially discrete concentrations correlatable with percentage variations in local till. The variety of raw materials provides the prehistoric miner a wide assortment of materials of various strengths and elasticity to choose from.

In southern locations, there is greater variability in till petrology, allowing for a more robust tool kit and fuller development of local quarries. Caches of metaquartzite are found at southern quarries in all phases of quarry development. Metaquartzites are pecked and ground, are a variety of sizes, and fit specific morphological classes, some of which suggest hafting during use. These observations infer metaquartzite curation and recycling, with specific morphological classes prescribing varied functions at quarries and associated sites.

Metaigneous and metasedimentary tools are joint-bounded, exhibit glacial polish and are restricted to extractive zones as large blocks. Size and location constraints infer employment as impactors. Broken fragments may be recycled for use in other areas of the quarry, but missing is evidence of grinding and pecking and ubiquitous presence at the quarry. These materials appear to be expendable, in contrast to metaquartzite utili-

zation. Similar lack of curation and expendability is seen with hornfels located in milling and crushing areas. Orthoquartzites are present predominantly in workshops. These trends suggest preferential selection patterns and a cognizant application of the strength and size of material to perform certain tasks and functions.

Despite the abundance of till suitable for extraction needs, volcanic intrusives occurring throughout the region are also quarried for the production of mining instruments. These occur admixed with both curated and non-curated till components of the instrument assemblages. Volcanic hammerstone quarries are visible in all phases of extraction and processing, suggesting they have a different value. Hammers fashioned from quartz are also visible in the southernmost workshops. Chert hammers are uncommon, but present.

ORAL

## 17. OBSIDIAN PROVENANCE ANALYSIS IN ARCHAEOLOGY: A VIEW FROM WESTERN NORTH AMERICA

*Hughes, Richard (Geochemical Research Laboratory)  
rehughes@silcon.com*

Since the inception of instrument-based analyses in the middle 1960's, research conducted on silica-rich volcanic glass (obsidian) erupted in California and the Great Basin of western North America has played an important role in the overall development of worldwide provenance studies in archaeology. Early work in California and the Great Basin focused on chemical identifications of archaeologically-significant obsidian, which were then employed through artifact analysis to sketch the broad outlines of "exchange networks" in prehistory. Since these early days there has been growing sophistication in archaeological uses of provenance data, including more explicitly awareness of the interpretive differences attending views of obsidian "sources" as geochemical vs. spatial entities, and appreciation of the importance of segregating material by artifact class for analysis. This paper presents examples and illustrations of these issues, and relates them to more general problems, and potentials, associated with inferring the behavioral mechanisms responsible for observed artifact distributions in other types of siliceous rock.

ORAL

**18. CHOCOLATE FLINT FROM CENTRAL POLAND IN THE ECONOMY OF FARMING COMMUNITIES IN THE NEOLITHIC AND BRONZE AGES - PROBLEMS WITH CORRECTLY DETERMINING THE ORIGIN OF THE RAW MATERIAL**

*Werra, Dagmara H. (Autonomous Research Laboratory for Prehistoric Flint Mining, The Institute of Archaeology and Ethnology Polish Academy of Sciences) werra@iaepan.edu.pl*

*Siuda, Rafał (Warsaw University, Faculty of Geology, Institute of Geochemistry, Mineralogy and Petrology) siuda@uw.edu.pl*

*Grafka, Oliwia (Warsaw University, Faculty of Geology, Institute of Geochemistry, Mineralogy and Petrology) oliwia.grafka@uw.edu.pl*

*Hughes, Richard E. (Geochemical Research Laboratory; 20 Portola Green Circle, Portola Valley, CA 94028-7833 U.S.A.) rehughes@silcon.com*

*Segit, Tomasz (Warsaw University, Faculty of Geology, Institute of Geology) t.segit@uw.edu.pl*

One of the most important types of flint used in the Vistula river basin in prehistory were the so-called "chocolate flints" from Central Poland, exploited from the Palaeolithic to the beginning of the Iron Age. At present we know of 26 exploitation points of "chocolate flints," mostly mines. Several have been excavated.

Exploitation of "chocolate flints" was economically significant even after the Neolithic. In the Early Bronze Age this is supported by discoveries of flint mines and flint tools such as axe blades, sickles, daggers or arrowheads. The paper will present current problems with correctly determining the origin of "chocolate flint" from Central Poland and results of research into the geochemical and petrographic characteristics of this raw material. As well as remarks on the management of this raw material in the Neolithic and Bronze Ages. Differences between varieties of "chocolate flints" (mainly from different mines) are also discussed.

The term "chocolate flint" is imprecise, as considerable variations of this raw material can be found. Research into its occurrence and geology has an eighty-year history, but no complex petrographic-geochemical investigations have as yet been carried out.

The aim of research being conducted since 2012 is to explain the internal differences between chocolate flints and to determine their diagnostic features in relation to other siliceous rocks from Central Poland.

Samples have been collected from all the exploitation points of "chocolate flint," as well as samples of the basic siliceous rock occurring in Central Europe.

The samples have undergone geochemical examinations, especially as to the content of trace elements and organic material.

Tests have shown that colour variation, which has hitherto been the basic criterion for distinguishing "chocolate flint," is connected with the differing composition and distribution of organic compounds present in these rocks. We can observe a clear trend: the diminishing content of organic matter in lighter coloured flint. This is related to variations in the amount of organic matter in the environment in which the deposition of siliceous rocks took place. The other factor influencing the hydrocarbon content was the flint weathering processes.

The lack of a full geological and petrographic description of "chocolate flint" may result in considerable errors when reconstructing the economies of prehistoric communities, of which the most critical are erroneous descriptions of the raw material and inconclusive indications as to place of extraction. As a consequence, exchange networks may be reconstructed incorrectly and the role played in the economy by individual flint mines is not determined properly.

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ORAL

**19. CHALCOLITHIC RAW MATERIAL ECONOMY IN THE LIGHT OF NEW DATA FROM MINING FIELD PRZYJAŹŃ IN RZECZKOWO (CENTRAL POLAND)**

*Budziszewski, Janusz (Institute of Archaeology, Cardinal Stefan Wyszyński University in Warsaw)*

*budziszewski.janusz@gmail.com*

*Gruzdź, Witold (Institute of Archaeology, Cardinal Stefan Wyszyński University in Warsaw) wittold@gmail.com*

*Jakubczak, Michał (Institute of Archaeology, Cardinal Stefan Wyszyński University in Warsaw)*

*michal.jakubczak87@gmail.com*

*Szubski, Michał (Institute of Archaeology, Cardinal Stefan Wyszyński University in Warsaw) michal.szubski@gmail.com*

The studies of chalcolithic production from chocolate flint are still not well investigated when it comes to the

production of blade “daggers”. These forms are usually made on long regular blanks and are found among inventories attributed to lubelsko-wołyńska culture. In our research we examine how these blades were extracted and produced.

During our survey carried out on chocolate flint outcrop in 2013 we discovered few new prehistoric extraction fields from which one, “Przyjaźń” in Rzeczkowo (Central Poland) was located on redeposited sediments of glacial origin. Flint nodules from this site were changed by post-depositional factors, which caused heavily patination of their colours. In such form they were picked up by prehistoric producers and used for blade production. We studied this collection with morphological analyses to access the technology and supported it with the comparison to experimentally made materials.

“Przyjaźń” is chocolate flint mine where raw material was extracted from quaternary sediments differently then we can observe on well know mines in the region. It is visible in fragmentary preserved relief of anthropomorphically changed surface of the site. Additionally, the specific type of colourful raw material, together with technology based on production of long blades with punch technique; presume us that the assemblages should be link with chalcolithic lubelsko-wołyńska culture.

Our hypothesis of raw material acquisition and flint distribution sheds new light on chalcolithic cultures in the region. Most probably the flints were extracted with use of simple methods and nodules were transported on long distances with only minimal preparation of precore. Occasionally, blades were produced on mining fields but it was linked with the early phases of reduction. Macro-lithic blades were made in settlements by highly qualify knappers.

ORAL

## 20. LITHIC PROCUREMENT STRATEGIES DURING THE MIDDLE NEOLITHIC IN NORTH-WESTERN FRANCE : THE CASE OF THE ‘CHASSEEN SEPTENTRIONAL’ CULTURE

*Bostyn, Françoise (Inrap – UMR 8215-Trajectoires, 11 rue des Champs, 59650 Villeneuve d’Ascq, France)  
francoise.bostyn@inrap.fr*

Several recent rescue excavations in the north-western France led to the discovery and the excavation of four news enclosure sites attributed to the ‘Chasseen septen-

trional’ culture. These sites have either simple palisaded ditches or bordered of one or several ring ditches. The studies of the lithic assemblages allow us to renew our knowledge of the raw material procurement strategies of these populations and point out the role of the flint mines in that organization. The ‘Chasseen septentrional’ settlements are located in a region where the Cretaceous substrate provide a large quantity of flint nodules of variable shape and size, most often exploited through small scale flint mines. These flint mines are specialized in the production of medium size blade axes. In parallel, we can observe the introduction of polished axes in metamorphic rocks. The distribution of finished products (blades and axes) coming from the specialized productions of the main flint mines of Spiennes (Belgium) and Jablines (Seine-et-Marne), which were exploited by people not belonging to the same cultural entity, seem to appear, given to the lithic assemblage of Villers-Carbonnel enclosure, in a second time. These changes in the raw material procurement strategies seem to have to be correlated with the development of multiple ditches enclosure sites.

ORAL

## 21. BETWEEN STANDARDISATION AND DIVERSIFICATION. SINGULAR SHAPE THE MINING TOOLS: WHAT THE REASON?

*Boguszewski, Andrzej (Archaeological engineer INRAP and CEDARC associated member) andrzej.boguszewski@inrap.fr*

When we study this exceptional phenomenon what is the flint extraction, we are still wonder about the choice done by the Neolithics to his tools. We can imagine that a mining tool-set was adapted to the technical constraints, to the local geology and to the environmental conditions. However, behind that, was-it also a cultural heritage reason in the preparation of this tool-set?

We made on review over 40 Neolithic and Chalcolithic flint mines and their tool-set, especially the antler, and we compare their shape and their degree of transformation. Some mines present a high standardization and almost a kind of “monotony”, while some other a riche technical and typological diversification. What is a sense or a significance of this difference? Where is their origin? In our paper, we discuss a different choice of the mining tools (stone, flint, bone and antler) in the Neolithic flint mines, and we will try to demonstrate the role of the non-technological influences into the mining system.

ORAL

**22. WIERZBICA “ZELE” (POLAND): THE BRONZE AGE FLINT MINE IN THE LIGHT OF NEW EXCAVATIONS**

*Lech, Hanna (Autonomous Research Laboratory for Prehistoric Flint Mining, The Institute of Archaeology and Ethnology Polish Academy of Sciences) lech@iaepan.edu.pl*

*Lech, Jacek (Autonomous Research Laboratory for Prehistoric Flint Mining, The Institute of Archaeology and Ethnology Polish Academy of Sciences) lech@iaepan.edu.pl*

*Malecka-Kukawka, Jolanta (Laboratory of Traseology, Institute of Archaeology, Nicolaus Copernicus University, Torun) Jolanta.Malecka-Kukawka@umk.pl*

*Werra, Dagmara (Autonomous Research Laboratory for Prehistoric Flint Mining, The Institute of Archaeology and Ethnology Polish Academy of Sciences) werra@iaepan.edu.pl*

Wierzbica “ZeLe”, Radom district, in Central Poland, is an important flint mining site from the Bronze Age and Early Iron Age. The paper will present the latest studies. Excavations were carried out at the site in 1979-1988, 2012 and 2014, revealing 81 shafts, which were investigated in varying degrees. Over 8000 flint specimens from the “ZeLe” mine were classified according to a classification list. During the initial analysis, new categories of artefacts were distinguished, which had hitherto not been differentiated in the flint material from settlements and mining fields. Microscopic use-wear analysis was carried on selected artefacts from the mining field.

In early periods of the Bronze Age, the “ZeLe” flint played an important economic role. This is confirmed by numerous initial forms of axes and single roughouts of sickles and arrowheads. In the Late Bronze Age, flint had different uses. The deepest shafts, no. 19 and 28, dated to about 1000 cal BC, are connected with this phase. It seems that at this time flint and mining had more symbolic significance than economic. Flint mining became a spectacular example of cultivating old traditions for other purposes.

Use-wear analysis showed signs of mining work on some of the artefacts (eg. scraping clay off nodules). Other artefacts were used for work with organic material – scraping and drilling bones/antlers, cutting meat/skin, scraping and drilling wood. Tools with such traces had hitherto been found in the context of household clusters.

The analyses of flint material from “ZeLe” show that, during the Bronze Age, the significance of flint changed and

the period can be divided into two parts. In the early Bronze Age, flint and mining played an important part in the economy, while in the Late Bronze Age their symbolic meaning became more significant and economy took second place. This hypothesis requires further analysis. If confirmed, then the presence of flints in rituals will be proof of conservative ideologies persisting for a long time, into the Late Bronze and Early Iron Age.

It was shown that use-wear analysis of material from the mines provides important information about the behaviour of prehistoric miners, which is revealed through technological and morphologic analyses.

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**23. WHY UNDERSTANDING FLINT MINING IS ESSENTIAL TO UNDERSTANDING METALLURGY? AND VICE VERSA: A DEMOGRAPHIC EXPLANATION OF FLINT AND COPPER PRODUCTION VOLUMES**

*Kerig, Tim (University of Cologne) tkerig@uni-koeln.de*

*Edinburgh, Kevan (University College London) k.edinburgh@ucl.ac.uk*

*Shennan, Stephen (University College London) ioa-director@ucl.ac.uk*

The paper aims at explaining the actual performances of flint mining and earliest metallurgy in the European areas north of the Alps (6000 – 2000 calBC).

Radiocarbon dates from mining sites were summed, and the development of these <sup>14</sup>C probability densities over time was used as a proxy for extraction volumes.

It can be shown that the development of flint mining and metallurgy is strikingly correlated in time. Instead of interpreting this as an indication of direct interconnections (eg. in a shared market) flint mining and the exchange of copper will both be shown as being effects of / responses to changing population densities.

The positive as well as the negative growth of Neolithic populations – well visible in the demographic proxy (Shennan et al 2013) – caused mayor transformations in the economic networks regulating the flow of technology and raw materials. Radiocarbon modelling allows the quantification of extraction thus adding an important perspective to mining archaeology.

**Concluding remarks – Andreas Zimmermann**

# A2a The first peopling of Europe

Commission on First humans in Europe

(Organizers: Eudald Carbonell, Marina Mosquera, Andreu Ollé, Deborah Barsky, Xosé Pedro Rodríguez, Robert Sala)

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## ORAL CONTRIBUTIONS

### ORAL

#### 1. BARRANCO LEÓN AND FUENTE NUEVA 3: AT THE CORE OF HOMININ TECHNICAL INNOVATION IN FIRST EUROPE

Sala, Robert (URV-IPHES) robert.sala@urv.cat  
Barsky, Deborah (IPHES-URV) dbarsky@iphes.cat  
Menéndez, Leticia (IPHES) letimenendez@gmail.com  
Sánchez, Lidia (URV) lidiasg@hotmail.com  
Cánovas, Isabel (US) isabellita@hotmail.com  
Tarrío, Antonio (UPV/EH) antonio.tarrino@gmail.com  
Toro, Isidro (Museo Arqueológico de Granada) toromoyano@hotmail.com

Barranco León and Fuente Nueva 3 (Orce, Andalusia, Spain) are well established as major archeological occurrences in the framework of Old Europe. Situated in southern Spain's Guadix-Baza depression, they provide an exceptionally rich and well dated record for the earliest human presence in Europe (1,4-1,3 Ma, respectively). Since 2008, renewed excavations and inter-disciplinary research conducted at the sites have considerably enlarged the artifact register, providing new lines of research in the fields of lithic technology and typology. Renewed interests focus on variability within the range of local raw material procurement patterns and also on the structural analysis of intra-site transmission of technological knowhow in the context of pioneering hominin groups in Europe. The context of the sites: on the shores of a paleo lake, and the evidence for the presence of other large carnivores, underline questions of expedience as an influence on techno-morphology in early stone toolkits. We propose an analysis of these themes, with an accent on updated information from these and other key sites situated in Europe and dating to the late Early Pleistocene.

### ORAL

#### 2. THE EARLY PLEISTOCENE SITE OF BOIS-DE-RIQUET (LÉZIGNAN-LA-CÈBE, HÉRAULT, FRANCE): STRATIGRAPHY, DATING, FAUNA, AND LITHICS

Bourguignon, Laurence (Inrap AnTet/ArsCan, Pôle mixte de Recherche, Domaine de Château Campagne, 24260 Campagne, France) laurence.bourguignon@inrap.fr

Crochet, Jean-Yves (ASPROGEO, 138 ancien Chemin du Triadou, 34270, Saint-Jean-de-Cuculles, France) asprogeo@orange.fr

Capdevila, Ramon (Lézignan-la-Cèbe, 34120, France) rs.capdevila@wanadoo.fr

Ivorra, Jérôme (Caux, 34720, France) jerome.ivorra@orange.fr

Antoine, Pierre-Olivier (Institut des Sciences de l'Évolution, UMR-CNRS 5554, CC064, Université Montpellier 2, Place Eugène Bataillon, F-34095 Montpellier, France) pierre-olivier.antoine@univ-montp2.fr

Agustí, Jordi (ICREA-IPHES, Tarragona, Spain /IPHES, Institut Català de Paleoeologia Humana i Evolució Social, c/ Marcelli Domingo s/n, Campus Sescelades URV, Edifici W3, 43007, Tarragona, Spain / Area de Prehistoria, Universitat Rovira i Virgili (URV), Avinguda de Catalunya 35, 43002 Tarragona, Spain) jordi.agusti@icrea.cat

Barsky, Deborah (IPHES, Institut Català de Paleoeologia Humana i Evolució Social, c/Marcelli Domingo s/n, Campus Sescelades URV, Edifici W3, 43007, Tarragona, Spain / Area de Prehistoria, Universitat Rovira i Virgili (URV), Avinguda de Catalunya 35, 43002 Tarragona, Spain) dbarsky@iphes.cat

Blain, Hugues-Alexandre (IPHES, Institut Català de Paleoeologia Humana i Evolució Social, c/Marcelli Domingo s/n, Campus Sescelades URV, Edifici W3, 43007, Tarragona, Spain / Area de Prehistoria, Universitat Rovira i Virgili (URV), Avinguda de Catalunya 35, 43002 Tarragona, Spain) hablain@iphes.cat

Boulbes, Nicolas (UMR 7194 CNRS, Université de Perpignan & EPCC-Centre Européen de Recherches Préhistoriques de Tautavel, Ave. Léon Jean-Grégory, Tautavel, FR-66720) nboulbes@aol.com

Claude, Julien (Institut des Sciences de l'Évolution, UMR-CNRS 5554, CC064, Université Montpellier 2, Place Eugène Bataillon, F-34095 Montpellier, France) eobatagur@yahoo.fr

Cochard, David (UMR 5199, PACEA/PPP, Bât. B8, Université de Bordeaux 1, Avenue des Facultés, 33405 Talence cedex, France) david.cochard@u-bordeaux1.fr

de Weyer, Louis (Maison René Ginouvès, UMR 7041, boîte 32, 21 rue de l'Université, 92023 Nanterre Cedex, France) louis.deweyer@gmail.com

Filoux, Arnaud (UMR 7194 CNRS, Université de Perpignan & EPCC-Centre Européen de Recherches Préhistoriques de Tautavel, Ave. Léon Jean-Grégory, Tautavel, FR-66720 / PRC, Palaeontological Research and Education Centre, Mahasarakham University, 44150 Mahasarakham Thailand) filoux\_arnaud@yahoo.fr

Firmat, Cyril (Centre for Biodiversity Dynamics, Department of Biology, Norwegian University and Technology, Trondheim, Norw) c.firmat@yahoo.fr

Lozano-Fernández, Iván (IPHES, Institut Català de Paleoeologia Humana i Evolució Social, c/Marcelli Domingo s/n, Campus Sescelades URV, Edifici W3, 43007, Tarragona, Spain) ivanlozano@gmail.com

Magniez, Pierre (UMR 7194 CNRS, Université de Perpignan

& EPCC- Centre Européen de Recherches Préhistoriques de Tautavel, Ave. Léon Jean-Grégory, Tautavel, FR-66720)  
pierre.magniez@gmail.com

Pelletier, Maxime (UMR 5199, PACEA/PPP, Bât. B8, Université de Bordeaux 1, Avenue des Facultés, 33405 Talence cedex, France) pelletiermaximus@gmail.com

Ríos, Joseba (Centro Nacional de Investigación Sobre Evolución Humana, CENIEH) joseba.rios@cenieh.es

Testu, Agnès (UMR 7194 CNRS, Université de Perpignan & EPCC- Centre Européen de Recherches Préhistoriques de Tautavel, Ave. Léon Jean-Grégory, Tautavel, FR-66720)  
agnes.testu@cerptautavel.com

Valensi, Patricia (Musée de Préhistoire de Tourrette-Levens, 171, Montée du Château, 06690, Tourrette-Levens, France) pvalensi@lazaret.unice.fr

Ongoing research at the Bois-de-Riquet site (Lézignan-la-Cèbe, l'Hérault, France) has significantly increased the archeological data available for this exceptional Lower Pleistocene occurrence. Since its discovery in the 1990's, the rich paleontological level situated within a basalt flowstone radiometrically dated to 1.57 Ma (archeostratigraphical unit: 'US2') has yielded a well preserved large and small mammal assemblage. New biochronological evaluations based on the entire faunal assemblage allow an age evaluation of around 1.3-1.2 Ma for this level (late-Early Pleistocene). A small lithic assemblage in basalt is attributed to anthropic intrusion. It includes some whole pebbles which are alien to the non-alluvial context of the infill. There are also a few small sized, non-modified flakes. The lithics have been analysed according to a strict selection protocol elaborated on the basis of a systematic experimental program. Microstratigraphical analysis of the deposits combined with updated geological interpretations of the site reveal that, at the time of the accumulation, a small opening existed within the thermal and textural boundary separating the basalt flowstone's base from its entablature. This shelter was situated within a low cliff juxtaposing a small river. It provided refuge to carnivores and, occasionally, hominins, who took advantage of the shelter and the nearby water source. Five different species of carnivores are identified at the site, including the large hyena *Pachycrocuta brevirostris*, as well as their coproliths, indicating the use of the cavity as a den. While the bone accumulation may be attributed to carnivores, the human presence already attested by a few stone artifacts is also suspected by the presence of cut marks on rare fossils. This paper synthesizes data from the ongoing interdisciplinary study of the Bois-de-Riquet site, an exceptional Lower Pleistocene occurrence in southern France.

ORAL

### 3. THE FIRST EUROPEAN PEOPLING AND THE ITALIAN CASE: PECULIARITIES AND OPPORTUNISM

Arzarello, Marta (Università degli Studi di Ferrara)  
marta.arzarello@unife.it

Peretto, Carlo (Università degli Studi di Ferrara)  
carlo.peretto@unife.it

de Weyer, Louis (Université Paris Ouest Nanterre La Défense)  
louis.deweyer@gmail.com

The Italian Peninsula attests an early human peopling by the presence of several sites such as Monte Poggiolo and Pirro Nord, the first one dated to about 1.0 My (by paleomagnetism and ESR) and the second one dated to 1.2-1.5 My (on biochronological basis and especially on the presence of *Allophaiomys ruffoi*).

The tecno-economical approach to the lithic industries has been used to highlight the technical behaviours, the choices related to raw materials and to make comparisons with other European sites that have the same chronology.

In these sites, the lithic production is generally characterized by short reduction sequences strongly adapted to the initial morphology of raw material (always flint cobbles or pebbles). The lithic production is mainly made by unipolar/orthogonal/multidirectional débitage but also the centripetal exploitation is attested and seems to have an important place inside the débitage economy. From a general point of view, these features are shared with the other contemporary European sites and with the African Mode 1, but some peculiarities can be underlined and these attest an extraordinary *savoir-faire* and capacity of adaptation to the raw material.

ORAL

### 4. THE FIRST EUROPEAN MODE 1 LITHIC INDUSTRY: VALLPARADÍS (BARCELONA, NORTH-EASTERN SPAIN)

García Garriga, Joan (Institut Català de Paleoecologia Humana i Evolució Social (IPHES) jgarc338@xtec.cat

Martínez Molina, Kenneth (Institut Català de Paleoecologia Humana i Evolució Social (IPHES) kmartine@xtec.cat

The Vallparadís site contains an abundant Epivillafranchian fauna and Mode 1 industry that has been dated to the upper limit of the Jaramillo subchron. The stone tool assemblage from Vallparadís covers the chronological vacuum between the pre-Jaramillo (Fuente Nueva 3,



Barranco León and Sima del Elefante TE9) and post-Jaramillo (Gran Dolina TD6) Iberian sites. The industries from these sites are associated to the Mode 1 technocomplex with a variability range.

The stone tools assemblage from Vallparadís has been analyzed by categories of artefacts and raw materials following the *chaîne opératoire* concept, discriminating technological issues related to configuration and exploitation processes.

At Vallparadís, lithic industry was obtained from short *chaînes opératoires* developed on small sized clasts and river pebbles on quartz, flint and lydite. Bipolar on an anvil knapping technique was used to core exploitation sequences, while a few cores were knapped with non orthogonal methods (unipolar and centripetal methods). The assemblage includes a significant amount of retouched tools, including notches, becs, scrapers and denticulates, and there are also a few denticulates associated with a distal notch and pointed tools.

Technological, taphonomical and archaeozoological data from the Iberian Early Pleistocene sites suggest that hominins share the same adaptive strategies. These early groups were able to maintain a continuous settlement in European ecosystems from 1.4–1.2 Ma up to the first half of the Middle Pleistocene (c. 0.6 Ma) and to expand into northern territories before the Jaramillo subchron. The adaptation of early hominins with Mode 1 technology to the different European ecosystems and climatic fluctuations probably retarded the expansion of new hominin groups with Mode 2 technology until the first half of the Middle Pleistocene.

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## 5. SITE FROM THE EARLY PLEISTOCENE OF ALTO DE LAS PICARAZAS

Guillem, Pere M. (Laboratorio de Arqueología y Paleontología. IVC+R. CulturArts. Generalitat Valenciana)  
guillem\_per@gva.es

Martínez Valle, Rafael (Laboratorio de Arqueología y Paleontología. IVC+R. CulturArts. Generalitat Valenciana)  
martinez\_rafval@gva.es

Vicente Gavarda, Miguel (Laboratorio de Arqueología y Paleontología. IVC+R. CulturArts. Generalitat Valenciana)  
mvicentega@yahoo.es

Casabó I Bernard, Josep (Dirección General de Patrimonio Cultural Valenciano. Generalitat Valenciana) casabo\_jos@gva.es  
Garay, Policarpo (Servicio Territorial de Medioambiente CIT-MA) garay\_pol@gva.es

Pueyo, Emilio (IGME. Unidad de Zaragoza) unaim@igme.es  
Company, Julio (Laboratorio de Arqueología y Paleontología. IVC+R. CulturArts. Generalitat Valenciana)  
julio.company@uv.es

The archeological site *Alto de las Picarazas* (Chelva-Andilla, Valencia) is located on a small slope at 1,070 m above sea level, on the eastern extreme of the Iberian system. It was discovered in 2008 during the construction of the wind power station *Peñas de Dios II*.

The site is inside a cavity of tectonic origin, formed on a bank of limestone. The cave grew in size through karstic processes, developing in a sub-vertical direction as the bedrock dissolved. It is completely full of clay and carbonate colluvial sediments, and four stratigraphic levels have been identified.

With regard to information relating to biostratigraphy and paleomagnetism, two chronological periods are apparent: one in the Middle Pleistocene, associated with the presence of *Microtus (Iberomys) brecciensis* and *Allocrietus bursa*; and another (Level IV) in the Early Pleistocene with *Allophaiomys lavocatí*, *Allophaiomys nutiensis*, *Arvicola jacobus* and *Prolagus sp.*, signifying that this level dates back about 1.2 to 1.5 m years.

Level IV has also provided abundant remains of large mammals, especially indeterminate *Bovini* remains, *Equus sp.*, *Soergelia minor* and *Stephanorinus etruscus*, as well as a few examples of carnivores, particularly *Ursus etruscus*. A small group of lithic artifacts have also been recovered, made up mainly of flakes from limestone and siliceous materials.

The existence of this industry as well as bones marked with lithic tools, rabbit bones showing evidence of carnage and human teeth, and numerous charred bone remains indicate that *Homo sp* frequented the site in the oldest period of the sequence (Level IV), and that he consumed remains from a medium-sized bovine, deer and lagomorphs. This evidence provides conclusive proof of the presence of hominids in very early dates in the eastern Iberian Peninsula.

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ORAL

## 6. THE FIRST PEOPLING OF EUROPE VIA NORTH BLACK SEA CORRIDOR: DISCOVERY OF OLDOVA-NEAN IN THE DNIESTER VALLEY

Chepalyga, Andrey (Institute of Geography Russian Academy of Sciences) tchepalyga@mail.ru  
Anisyutkin, Nikolay (Institute of Material Culture History, Rus-

*sian Academy of Sciences) leonid.dictyoptera@gmail.com*

The problem of Oldovan pass ways from Africa into Europe cross Near East, last time is discussed. Previously proposed Anatolian - Balkan way southward of the Black Sea has not been confirmed by any oldovan sites. Reconstruction of Oldovan migration way from Africa to Europe via South Caucasus (Dmanisi) was proposed by E. Aguirre and E. Carbonell (2002).

New discoveries of oldovan pebble culture in the Dniester valley and in Crimea permit us to reconstruct new migration way northward of the Black Sea from Caucasus along the Taman peninsula and South Crimea coast to Europe. This new way **North Black Sea Corridor** (Chepalyga, 2013) is based on a chain of 17 Oldovan sites seem to be like **steppingstones** into Europe connected Asian oldovan area with European one. The best studied sites with oldovan culture tools were recovered and digged by N.K. Anisutkin and A.L. Chepalyga in 2010-2014 in Lower Dniester valley near the town Dubossary, Moldova (Dniester Republic). 5 sites related to VII (Kitskany) terrace (125 m asl.) sediments were recovered.

The multilayered site Bayraki is digged in Bayraki gully, east suburb of Dubossary town (N47°16'27" E29°11'10"). The terrace sediments section 10 m thickness subdivided by 10 lithological and 6 culture layers: two Achelean and four Oldovan. More than 1000 stone artefacts from chert, hard sandstones, quartzite were found in Bayraki (oldovan). Several hundred tools belong to heavy duty, light-duty, microtools including choppers, chop-pings, peaks, bill-hooks, end- and side- scrapers, borers, rabou, protoknives. This industry belongs to developed Oldovan culture Mode I. Some tools were effected by fire. Stone pavement from prepared lime stone plates, accompanied by tools in culture layer IV were digged. Using of this construction is unknown, possible it was animal skin preparation (bones absence and bill-hooks existence).

Mammals rest *Archdiscodon meridionalis tamanensis*, *Equus sussenbornensis* are typical for Tamanean complex (=Epivillafranchian). Mollusk fauna contains freshwater bivalves *Pseudosturia caudata*, *Crassiana crassoides* – index species for Kosnitsa complex (upper part of Lower Pleistocene).

Paleomagnetic studies recovered Matujama and Brunhes epochs as well as Jaramillo event 0.99-1.07 Ma. Oldovan culture layers (III-VI) are within Jaramillo event. This suggests the age of oldovan Bayraki site as 0.95-1.1 Ma. Ashelean layers I-II are in the base of Brunhes paleomagnetic epoch younger 0.78 Ma.

Just on Asia-Europe boundary in Taman peninsula was studied oldovan stratificated sites: Bogatyri, Rodniki, Kermek, Tsimbal (Schelinskiy, 2012). The westward pass-way continued on South Crimea coast where new Early Paleolithic, probably oldovan sites Echki-Dag, Artek, Gaspra, Ai-Petry, Blue bay, Cape Majachny (Zuk, 1995, Stepanchuk, 2006) were recovered. This was the narrowest part of the North Black Sea Corridor 10-15 km width named as **South Crimea Pass**. Further to the west migration way can passed on NW Black Sea shelf (dried during Gurian Sea basin) up to the Dniester river valley and upstream to Dubossary, where are Bayraki and other Oldovan sites on Dniester valley: Kretceshti, Moch-Gori, Napadovo, Luka Vrublevetskaya (total 7 sites). These oldovan sites are as likely steppingstones from Asia into Europe and further just to Atapuerca.

ORAL

## 7. EARLY PALEOLITHIC OF KOROLEVO: TYPOLOGICAL ANALYSIS.

*Kulakovska, Larissa (Institute of Archaeology NASU)  
larissa.kulakovska@gmail.com*

The Korolevo Paleolithic site located on two terraces "Gostry Verkh" (120 m) and "Beyvar" (100 m) of the right bank of Tisza River. In the main geological profile (12 m) 7 paleosoils distinguished (K-III – K-IX) (Haesaerts, Koulikovska, 2006, fig.2). In the sequence of 10 archaeological Levels two lowest ones were determined as Lower Paleolithic (Kulakovska, 2001, Kulakovska, Usik, 2011). It should be stressed that in Transcarpathian sediments there are no organic finds.

AH VII was found in the small pebble alluvium layer under Brunhes-Matuyama-Brunhes boundary (MIS 23/25). For the artifact production the local volcanic raw material andesite (vitrophyric dacite (Racz, 2013)), quartz and quartzite were used. The main in situ collection of Level VII (33 artifacts) included cores, flakes, choppers and fragment of the bifacial tool. Primary flaking presented by simple unidirectional, parallel methods. Additionally one artifact can be determined as polyhedron, which probably is result of the way of reduction "without hammer". This industry belongs to so-called Mode I (fig.1,B) (Kulakovska et al., 2010).

Cultural Level VI was found in the upper part of inter-Mindel paleosol K-VII (after P.Haesaerts, 2006) (around 550 000 years ago). The lithic collection contains more

than 5000 pieces. Apart from main raw material (andesite = vitrophyric dacite) quartzite, quartz, flint, slate were used for reduction. The primary flaking characterized by exploitation of simple unidirectional, parallel and rare radial methods. Polyhedron kinds of artifacts are present too. In the tool-kit the next tool-types are present: simple, transversal and diagonal scrapers with steeped retouch; denticulates, etc.. A few samples with bifacial retouch by shape and the way of treatment are quite similar to "Keilmesser" of Micoquen techno-complex. The industry of Level VI can be attributed to Mode 1 too (Kulakovska et al, 2010) (fig.1,A).

The new investigations of Lower Paleolithic stratified sites and detailed analysis of lithic industries made some adjustments to established understanding of this period. The typology of Lower Paleolithic industries demonstrated quite wide variability and quite "developed" level of the tools manufacture, which can be change opinion about expected "archaism" (Derevyanko, 2009). The tool collection of Level VI of the Korolevo site supports this opinion. In contradistinction to typology the primary flaking demonstrated monotonic examples of reduction and simple technology. In this context it possible to talk about reduction "without hammer", simple unidirectional and parallel exploitation of cores with flat working surface. The technology of centripetal reduction of non-Levallois flat cores is not developed yet (Kulakovska, Usik, 2010).

For the Middle Paleolithic the methods of primary flaking are more variable and technologically more complex. It can be marked the appearance of Levallois Methods, widespread centripetal Methods, parallel and convergent methods and other variants. Thus, the first trace of presence of humans for the time of MIS 23/25 in Tisz?-Danube basin marked by Mode 1 type industry of AH VII Korolevo I site. The next wave of human occupation (600-500 ???) represented by Mode 1 industry of AH VI Korolevo I site.

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ORAL

## 8. EARLY PLEISTOCENE ADAPTATIONS IN THE LEVANT: A VIEW FROM BIZAT RUHAMA, ISRAEL.

Zaidner, Yossi (Zinman Institute of Archaeology, University of Haifa; Institute of Archaeology, The Hebrew University of Jerusalem) [yzaidner@research.haifa.ac.il](mailto:yzaidner@research.haifa.ac.il)

The site of Bizat Ruhama, located on the southern coastal plain of Israel, at the fringe of the Negev desert, yielded

several lithic and faunal assemblages in primary anthropogenic context and is dated to the Matuyama paleomagnetic chron (1.96-0.78 Ma), based on paleomagnetic and faunal evidence. The results of the current study at the site reveal a spatially extensive single-horizon open-air occurrence with indications for fast burial and good preservation of the original site features. According to geological and faunal evidence Bizat Ruhama hominins inhabited inter-dune depression in an open homogeneous semi-arid environment. The faunal assemblage was accumulated primarily by anthropogenic agents, preserving signs of hominin butchery. Altogether, the results point to short-term hominin occupations and suggest that animal carcasses were processed in situ along with knapping activities.

The lithic technology is characterized by using both free-hand and bipolar techniques for reduction of small pebbles in order to obtain flakes. Core-tools are virtually absent and intentionally retouched tools are probably very few. The lithic assemblage shows clear evidence for systematic secondary knapping of flakes. The probable aim of the flake knapping was to maximize raw material exploitation by producing a large number of small, thin and sharp flakes. The flakes were knapped using a bipolar technique. Similar techniques of flake reduction possibly occur in some of the Early Pleistocene sites in Europe. The Early Pleistocene site at Bizat Ruhama contributes to our understanding of the range of Eurasian habitats exploited by early hominins, and the behavioral adaptations and technological skills of the earliest Eurasians.

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ORAL

## 9. THE HOMINID COLONIZATION OF EUROPE IN THE CONTEXT OF MULTISTAGE PUNCTUATED DISPERSALS INTO THE CIRCUM-MEDITERRANEAN AND EURASIA

Rolland, Nicolas (Universidad Victoria, Canada) [prehistory@shaw.ca](mailto:prehistory@shaw.ca)

Palaeoanthropological spatiotemporal distribution patterns indicate that Europe was colonized during the Early Pleistocene from two independent converging trails from eastern and southwestern directions. These integrated within a wider framework, which encompassed a series of multidirectional dispersal and peopling events from separate staging posts around the Circum-Mediterranean and throughout Eurasia, ultimately originating in Subsaharan Africa. Their time trajectory highlights a

multistage, 'punctuated' configuration, which suggests a succession of adaptively stable peopling phases alternating with renewed dispersals from these staging posts. These observations require addressing their reticulate and multivariate causal interrelationships: identifying optimal colonization habitats; implications for colonization logistics of a single polymorphous early Homo species; the bearing of biocultural hominization antecedents on the model of 'pioneering' populations expansions; the behavioural ecological dynamics between incoming hominids for habituation with unfamiliar large Palaearctic mammalian prey species during the Epi-Villafranchian and Galerian Events; the respective roles of social canids analogs in prey species habituation, and of long-lived core aspects of hominid socio-spatial and ecological organization for interpreting this punctuated stasis/dispersals sequence.

POSTER

POSTER

**10. MODELING HUMAN SETTLEMENT, FAUNA AND FLORA DYNAMICS IN EUROPE DURING THE MID-PLEISTOCENE REVOLUTION (1.2 TO 0.5 MA).**

*Rodríguez, Jesús (CENIEH) [jesus.rodriguez@cenieh.es](mailto:jesus.rodriguez@cenieh.es)*

*Mateos, Ana (CENIEH) [ana.mateos@cenieh.es](mailto:ana.mateos@cenieh.es)*

*Palombo, María Rita (Dipartimento di Scienze della Terra, Università di Roma "La Sapienza")*

*[mariarita.palombo@uniroma1.it](mailto:mariarita.palombo@uniroma1.it)*

*Hertler, Christine (Senckenberg Forschungsinstitut)*

*[christine.hertler@senckenberg.de](mailto:christine.hertler@senckenberg.de)*

We introduce here a new international project supported by the INQUA Humans and Biosphere Commission (HaBComm) focused on the Mid-Pleistocene Revolution. This project intends to be a "pilot project" intended to be developed into an International Focus Group in the 2015-2019 INQUA inter-congress period.

The so called Mid-Pleistocene Revolution (c. 1.2-0.5 Ma) was a major environmental crisis driven by changes in orbital forcing which increased the amplitude of climatic oscillations. Changes in climate drastically affected vegetation in complex ways and led to a significant renewal of mammalian faunal paleo-communities. Human groups with Oldowan technology were present in southern Europe shortly before the Jaramillo subchron and in Britain shortly after the Matuyama/Brunhes boundary. However, evidence of human presence during the 0.7-0.5 Ma period is remarkably scarce, leading some authors to

propose a depopulation of the continent in this period and a subsequent recolonization by other groups with a new material culture: the Acheulean.

The aim of this project is to bring together researchers with experience in the study of the archaeological evidence on the colonization of Europe in the Early and Middle Pleistocene, specialists who may provide primary data on the potential constraints to human settlement (palaeoclimate, mammalian faunas, palaeoflora, palaeogeography, quantitative palaeoecology, sedimentology and palaeosoils...) and specialists in mathematical modeling. The main goals of this project are as follows: (i) archaeologists will develop hypotheses about the patterns of human occupation and cultural change in relation to the main environmental constraints of this period and (ii) palaeontologists, palynologists, palaeoclimatologists, geologists, and palaeogeographers will provide the primary data to test these constraints; (iii) these conceptual models will be turned into mathematical models, and this will be made possible with the participation of mathematicians, biogeographers and engineers with experience in the modeling of complex systems using different methodological approaches (like stochastic, differential, or agent-based models). Members of the project are not expected to have previous skills on research fields other than their own. This initiative is intended as a forum where specialists may share their expertise and join efforts to build up new approaches to address the key question of understanding the way environmental change influenced the human occupation of Europe in the Early and Middle Pleistocene.

# A2b Technological change during the Lower-Middle Pleistocene transition in Europe

Commission on First humans in Europe

(Organizers: Eudald Carbonell, Marina Mosquera, Andreu Ollé, Deborah Barsky, Xosé Pedro Rodríguez, Robert Sala)

Wednesday 3rd  
9:00-13:30  
A01 Meeting Room



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XVII World UISPP Congress  
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ORAL CONTRIBUTIONS

ORAL

## 1. THE EARLY PALEOLITHIC SITE OF KERMEK IN THE WESTERN CISCAUCASIA (RUSSIA)

*Shchelinsky, Viacheslav (Institute of Material Culture History, Russian Academy of Sciences) shchelinsky@yandex.ru*  
*Gurova, Maria (National Institute of Archaeology, Bulgarian Academy of Sciences) gurovam@yahoo.fr*

The site of Kermek is located in the south of European Russia in the southern Azov Sea region, on the northern shore of the Taman Peninsula, near the village of Peresyp'. The site was discovered in 2008 by V.E. Shchelinsky during a survey of the Early Pleistocene deposits exposed in the coastal cliff of the Azov Sea. The sequence hosts the important palaeontological localities of Tizdar 1 and 2. The archaeological site is preserved *in situ* and has a clear geological context. The bed containing stone artefacts belongs to the sedimentary sequence of the Late Kujalnik regional stage of the Black Sea marine scale. In the studied section, these deposits are characterized by reversed magnetization, a fauna of fresh- and brackish water molluscs, including the index fossil *Dreissena theodori*, and a small mammal fauna with *Allophaiomys deucalion*.

The deposits are dated to the late Gelasian or earliest Calabrian stage between c. 2.1-1.77 Ma. The stone industry of the site includes some 300 objects characterized by:

- the exclusive use of local stone raw material (silicified dolomite in the form of platy fragments of different sizes);
- archaic technology of the primary stone flaking, based on use of the unprepared core-like stone fragments (cores with 1-2 and more platforms, with few removals);
- the debitage includes deliberately made large flakes;
- abundant deliberately produced tools (choppers, chopper-like massive sidescrapers, picks, sidescrapers made on flakes and stone fragments, endscrapers, thorned tools, beak-shaped tools, etc.)
- some of the artefacts show well preserved use-wear traces.

The stone industry of Kermek represents a specific Tamanian variant of the Oldowan. Characteristic of this early industry is the presence of deliberately made large flakes and complex tools, such as picks. Kermek is currently the oldest-known Oldowan site in western Asia

outside the Caucasus, located at the southern boundary of Europe.

ORAL

## 2. STRUCTURAL CONTINUITY AND TECHNOLOGICAL CHANGE IN EARLY AND MIDDLE PLEISTOCENE TOOLKITS

*Carbonell, Eudald (IPHES-URV-IVPP) eudald.carbonell@urv.cat*  
*Barsky, Deborah (IPHES-URV) dbarsky@iphes.cat*  
*Sala, Robert (URV-IPHES) robert.sala@urv.cat*  
*Celiberti, Vincenzo (CERPT-UVPD) vceliberti@hotmail.com*

A structural foundation has been laid down to interpret early stone industries using a four-phase, branching evolutionary model: *Homogeneity*, *Variability*, *Diversity* and *Multiplicity*. *Homogeneity* hypothetically predates the first recognizable industries in Africa, at a time when stones were used but there was no controlled knapping. The *Variability* phase bears witness to hominins innovating and testing unidirectional and orthogonal knapping strategies. In Africa and Eurasia, this phase invariably precedes the appearance of shaped tools in assemblages with largely divergent timeframes. The present contribution defines *Diversity*, a phase characterized by standardized shaped tools and innovative stone reduction methods. Presently, flake-core assemblages without configured tools are united under the denomination 'Oldowan' or 'Mode 1' and assemblages containing handaxes, picks and/or cleavers are called 'Acheulian' or 'Mode 2'. The model exposed here does not suggest to replace existing nomenclature, but rather to adapt an alternative approach to the ways we conceive of techno-typological change. On a structural level, it could explain why analogous developments occurred diachronically in different areas of the globe where contact between populations was unlikely. This *Diversity* phase testifies to the enhanced techno-functional capacities developed by hominins to access resources in competition with other carnivores. This would, in turn, have expanded their free-time to further improve their toolkits and widen their range of activities. This process intensified exchange between an ever more complex lifestyle and enlarged cognitive capacities and, ultimately, provided a driving force leading to *Multiplicity*; the fourth and final phase of our model explaining change in early human technology.

30009 Murcia, Spain (MUPANTQUAT Murcian Ass for Study of Palaeoanthropology and Quaternary)

marianolopez@hotmail.com

Martín-Lerma, Ignacio (Dept of Prehistory, Archaeology, Ancient and Mediaeval History and Historiographical Techniques, Faculty of Letters, Murcia University, Campus Universitario de La Merced, Calle Santo Cristo 1, 30001 Murcia, Spain) ignaciomartinlerma@hotmail.com

Ortega-Rodríguez, Jon (Dept of Zoology and Physical Anthropology, Biology Faculty, Murcia University, Campus Universitario de Espinardo Edificio 20, 30100 Murcia, Spain) ventepalportus@yahoo.es

Polo-Camacho, Juan-Luis (Dept of Analytical Chemistry, Faculty of Chemistry, Murcia University, Campus Universitario de Espinardo Edificio 19, 30100 Murcia, Spain) jlpolo@um.es

Rhodes, Sara (Dept of Anthropology, Faculty of Arts and Sciences, University of Toronto St. George Campus, 172 St. George Street, Toronto, Ontario, ON M5R 0A3, Canada) sara.rhodes@utoronto.ca

Rodríguez-Estrella, Tomás (Dept of Mining Engineering, Geology and Cartography, Cartagena Polytechnic University, Plaza Cronista Isidoro Valverde, Edificio La Milagrosa, 30202 Cartagena, Murcia, Spain) tomas.rodriguez@upct.es

Romero-Sánchez, Gregorio (Dirección General de Bienes Culturales, Consejería de Cultura, Comunidad Autónoma de la Región de Murcia, 30001 Murcia, Spain) gregorio.romero2@carm.es

San-Nicolás-del-Toro, Miguel (Dirección General de Bienes Culturales, Consejería de Cultura, Comunidad Autónoma de la Región de Murcia, 30001 Murcia, Spain) miguel.san-nicolas@carm.es

Schwenninger, Jean-Luc (Oxford University Research Laboratory for Archaeology and the History of Art, Dyson Perrins Building, South Parks Road, Oxford OX1 3QY, United Kingdom) jean-luc.schwenninger@rlaha.ox.ac.uk

Scott, Gary R (Lodestar Magnetics Inc., 1719 Addison Street, Berkeley, California 94703, USA) magnetoscot@yahoo.com

R Skinner, Anne (Dept of Chemistry, Williams College, 880 Main Street, Williamstown, Massachusetts, MA 01267, USA) anne.skinner@williams.edu

Made, Jan van der (Dept of Palaeobiology, National Museum of Natural Sciences of the Spanish National Research Council, Calle José Gutiérrez Abascal 2, 28006 Madrid, Spain) mcnjv538@mncn.csic.es

Zack, Winston (707 E. University Blvd, Tucson, AZ 85719, USA) stoneman101@gmail.com

Cueva Negra overlooking the R. Quípar, a R. Segura tributary, is an upland rock-shelter 75 km N of the Mediterranean coast and 110 W of the Segura river-mouth. It contains undisturbed sediment 5m deep assigned by magnetostratigraphy to >0.78 Ma (Matuyama magnetochron). Optically stimulated

sediment luminescence implies >0.5 Ma and mammalian biochronology (notably, of Arvicolid rodents) indicates <1-0.7 Ma. Remains include hominin teeth, an Acheulian limestone handaxe, and small chert, limestone or quartzite artifacts, knapped on site, often by bipolar reduction or repetitive centripetal flaking of small discoidal cores. Retouched artifacts include small irregular chert fragments, resembling chert at an adjacent conglomerate outcrop according to laser-ablation inductively-coupled plasma mass-spectrometry of 19 lanthanide and other crustal trace elements, though some chert was likely procured ~25 km away (one radiolarite artifact from ~40 km). Mammals, birds (including waterfowl), reptiles, amphibians and fish corroborate pollen typical of mild (MIS-21?), damp, fluvio-lacustrine environments. Evidence of fire in a deep, sealed layer includes thermally-altered, lustreless chert, with pot-lid fractures and conjoined splintering caused by thermal shock; charred burnt bone, and white calcined fragments showing conjoined lengthwise long-bone spalling typical of circumferential shrinkage after thermal volatilization of organic components. Taphonomical analysis and electron microscopy of bone fragments attribute discolouration to burning, not to post-depositional mineral staining. Sediment geochemistry and thin-section micromorphology suggest combustion; Fourier Transform infrared spectroscopy and electron spin resonance analysis of chert and bone imply firing temperatures 550-600°C. Fire ~0.8 Ma supported hominin cognitive versatility, techno-manual dexterity, and palaeoeconomic extractive behaviour in long-vanished Western European palaeoecological and palaeobiogeographical contexts.

ORAL

#### 4. THE EARLY ACHEULEAN SITE OF LA BOELLA (TARRAGONA, SPAIN)

Mosquera, Marina (URV-IPHES) marina.mosquera@urv.cat

Ollé, Andreu (IPHES-URV) aolle@iphes.cat

Saladié, Palmira (IPHES-URV) psaladie@iphes.cat

Cáceres, Isabel (URV-IPHES) isabel.caceres@urv.cat

Huguet, Rosa (IPHES-URV) rhuguet@iphes.cat

Rosas, Antonio (MNCN) arosas@mncn.csic.es

Villalaín, Juan José (UBU) villa@ubu.es

Carrancho, Ángel (UBU) acarrancho@ubu.es

Bourlés, Didier (Aix-Marseille University, CEREGE, CNRS UM34, F-13545 Aix-en-Provence, France) bourles@cerege.fr

Braucher, Régis (Aix-Marseille University, CEREGE, CNRS UM34, F-13545 Aix-en-Provence, France) braucher@cerege.fr

Vallverdú, Josep (IPHES-URV) jvallverdu@iphes.cat

Excavations at the Barranc de La Boella (Tarragona, Catalonia, Spain) since 2007 have opened three localities with rich archaeopaleontological assemblages: La Mina, El Forn and Centre de Convencions.

Paleontology, paleomagnetism and cosmogenic analyses have yielded dates close to 1 my, being La Mina the oldest site and El Forn and Centre de Convencions the younger. The mammal taxa identified in the three localities are *Mammuthus meridionalis*, *Hippopotamus antiquus*, *Stephanorhinus cf. hundsheimensis*, *Equus sp.*, *Ursus sp.*, *Miomys savini* and *Victoriamys chalinei*.

The lithic assemblage from La Mina is formed by percussive pebbles, choppers, chopping-tools, cores, simple flakes and few retouched flakes, and has been ascribed to an Oldowan technology. The lithic assemblage from El Forn and Centre de Convencions are mostly formed by similar tools than La Mina, but they stand out because of the presence of two large cutting tools: one pick and one cleaver made on schist. These Acheulean forms appear in association to a set of flint flakes finely flaked, among which some denticulates and notches are present. Furthermore, at Centre de Convencions the lithic assemblage, that includes several refitting groups, is closely related to the remains of an elephant, in a clear buthcery context.

These evidences may point to Barranc de La Boella as one of the older Early Acheulean sites in Europe. The study of the variability of the three localities in the same environmental conditions may contribute to the knowledge about the appearance of the Acheulean in Europe, and its relation of continuity or discontinuity with the Mode 1 or Oldowan.

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#### ORAL

### 5. THE MIDDLE PLEISTOCENE SITE OF LA CANSALADETA (TARRAGONA, SPAIN): STRATIGRAPHIC AND ARCHAEOLOGICAL SUCCESSION

Ollé, Andreu (IPHES, Institut Català de Paleoecologia Humana i Evolució Social, Zona educacional 4 (Edifici W3), Campus Sescelades URV, 43007 Tarragona, Spain / Àrea de Prehistòria, Universitat Rovira i Virgili, Fac. de Lletres, Av. Catalunya 35, 43002 Tarragona, Spain) aolle@iphes.cat  
Vergès, Josep Maria (IPHES, Institut Català de Paleoecologia Humana i Evolució Social, Zona educacional 4 (Edifici W3), Campus Sescelades URV, 43007 Tarragona, Spain / Àrea de Prehistòria, Universitat Rovira i Virgili, Fac. de Lletres, Av. Catalunya 35, 43002 Tarragona, Spain) jmverges@iphes.cat

Rodríguez, Xosé Pedro (Àrea de Prehistòria, Universitat Rovira i Virgili, Fac. de Lletres, Av. Catalunya 35, 43002 Tarragona, Spain / IPHES, Institut Català de Paleoecologia Humana i Evolució Social, Zona educacional 4 (Edifici W3), Campus Sescelades URV, 43007 Tarragona, Spain) xprodriguez@iphes.cat

Cáceres, Isabel (Àrea de Prehistòria, Universitat Rovira i Virgili, Fac. de Lletres, Av. Catalunya 35, 43002 Tarragona, Spain / IPHES, Institut Català de Paleoecologia Humana i Evolució Social, Zona educacional 4 (Edifici W3), Campus Sescelades URV, 43007 Tarragona, Spain) icaceres@iphes.cat

Bennàsar, Maria (IPHES, Institut Català de Paleoecologia Humana i Evolució Social, Zona educacional 4 (Edifici W3), Campus Sescelades URV, 43007 Tarragona, Spain / Àrea de Prehistòria, Universitat Rovira i Virgili, Fac. de Lletres, Av. Catalunya 35, 43002 Tarragona, Spain) bennasar.maria1@gmail.com

López-García, Juan Manuel (Sezione di Scienze Preistoriche e Antropologiche, Dipartimento di Studi Umanistici, Università degli Studi di Ferrara, Ferrara, Italy) jlopezgarci1980@gmail.com

Bañuls, Sandra (Sezione di Scienze Preistoriche e Antropologiche, Dipartimento di Studi Umanistici, Università degli Studi di Ferrara, Ferrara, Italy) sanbacard@gmail.com

Burjachs, Francesc (ICREA, Barcelona, Spain / IPHES, Institut Català de Paleoecologia Humana i Evolució Social, Zona educacional 4 (Edifici W3), Campus Sescelades URV, 43007 Tarragona, Spain / Àrea de Prehistòria, URV, Fac. de Lletres, Av. Catalunya 35, 43002 Tarragona-Spain) fburjachs@iphes.cat

Expósito, Isabel (IPHES, Institut Català de Paleoecologia Humana i Evolució Social, Zona educacional 4 (Edifici W3), Campus Sescelades URV, 43007 Tarragona, Spain / Àrea de Prehistòria, Universitat Rovira i Virgili, Fac. de Lletres, Av. Catalunya 35, 43002 Tarragona, Spain) iexpósito@iphes.cat  
Falguères, Christophe (Département de Préhistoire, Muséum national d'Histoire naturelle, UMR7194, 1, rue René Panhard, 75013 Paris, France.) falguere@mnhn.fr

Arnold, Lee (School of Earth and Environmental Sciences, Environment Institute, and Institute for Photonics and Advanced Sensing (IPAS), University of Adelaide, North Terrace, Adelaide SA 5005, Australia) lee.arnold@adelaide.edu.au

Demuro, Martina (Institute for Photonics and Advanced Sensing (IPAS), University of Adelaide, North Terrace, Adelaide SA 5005, Australia) martina.demuro@gmail.com

Voinchet, Pierre (Département de Préhistoire, Muséum national d'Histoire naturelle, UMR7194, 1, rue René Panhard, 75013 Paris, France) pvoinchet@mnhn.fr

López-Polín, Lucía (IPHES, Institut Català de Paleoecologia Humana i Evolució Social, Zona educacional 4 (Edifici W3), Campus Sescelades URV, 43007 Tarragona, Spain / Àrea de Prehistòria, Universitat Rovira i Virgili, Fac. de Lletres, Av. Catalunya 35, 43002 Tarragona, Spain) lucia.lopezpolin@iphes.cat  
López, Esther (IPHES, Institut Català de Paleoecologia Hu-



*mana i Evolució Social, Zona educacional 4 (Edifici W3), Campus Sescelades URV, 43007 Tarragona, Spain / Àrea de Prehistòria, Universitat Rovira i Virgili, Fac. de Lletres, Av. Catalunya 35, 43002 Tarragona, Spain) elopez@iphes.cat*  
*Vallverdú, Josep (IPHES, Institut Català de Paleoecologia Humana i Evolució Social, Zona educacional 4 (Edifici W3), Campus Sescelades URV, 43007 Tarragona, Spain / Àrea de Prehistòria, Universitat Rovira i Virgili, Fac. de Lletres, Av. Catalunya 35, 43002 Tarragona, Spain) jvallverdu@iphes.cat*

The site of La Cansaladeta is located in a narrow passage dug out by the Francolí river in the prelittoral range that connects the Tarragona coastal plain with the central Catalan depression. The archaeological deposit lays on top of a +40-45m fluvial terrace, at the foot of a partially dismantled rock shelter.

The archaeological works initiated at the site in 1999 brought to light a rich Middle Pleistocene stratigraphic succession containing 10 archaeological levels. Although the site's archaeological record is mainly composed of lithic artefacts, faunal remains as well as fire evidences are available.

Here we present the description of the sedimentary succession of the site, the available chronological framework (including Luminiscence, ESR/Useries datings and biostratigraphical information), the characteristics of the lithotechnical and faunal assemblages, as well as the first interpretation of the human occupations at the site.

Lower levels date back to the Early Middle Pleistocene, and the upper ones show an age of c. 300 ka. Three main occupation phases have been differentiated. The oldest levels appear in a paleosol formed on a clayey layer that contains also some limestone fragments detached from the shelter's wall and roof. During the second phase, low energy fluvial sediments coming from lateral river floods were deposited and sealed the archaeological levels. After a transitional phase, the upper levels appear totally included in colluvial slope sediments.

The rich technological record is made up with several local raw materials, especially chert but also hornfels, quartzite, quartz and other residual rocks. Knapping sequences seem to be autochthonous, as all the elements and size-categories of the reduction sequence are present, and refits are common. Although the technological features observed along the sequence are not very diagnostic, in the lower levels there is a significant presence of some Acheulean forms among the large shaped tools, accompanied by a restricted variability among the small retouched tools (mostly

denticulates) and a virtually absence of prepared cores.

The faunal assemblage is scarce and appears strongly weathered. In fact, only the levels included in the two lower sedimentary phases have provided fruitful information, especially from a biochronological point of view.

Although neither combustion areas nor structures related to fire have been documented to date, its damage has been repeatedly recorded on either lithic and faunal remains, what seems to point to its systematic use along the sequence.

The new data provided by the ongoing excavations at the La Cansaladeta site considerably helps the early human settlement of northeast Iberia to be reconstructed. In fact, combining these data with those coming from el Barranc de la Boella, a site located very close in the same Francolí basin, we can draw a new scenario on the early human presence in the region and on the diffusion of the Acheulean.

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## ORAL

### 6. THE ACHEULEAN WORKSHOP OF LA NOIRA (FRANCE, 650 KA) IN THE EUROPEAN TECHNOLOGICAL FRAMEWORK

*Moncel, Marie-hélène (MNHN-CNRS) moncel@mnhn.fr*  
*Despriée, Jackie (MNHN) jackie.despriee@free.fr*  
*Voinchet, Pierre (MNHN) pvoinch@mnhn.fr*  
*Courcimault, Gilles - gilles.courcimault@wanadoo.fr*  
*Gallet, Xavier (MNHN) gallet@mnhn.fr*  
*Hardy, Bruce (Kenyon College) hardyb@kenyon.edu*  
*Bahain, Jean-Jacques (MNHN) bahain@mnhn.fr*  
*Falguères, Christophe (MNHN-CNRS) falguere@mnhn.fr*

The lower unit of la Noira, located in the Center of France, has yielded an assemblage composed of Large Cutting Tools (LCTs), cores and flakes. ESR dates (655 ± 55 ka) and technical characteristics suggest that it is among the oldest evidence of the Acheulean in Western Europe. Since 2011, new excavations of the level have been undertaken.

The aim of the communication is to provide new data on the excavations of the workshop and replace the lithic assemblage in the European technological framework. More than 30 m<sup>2</sup> have been opened and the site yields artefacts from workshops. Hominins found millstone slabs in huge quantity along the river. We can describe

the modes of knapping on these slabs, crude bifacial tools, flaking of small and large flakes, cores. Cores, flakes and crude LCTs are dispersed among the fragments of slabs.

Numerous slabs show few invasive removals or are broken by hard direct percussion. Associated with these possible crude cores, there small and large flakes, cores. Flakes are few retouched. Large flakes are not used for the shaping. Most of the LCTs are crude tools, some of which are broken. One is a completely worked biface. A preliminary study of the microscopic traces attest butchery and wood working.

Hominins were present at the beginning of a Lower Middle Pleistocene glacial-interglacial cycle, before a pleniglacial period (MIS 16). The site is contemporaneous of sites with LCTs such as Arago levels P-Q or Notarchirico, or sites without LCTs such as Pakefield or Isernia. Technological comparison will allow us discussing on the diversity of strategies in Europe at 800-500 ka and the hypothesis of punctual arrivals of new traditions as soon as 700 ka.

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ORAL

## 7. LA GRANDE VALLÉE, A NEW EVIDENCE ON THE DISCUSSION OF THE APPEARANCE OF BIFACIAL TECHNOLOGY IN EUROPE

*Hérisson, David (UMR7194, CNRS) davidherisson@yahoo.fr*

*Jean Airvaux airvaux.jean@wanadoo.fr*

*Arnaud Lenoble (UMR5199, CNRS)*

*a.lenoble@pacea.u-bordeaux1.fr*

*Daniel Richter (Max Planck Institute for Evolutionary Anthropology) drichter@eva.mpg.de*

*Emilie Claud (INRAP; UMR5199, CNRS) emilie.claud@inrap.fr*

*Jérôme Primault (DRAC Poitou-Charentes; UMR7041, CNRS)*

*jerome.primault@cluture.gouv.fr*

As noticed by organisers of this session, the archaeological evidence dating between 0,8 and 0,5 Mya in Europe is scarce but recent discoveries suggest that the Acheulian or Mode 2 started to appear around this time. In this context, every new evidence and site dating from this time period are welcomed additions to debate about the modalities of the appearance of Mode2 in Europe. In this communication, we will present recent data coming from a new excavation, La Grande Vallée, and its contribution to the knowledge of technological change during the Lower-Middle Pleistocene transition in Europe.

La Grande Vallée is situated at the borders of the 'Bassin

Parisien' and 'Bassin Aquitain', between the extensions of the 'Massif Central' and the 'Massif Armoricain'. Located in the northern part of the Seuil du Poitou, the site occupies a key-space between southern and northern Europe. Discovered in 1995, the site was recently excavated from 2006 to 2008, by an interdisciplinary team.

Within three meters depth, five archaeological layers were discovered, delivering more than 18 500 lithic artifacts. Archaeological and pedostratigraphic results as well as thermoluminescence dating on burnt flint converge on an age for the lithic assemblages around 500 ka for the two oldest layers (U5i, U5g) and 400 ka for the three youngest layers (U5e, U5c, U5a). Attributable to the technological Mode 2, the wealth of lithic assemblages of La Grande Vallée permit us to study a series of sites during a scarcely documented period in Europe. Huge slabs of Upper Turonian flint were exploited by hominids to produce huge flakes. These huge flakes were used as tools or blanks for bifacial shaping. Handaxes have also been produced by direct shaping of Upper Turonian slabs. Technological studies show a large typological variety with morpho-functional concepts of relatively stabilized tools as well as specialized and repeated 'chaînes opératoires'.

All these recent data from La Grande Vallée will be presented and placed in the debate as a new evidence in the discussion of the appearance of bifacial technology (mode 2) in Europe.

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ORAL

## 8. MODE 1 OR MODE 2 ? SMALL TOOLS IN THE TECHNICAL VARIABILITY OF THE EUROPEAN LOWER PALAEOLITHIC: THE SITE OF FICONCELLA (TARQUINIA, LAZIO, CENTRAL ITALY).

*Aureli, Daniele (Università degli Studi di Siena Dip. di Scienze Fisiche, della Terra e dell'Ambiente U.R. Preistoria e Antropologia) danieleaureli@gmail.com*

*Contardi, Antonio (Museo Civico Klitsche de La Grange di Al-lumiere) antoniocontardi@libero.it*

*Giaccio, Biagio (Istituto di Geologia Ambientale e di Geoingegneria, CNR, Roma) biagio.giaccio@cnr.it*

*Lemorini, Cristina (Università di Roma "La Sapienza") cristina.lemorini@uniroma1.it*

*Marano, Federica (Università di Roma "La Sapienza", Dip. Scienze della Terra) mariarita.palombo@uniroma1.it*

*Milli, Salvatore (Università di Roma "La Sapienza", Dip. Scienze della Terra) salvatore.milli@uniroma1.it*

*Modesti, Valerio (Università di Roma "Tor Vergata", Dip. Let-*

*tere) valeriomodesti1974@libero.it*

*Palombo, Maria Rita (Università di Roma "La Sapienza", Dip. Scienze della Terra) mariarita.palombo@uniroma1.it*

*Rocca, Roxane (Université Paris Ouest Nanterre La Défense UMR 7041 - ArScAn - équipe AnTET) roxane.rocca@gmail.com*

The site of Ficoncella, in northern Latium (Italy), provides the opportunity to investigate the modalities of a short occupation in a fluvial context during Lower Palaeolithic. Geological investigations, radio-isotopic dating and tephrochronological analyses indicate that the human activity took place on a riverbank during the sea-level high-stand of the marine isotope stage 13 (MIS 13; ca. 500-490 ka)

This period represent a key moment in the Italian Lower Palaeolithic, at the crossroad between the youngest mode 1 sites, (Monte Poggiolo) and the first acheulean one (Venosa). Furthermore, Ficoncella is located in Central Italy, known for its richness of Lower Palaeolithic occupations belonging to those two wide techno-complexes (Ceprano, Campo Verde, Castel di Guido, Torre in Pietra, La Polledrara).

The lithic assemblage, obtain after three fieldworks missions, was analysed using firstly a classical technological approach. This classical techno-productional analysis has been combined with a techno-functional approach. Refitting analysis and RMU (Raw Material Unit) approach represent an important step of the methodology applied. It's a useful tool for understanding the lithic industry and the spatial distribution of the material. The goal of this method is to understand the functional potential of a tool thanks to the chronology of the removals, the technical consequences of each removal on the blank (angles, surfaces morphology, etc). This approach will be combined with a use wear analysis to go further in the understanding of the site function and interactions with the fauna.

The first results obtain after three fieldwork missions, allows us to reconsider the variability of technical and maybe subsistence strategy during the Lower Palaeolithic. The geological and taphonomical data indicate that the finds where accumulated in a short time range. The lithic industry, very small in size, shows a very original reduction sequence. The good preservation status allowed us to makes a first use wear analysis. The hypothesis that Ficoncella could be an occasional butchery site is supported by the presence of a partially preserved carcass of *Palaeoloxodon antiquus*.

To conclude, the material of Ficoncella contains some extremely interesting information. The technological

features are both very original and well integrated in the Lower Palaeolithic variability. The absence of handaxes still now is not so surprising given the technical trends known in Italy and Southern Europe this chronological range. The technical abilities, evidences by the precision of gesture in core preparation, flaking and retouch are remarkable. This may help renew our image of the lithic industries without handaxes too often ignored.

ORAL

## 9. STILL, SOME DIFFICULTIES: THE EARLIEST OCCUPATION OF EUROPE AS SEEN FROM THE LEVANT

*Sharon, Gonen (Tel Hai College) gonen@telhai.ac.il*

Recent excavations and research have resulted in a wealth of new data from Early Pleistocene sites in Europe. Yet, a critical review of the published findings in light of evidence from the Levant poses some difficulties in accepting the interpretation of this data. A look from the east raises the following issues:

Chronology: the Early Pleistocene sites in the Iberian Peninsula yield a solid chronology; however, this cannot be claimed for most of the sites beyond the Pyrenees. These sites are dated either by means of stratigraphic correlations or by less well-established dating methods. Technology: Early Pleistocene Levantine (and African) assemblages are Early Acheulian (or Developed Oldowan) in nature, the type site being 'Ubeydiya. While non-biface assemblages do exist in the Levant (Bitzat Ruchama) the absence of the early Acheulian from Western Europe should be explained.

Nature of sites: The Levantine sites (again, similar to African sites) are large in area, with long chronological sequences and a wealth of stratified, in situ lithic tools. Such sites are also present in Western Europe, beginning with the Middle Pleistocene. The question remains as to why we do not find large scale, rich sites from the Early Pleistocene.

The eastern gap: Early sites are reported from the Levant and the Caucasus. Some preliminary reports are starting to come from Turkey, but we still await solid evidence for Early Pleistocene sites in Eastern Europe (admittedly, even evidence for the Acheulian is still rare).

These important questions remain to be answered by researchers studying the earliest occupation of Europe.

POSTER

POSTER

### 10. LITHIC MATERIALS IN HIGH FLUVIAL TERRACES OF THE RIVERS CINCA-ALCANANDRE (N SECTOR OF THE EBRO BASIN)

*Montes, Lourdes (Universidad de Zaragoza)*

*lmontes@unizar.es*

*Domingo, Rafael (Universidad de Zaragoza)*

*rdomingo@unizar.es*

*Rodríguez-Ochoa, Rafael (Universitat de Lleida)*

*rrodriguez@macs.udl.cat*

*Utrilla, Pilar (Universidad de Zaragoza) utrilla@unizar.es*

*Peña-Monné, José Luis (Universidad de Zaragoza)*

*jlpena@unizar.es*

*Sampietro-Vattuone, María Marta (Univ. Nacional de Tucumán-CONICET) sampietro@tucbbs.com.ar*

The findings of Palaeolithic tools linked to Quaternary accumulations in the Ebro Basin are very scarce, with some exceptions such as the Najerilla valley ensembles (La Rioja). Recently, we have localised some materials on the higher fluvial terrace levels from the interfluvial Alcanadre – Cinca – Noguera Ribagorzana (Level Qt1). Today these reliefs are platforms and isolated hills, around 200 m above the main rivers. They are composed of gravels that come from the Pyrenean and Pre-Pyrenean ranges and show in the top the development of petrocalcic horizons (*caliches*), that can reach a thickness of up to 2-5 m such as in Saso de las Fitas (Alcanadre river) and in Sierra de San Quílez (Cinca river). The palaeomagnetism and the development degree of the petrocalcic horizons could date these two high terraces in 0.9-1 million years. The prehistoric materials found at those terraces are scarce but significant: in las Fitas we have found some cores and pebbles that have been knapped to simple morphologies, either uni- or bifacial, on quartzite and similar rocks; in San Quílez there are some archaic handaxes and a trihedral piece knapped on flint. As they were on top of both terraces, they must be younger than them, without any further precision.

A third quaternary formation between the courses of the Cinca and the Noguera Ribagorzana, Mina de Olriols, shows a different disposition. It is an alluvial fan - terrace deposited by a lateral stream. Its position, altitude and lesser development of petrocalcic horizons could locate it topographically in Middle Pleistocene levels. It could be related to the Cinca river's terraces Qt5 to Qt6 (178/151 ky to 98 ky respectively). This deposit holds some stratified remains, obtained from a section left by

a quarry exploitation: a 0-type cleaver made on black basalt and some scarce bone splinters.

The soil study and the analysis of the eolized pieces will help us to precise the chronology of the prehistoric remains from Saso de las Fitas and Sierra de San Quílez. As for Mina de Olriols, we seek to assess the chronology of the geological strata by means of an OSL dating, in order to confirm or discard the relationship between this area and the dated quaternary terraces.

POSTER

### 11. ASSESSMENT OF THE ACHEULEAN IN SOUTHERN ITALY: NEW STUDY ON THE CIMITERO DI ATELLA SITE (BASILICATA, ITALY)

*Abruzzese, Claudia (Università degli Studi di Napoli - Dip. Asia, Africa e Mediterraneo) cla.abruzzo@gmail.com*

*Aureli, Daniele (Università degli Studi di Siena - Dip. di Scienze Fisiche, della Terra e dell'Ambiente - U.R. Preistoria e Antropologia) danieleaureli@gmail.com*

*Rocca, Roxane - (Université Paris Ouest Nanterre La Défense - UMR 7041 - ArScAn - équipe AnTET)*

*roxane.rocca@gmail.com*

The Cimitero di Atella site (Basilicata, Southern Italy) was discovered in 1990 and examined for more than 20 years by an *équipe* of Università di Firenze directed by Prof. Borzatti von Löwenstern. Thanks to geological and geomorphologic studies on the area, located a few kilometres far from the Venosa basin sites (Loreto and Notarchirico), and to the typological classification of the lithic industry, a chronology around 600-550 ka (OIS 15) has been proposed for this site. Moreover, the presence of "bifaces" has led authors to refer this techno-complex to the Lower Acheulean. Despite of problems related to the absence of direct radiometric dates, after this new study Atella site can be taken into account in the large debate on the first peopling of Europe.

This work is based on data obtained in a graduation thesis about the lithic industry found in Atella levels F, considered as colluviums and excavated on about 12m<sup>2</sup>, which has been analysed through a technological approach, never applied on these materials until today. Then, retouched tools have been studied by a techno-functional approach, reasoning about transformative and prehensile parts on each tool. Materials were affected by strong taphonomic events of both mechanical and chemical nature, so it was possible to analyse only a sample of 666 pieces.

The technological categories found are cores, flakes, small tools, large tools and retouch flakes.

Retouched flakes and natural fragments have been divided into small and large tools on dimensional basis, even if large tools category approximately corresponds to the "bifaces" individuated by Borzatti and colleagues. Actually the *façonnage* of these tools affects almost exclusively only one of the blank surfaces. Small tools are made both on natural fragments and *débitage* flakes and, whatever is the nature of the support, they share some common features: small dimension, important thickness and a flat ventral surface used as a striking platform for retouch.

Comparing Atella lithic industry with others, with or without bifaces/handaxes, we found analogies first in production strategies and then in recurrences individuated on small tools confection. Large unifacial tools, on the other hand, hardly find comparisons with other Italian or European sites.

In conclusion, we assert on one part the great scientific potential of the area, on the other part the necessity of continuing survey researches in the Atella basin, enlarging the excavated area of Cimitero di Atella site levels F, and restudying several old lithic collections discovered in the area (for example, Loreto in the Venosa Basin) applying this new technological approach, with the intent of a better comparison among these techno-complexes.

# A2C What's happening now in Atapuerca? Latest research at the Sierra de Atapuerca

Commission on First humans in Europe  
(Organizers: Jordi Rosell, Alfonso Benito, Jesús Rodríguez)

Tuesday 2nd (9:00 to 13:30 15:00 to 19:30)  
Salon de Actos (Facultad de Económicas)



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ORAL CONTRIBUTIONS  
9:00-9:20 PRESENTATION

ORAL

**1. PALAEOGEOGRAPHICAL RECONSTRUCTION OF THE PLEISTOCENE SITES IN THE SIERRA DE ATAPUERCA (BURGOS, SPAIN)**

*Benito-Calvo, Alfonso (CENIEH, GEE)*

*alfonso.benito@cenieh.es*

*Ortega, Ana Isabel (CENIEH, GEE) anaisabel.ortega60@gmail.com*

*Campaña, Isidoro (CENIEH) isidoro.campanna@cenieh.es*

*González, Laura (CENIEH, UBU) eternal.lau@gmail.com*

*López, David (CENIEH, UBU)*

*davidlopezhurtado@gmail.com*

*García Luis, María (UBU) limgcite@ubu.es*

*Pérez-González, Alfredo (CENIEH) alfredo.perez@cenieh.es*

*Bermúdez de Castro, José María (CENIEH) josemaria.bermudezdecastro@cenieh.es*

*Carbonell, Eudald (URV, IPHES, IVPP) ecarbonell@iphes.cat*

The Sierra de Atapuerca is a carbonated gentle anticlinal ridge belonging to the NW extreme of the Iberian Chain (North-Central Spain, Burgos), which has been isolated (at least from the Oligocene) by subhorizontal continental endoreic sediments of the NE Duero Cenozoic Basin. The shift to exoreic conditions in the Duero Basin caused the onset of a downcutting staircase model, which caused the development of the Atapuerca multi-level cave system, containing several sites from the Early Pleistocene. In this work, we carry out the palaeogeographical reconstruction of the SW flank of the Sierra de Atapuerca, where these archaeo-palaeoanthropological sites are located.

These works are based on detailed geomorphological, geological and stratigraphical analysis, combined with GPS and 3D LiDAR data, and GIS and finite elements modelling. This work combines the reconstruction of Pleistocene base levels, the analysis of valley longitudinal profiles, the study of slope retreatment, the reconstruction of cave morphologies, and the reconstruction of post-depositional deformation features shown by the site sediments

These reconstructions have provided the landscape and karstic palaeogeographical habitats during the Pleistocene hominid occupation of the Sierra de Atapuerca.

ORAL

**2. ELECTRICAL RESISTIVITY TOMOGRAPHY (ERT) FOR IDENTIFYING TORCAS AREA PASSAGES CONNECTING GRAN DOLINA, GALERÍA COMPLEX AND SIMA DEL ELEFANTE SITES (SIERRA DE ATAPUERCA, BURGOS, SPAIN)**

*Bermejo, Lucía (UBU/CENIEH) lucia.bermal@hotmail.com*

*Ortega, Ana Isabel (CENIEH, Centro Nacional de Investigación sobre la Evolución Humana) anaisabel.ortega60@gmail.com*

*Guérin, Roger (Sorbonne universités, UPMC Univ Paris 06, UMR 7619, METIS, F-75005, Paris, France) roger.guerin@upmc.fr*

*Benito-Calvo, Alfonso (CENIEH, Centro Nacional de Investigación sobre la Evolución Humana, Paseo Sierra de Atapuerca 3, 09002 Burgos, Spain) alfonso.benito@cenieh.es*

*Pérez-González, Alfredo (CENIEH, Centro Nacional de Investigación sobre la Evolución Humana, Paseo Sierra de Atapuerca 3, 09002 Burgos, Spain) alfredo.perez@cenieh.es*

*Parés, Josep María (CENIEH, Centro Nacional de Investigación sobre la Evolución Humana, Paseo Sierra de Atapuerca 3, 09002 Burgos, Spain) josep.pares@cenieh.es*

*Aracil, Enrique (Análisis y Gestión del Subsuelo, S.L. c/ Luxemburgo, 4; portal 1, oficina 3; 28224-Pozuelo de Alarcón, Madrid, Spain) e.aracil@ags-geofisica.com*

*Maruri, Unai (Análisis y Gestión del Subsuelo, S.L. c/ Luxemburgo, 4; portal 1, oficina 3; 28224-Pozuelo de Alarcón, Madrid, Spain) u.maruri@ags-geofisica.com*

*Pérez, Raquel (TAUP, Topografs Alt Urgell i Pirineus SLT, C/ Joaquim Viola 12, 25700, La Seu d'Urgell, Lleida, Spain/ IPHES, Institut Català de Paleoecologia Humana i Evolució Social, C/ Escorxador s/n, 43003 Tarragona, Spain) rape-mar88@hotmail.com*

*Cáceres, Isabel (Àrea de Prehistòria, Universitat Rovira i Virgili (URV), Avinguda de Catalunya 35, 43002 Tarragona, Spain - IPHES, Institut Català de Paleoecologia Humana i Evolució Social, C/ Escorxador s/n, 43003 Tarragona, Spain) icaceres@iphes.cat*

*Huguet, R. (Àrea de Prehistòria, Universitat Rovira i Virgili (URV), Avinguda de Catalunya 35, 43002 Tarragona, Spain - IPHES, Institut Català de Paleoecologia Humana i Evolució Social, C/ Escorxador s/n, 43003 Tarragona, Spain) rhu-guet@iphes.cat*

*Ollé, Andreu (Àrea de Prehistòria, Universitat Rovira i Virgili (URV), Avinguda de Catalunya 35, 43002 Tarragona, Spain - IPHES, Institut Català de Paleoecologia Humana i Evolució Social, C/ Escorxador s/n, 43003 Tarragona, Spain) aolle@iphes.cat*

*Rosell, Jordi (Àrea de Prehistòria, Universitat Rovira i Virgili (URV), Avinguda de Catalunya 35, 43002 Tarragona, Spain - IPHES, Institut Català de Paleoecologia Humana i Evolució*

*Social, C/Escorxador s/n, 43003 Tarragona, Spain) jordi.rossell@urv.cat*

*Saladié, Palmira (Àrea de Prehistòria, Universitat Rovira i Virgili (URV), Avinguda de Catalunya 35, 43002 Tarragona, Spain - IPHES, Institut Català de Paleoecologia Humana i Evolució Social, C/Escorxador s/n, 43003 Tarragona, Spain) psaladie@iphes.cat*

*Vallverdú, Josep (Àrea de Prehistòria, Universitat Rovira i Virgili (URV), Avinguda de Catalunya 35, 43002 Tarragona, Spain - IPHES, Institut Català de Paleoecologia Humana i Evolució Social, C/Escorxador s/n, 43003 Tarragona, Spain) jvallverdu@iphes.cat*

*Martín, Miguel Ángel (Grupo Espeleológico Edelweiss, Excma. Diputación Provincial de Burgos, C/Paseo del Espolón s/n, 09071, Burgos, Spain. mamartinmerino@gmail.com*

*Bermúdez de Castro, José María (CENIEH) josemaria.bermudezdecastro@cenieh.es*

*Carbonell, Eudald (URV, IPHES, IVPP) ecarbonell@iphes.cat*

Electrical Resistivity Tomography (ERT) carried out in the Sierra de Atapuerca sites (Ortega et al., 2010; Bermejo et al., 2013) has revealed its ability to characterizing the sub-surface geometry, which allows future archaeological planning strategies. This work is specially focused on the Torcas area in which the Gran Dolina, Galería Complex and Sima del Elefante sites, discovered by the railway trench, are located. These sites preserve archaeo-palaeoanthropological sedimentary infills dating back to the Early and Middle Pleistocene. The surveying was based on the elaboration of several ERT sections on the Trinchera area and in these sites' slope. This geophysical survey is aimed to identifying the extension and continuity of passages in the Trinchera multilevel cave system. The result of this exploration, together with previous geophysical, topographic, archaeological, geological and geomorphological data, shows a larger complexity of the karstic system than previously thought. The data confirms the presence of ancient cave entrances filled with sediments which relate to the upper cave level, and the existence of endokarstic morphologies belonging to the intermediate and lower karst level.

#### ORAL

### **3. SOIL-STRATIGRAPHY OF THE MIDDLE PLEISTOCENE SEDIMENTARY UNITS IN THE ELEFANTE, GALERIA AND GRAN DOLINA CAVE ENTRANCE DEPOSITS (SIERRA DE ATAPUERCA, SPAIN).**

*Vallverdú, Josep (IPHES, Institut Català de Paleoecologia Humana i Evolució Social) jvallverdu@iphes.cat*

*Carrancho, Ángel (Área de Prehistoria. UBU) acarrancho@ubu.es*

*Villalaín, Juan Jose (Laboratorio de Paleomagnetismo. UBU) villa@ubu.es*

*Ortega, Ana Isabel (CENIEH, Centro Nacional de Investigación sobre la Evolución Humana) anaisabel.ortega60@gmail.com*

In the cave entrance deposits of the Trinchera del Ferrocarril (Sierra de Atapuerca) there are sediments derived from soils and paleosoils. Paleosol studies provide observations to characterize paleoclimates, rates of sedimentation or fix hierarchies on stratigraphic discontinuities, among others. In this contribution, we present the description and classification of soil-horizons through field and microscopic features in order to propose a preliminary soil stratigraphy of the Middle Pleistocene lithostratigraphical units of the Elefante, Galeria and Gran Dolina sites. The description of soil-horizon forming processes is based on the association of relict features and are distinguished from disturbed and inherited (re-sedimented) pedological features.

The indirect evidences available about paleoclimates and climate change in the Middle Pleistocene record of the Trinchera del Ferrocarril are mainly based on the abundant biostratigraphic record. This biostratigraphic record illustrates the dominance of temperate habitats according to the stable ecological composition of the mammalian record. The climatic-related significance and temporal span of the soil-forming processes can be added to the evidences devoted to interpret the Paleocology in the Sierra de Atapuerca project.

Trinchera del Ferrocarril soil-horizons of Middle Pleistocene age can be grouped according to the dominant nature and number of phases in the soil forming processes recognized. Sediments derived from upslope soils recorded in the lithostratigraphic units can be characterised by their mineral composition and colour as yellow calcitic, red-yellowish carbonated and brown carbonaceous. The calcitic and carbonated sediments shows monophased pedological features of carbonatation and criogenic soil forming processes. Also, carbonated sediments may contain polyphased carbonatation and cryptocrystalline enrichments and depletions. Carbonaceous sediments contain monophased carbonatation and iron depletion.

During the Middle Pleistocene, the cave entrances of the Trinchera del Ferrocarril are located in the karstified middle slope of the Sierra de Atapuerca. The cave entrance depositional environment is a product of short



episodes of sedimentation, when sediment gravity flows and gravitational collapses on high slope surfaces occur, separated by large episodes of no deposition or erosion. This depositional environment, similar to colluvial or debris flow dominated alluvial fan sedimentary model, point out to the habitat stability suggested by biostratigraphic assemblages. The habitat stability in the cave entrance deposits Trinchera del Ferrocarril is likely related to sedimentary dominance of the red-yellowish carbonated sediments (terra rossa). However, petrographic and micromorphological observations allowed us to distinguish different kinds of soil horizons in order to systematize a local paleoclimatic evolution in the cave entrance setting. The ability to trace chronostratigraphic correlations between cave entrance soil stratigraphies helps us to suggest a regional biome for the paleoclimatic interpretation. Also, the temporal scale of the depositional recurrence may be considered in the chronological frame of the marine isotopic stages and other paleoclimatic events (stadials and interstadials, Bond cycles, etc.).

ORAL

#### 4. THE BISON FROM ATAPUERCA SIMA DEL ELEFANTE LEVEL TE9 AND THE DISPERSAL HUMANS AND BISONS TO WESTERN EUROPE

*van der Made, Jan (Museo Nacional de Ciencias Naturales, CSIC, Madrid) mcnjv538@mncn.csic.es*

The possible reasons for the first human dispersal to Europe have been the subject of intensive debate and research. A possible relationship between climatic change on the one hand and human and faunal dispersal, in particular bisons, on the other has been suggested fifteen years ago (Carbonell et al, 1999). Since that time, early human remains or indications of human presence have been found in a number of localities, localities have been dated more precisely, and early bison remains have been identified. All this applies to Atapuerca TE9.

More precisely worded the "bison hypothesis" is as follows. Humans and bisons may have been present in western Asia or eastern Europe, but their westward expansion was limited by a wooded environment in central Europe. When glacial cyclicity started to develop at the end of the Early Pleistocene, open environments (called mammoth steppe) expanded periodically into central and western Europe. After a cold phase, temperatures rose and a short period with warm open landscapes existed before forests were restored. Bisons may

have used the opening of the landscape immediately, while humans may have dispersed during such a short period with prevailing warm open landscapes.

Here the new data are discussed in relationship to the "bison hypothesis". The bison remains from Atapuerca TE9 will be presented. Bison evolution and systematics will be discussed using simple biometrics. The ages of the localities with the earliest human and bison presence will be discussed.

According to the morphology of the skulls and horn cores, robusticity of the metapodials and size trends, there are three to four groups or lineages of bison in western Europe. The two first lineages to appear are the one of *Bison menneri* - *B. voigtstedtensis* and *Bison degiulii* - *B. schoetensacki*. The bison from Atapuerca TE9 belongs to the first lineage.

The appearance of the first two lineages of bison in Western Europe appears to have coincided with the first appearance of humans there, and indeed, several of the earliest localities recording early humans, also record early bisons.

The ages of the first localities that record human and bison presence are relatively close to the ages of major climatic changes, which lead to the well known glacial cycles.

The results are consistent with the "bison hypothesis".

ORAL

#### 5. THE LOWER AND MIDDLE PLEISTOCENE LITHIC RECORD OF SIMA DEL ELEFANTE (SIERRA DE ATAPUERCA, BURGOS, SPAIN)

*Rodríguez, Xosé Pedro (Àrea de Prehistòria, Universitat Rovira i Virgili (URV), Avinguda de Catalunya 35, 43002 Tarragona, Spain - IPHES, Institut Català de Paleoecologia Humana i Evolució Social, C/Escorxador s/n, 43003 Tarragona, Spain) xprodriguex@iphes.cat*

*de Lomberra-Hermida, Arturo (Àrea de Prehistòria, Universitat Rovira i Virgili (URV), Avinguda de Catalunya 35, 43002 Tarragona, Spain - IPHES, Institut Català de Paleoecologia Humana i Evolució Social, C/Escorxador s/n, 43003 Tarragona, Spain / GEPN-USC) artulomb@gmail.com*

*Bargalló, Amèlia (Àrea de Prehistòria, Universitat Rovira i Virgili (URV), Avinguda de Catalunya 35, 43002 Tarragona, Spain - IPHES, Institut Català de Paleoecologia Humana i Evolució Social, C/Escorxador s/n, 43003 Tarragona, Spain) ameliabarg@gmail.com*

*Terradillos-Bernal, Marcos (Laboratorio de Prehistoria, I+D+i, Universidad de Burgos) mterradillos@hotmail.com*  
*Huguet, Rosa (Àrea de Prehistòria, Universitat Rovira i Virgili (URV), Avinguda de Catalunya 35, 43002 Tarragona, Spain - IPHES, Institut Català de Paleoecologia Humana i Evolució Social, C/Escorxador s/n, 43003 Tarragona, Spain) rhu-  
guet@iphes.cat*

*Vallverdú, Josep (Àrea de Prehistòria, Universitat Rovira i Virgili (URV), Avinguda de Catalunya 35, 43002 Tarragona, Spain - IPHES, Institut Català de Paleoecologia Humana i Evolució Social, C/Escorxador s/n, 43003 Tarragona, Spain) jvallverdu@iphes.cat*

*García-Antón, M.Dolores (Àrea de Prehistòria, Universitat Rovira i Virgili (URV), Avinguda de Catalunya 35, 43002 Tarragona, Spain - IPHES, Institut Català de Paleoecologia Humana i Evolució Social, C/Escorxador s/n, 43003 Tarragona, Spain) lgarciaanton@iphes.cat*

*Mosquera, Marina (Àrea de Prehistòria, Universitat Rovira i Virgili (URV), Avinguda de Catalunya 35, 43002 Tarragona, Spain - IPHES, Institut Català de Paleoecologia Humana i Evolució Social, C/Escorxador s/n, 43003 Tarragona, Spain) marina.mosquera@urv.cat*

*Ollé, Andreu (Àrea de Prehistòria, Universitat Rovira i Virgili (URV), Avinguda de Catalunya 35, 43002 Tarragona, Spain - IPHES, Institut Català de Paleoecologia Humana i Evolució Social, C/Escorxador s/n, 43003 Tarragona, Spain) aolle@iphes.cat*

*Sala, Robert (Àrea de Prehistòria, Universitat Rovira i Virgili (URV), Avinguda de Catalunya 35, 43002 Tarragona, Spain - IPHES, Institut Català de Paleoecologia Humana i Evolució Social, C/Escorxador s/n, 43003 Tarragona, Spain) robert.sala@urv.cat*

*Carbonell, Eudald (Àrea de Prehistòria, Universitat Rovira i Virgili (URV), Avinguda de Catalunya 35, 43002 Tarragona, Spain - IPHES, Institut Català de Paleoecologia Humana i Evolució Social, C/Escorxador s/n, 43003 Tarragona, Spain, IVPP, Institute of Vertebrate Paleontology and Paleoanthropology of Beijing, China) ecarbonell@iphes.cat*

The main aim of this communication is to present the technological strategies documented in Sima del Elefante site and its relevance in the European context. Sima del Elefante is a cave with a stratigraphic sequence 25 m thick and 15 wide. The exposed section has been divided into 16 lithostratigraphic units (TE7 to TE21), dating from the end of the Lower Pleistocene to the Late Middle Pleistocene.

We describe the most outstanding features of the lithic tools found in Sima del Elefante. The lithic assemblage found in the Lower Pleistocene levels up to 2013 field-work season contains 86 artefacts, and the Middle Pleistocene levels have yielded 41 artefacts.

Neither pebble tools nor Large Cutting Tools (LCT) have been recovered from the Lower Pleistocene levels. On the basis of its technological features, the lithic assemblage from the lower sequence of Sima del Elefante can be assigned to the Mode 1 technocomplex. The lithic collection from the Middle Pleistocene levels is defined by the presence of medium to large-sized implements, including several LCT, and longitudinal and centripetal reduction sequences. These types of lithic components are usually associated with the Mode 2 technocomplex. Sima del Elefante has two main values for the study of human evolution. On the one hand, the lower levels (TE7-TE14) are an essential reference to know the early stages of the colonization of Europe. The TE9c level has provided stone tools (Mode 1), faunal remains and human fossils, dated to 1.22 My. On the other hand, this is one of the few European sites with a stratigraphic sequence including remains of human occupations during the end of the Lower Pleistocene and the Late Middle Pleistocene (Units TE18-TE19). This allows us to compare the technological and paleo-economic strategies carried out by different species of hominins during two key phases of the occupation of Europe.

ORAL

## 6. ACCUMULATION EVENTS AT TE9C (SIMA DEL ELEFANTE SITE, SIERRA DE ATAPUERCA, SPAIN)

*Huguet, Rosa (Institut Català de Paleoecologia Humana i Evolució Social (IPHES), Campus Sescelades URV (W3), Tarragona, Spain. Unidad asociada al CSIC. Universitat Rovira i Virgili, Avda. Catalunya, Tarragona (Spain) rhu-  
guet@iphes.cat*

*Vallverdú Josep (Institut Català de Paleoecologia Humana i Evolució Social (IPHES), Campus Sescelades URV (W3), Tarragona, Spain. Unidad asociada al CSIC. Universitat Rovira i Virgili, Avda. Catalunya, Tarragona (Spain) jvallverdu@iphes.cat*

*Rodríguez, Xose Pedro (Àrea de Prehistòria, Universitat Rovira i Virgili (URV), Avinguda de Catalunya 35, 43002 Tarragona, Spain. Institut Català de Paleoecologia Humana i Evolució Social (IPHES), C/ Marcel·lí Domingo s/n e Campus Sescelades URV (W3), 43007 Tarragona, Spain) xprodri-  
guez@iphes.cat*

*Canals, Antoni (Institut Català de Paleoecologia Humana i Evolució Social (IPHES), Campus Sescelades URV (W3), Tarragona, Spain. Universitat Rovira i Virgili, Avda. Catalunya, Tarragona (Spain). Equipo Primeros Pobladores de Extremadura, Cáceres) acanals@iphes.cat*

*Terradillos, Marcos (Àrea de Prehistoria. Dpto. de Ciencias Históricas y Geografía, Universidad de Burgos, Edificio I+D+i,*

Plaza Misael Bañuelos s/n, 09001 Burgos, Spain) mterrados@hotmail.com

Bargalló, Amèlia (Institut Català de Paleoecologia Humana i Evolució Social (IPHES), C/ Marcel·lí Domingo s/n e Campus Sescelades URV (W3), 43007 Tarragona, Spain. Universitat Rovira i Virgili (URV), Avinguda de Catalunya 35, 43002 Tarragona. Spain) ameliabarg@gmail.com

de Lombera-Hermida, Arturo (Àrea de Prehistòria, Universitat Rovira i Virgili (URV), Avinguda de Catalunya 35, 43002 Tarragona, Spain - IPHES, Institut Català de Paleoecologia Humana i Evolució Social, C/Escorxador s/n, 43003 Tarragona, Spain / GEPN-USC) artulomb@gmail.com

Menéndez Leticia (Institut Català de Paleoecologia Humana i Evolució Social (IPHES), C/ Marcel·lí Domingo s/n e Campus Sescelades URV (W3), 43007 Tarragona, Spain. Universitat Rovira i Virgili (URV), Avinguda de Catalunya 35, 43002 Tarragona. Spain) letimenendez@gmail.com

Modesto-Mata, Mario (Centro Nacional de Investigación sobre la Evolución Humana (CENIEH), Paseo Sierra de Atapuerca, 09002 Burgos, Spain/ Equipo Primeros Pobladores de Extremadura, Cáceres) mario.modesto@fa.cenieh.es  
van der Made, Jan (Museo Nacional de Ciencias Naturales (MNCN). Calle José Gutiérrez Abascal, 2. 28006 Madrid, Spain) mcnjv538@mncn.csic.es

Soto Maria (Institut Català de Paleoecologia Humana i Evolució Social (IPHES), C/ Marcel·lí Domingo s/n e Campus Sescelades URV (W3), 43007 Tarragona, Spain. Universitat Rovira i Virgili (URV), Avinguda de Catalunya 35, 43002 Tarragona. Spain) sotoquesadamaria@gmail.com

Blain, Hugues-Alexandre (Àrea de Prehistòria, Universitat Rovira i Virgili (URV), Avinguda de Catalunya 35, 43002 Tarragona, Spain - IPHES, Institut Català de Paleoecologia Humana i Evolució Social, C/Escorxador s/n, 43003 Tarragona, Spain) hablain@iphes.cat

García, Núria (Dept. Paleontología, F. C. Geológicas, Universidad Complutense de Madrid, Ciudad Universitaria, 28040 Madrid, Spain. Centro Mixto (UCM-ISCI) de Evolución y Comportamiento Humanos, C/ Monforte de Lemos 5, Pab. 14, 29029 Madrid, Spain) nuria.garcia.ucm@gmail.com

Cuenca-Bescós, Gloria (Aragosaurus-IUCA, Departamento de Ciencias de la Tierra. Facultad de Ciencias, Universidad de Zaragoza) cuencag@unizar.es

Gómez-Merino, Gala (Institut Català de Paleoecologia Humana i Evolució Social (IPHES), C/ Marcel·lí Domingo s/n e Campus Sescelades URV (W3), 43007 Tarragona, Spain. Universitat Rovira i Virgili (URV), Avinguda de Catalunya 35, 43002 Tarragona. Spain) ggomez@iphes.cat

Pérez, Raquel (TAUP, Topografs Alt Urgell i Pirineus SLT, C/ Joaquim Viola 12, 25700, La Seu d'Urgell, Lleida, Spain/ IPHES, Institut Català de Paleoecologia Humana i Evolució Social, C/Escorxador s/n, 43003 Tarragona, Spain) rape-mar88@hotmail.com

Bermúdez de Castro, José María (Centro Nacional de Inves-

tigación sobre la Evolución Humana (CENIEH), Paseo Sierra de Atapuerca, 09002 Burgos, Spain) josemaria.bermudezdecastro@cenieh.es

Carbonell, Eudald (Àrea de Prehistòria, Universitat Rovira i Virgili (URV), Avinguda de Catalunya 35, 43002 Tarragona, Spain - IPHES, Institut Català de Paleoecologia Humana i Evolució Social, C/Escorxador s/n, 43003 Tarragona, Spain, IVPP, Institute of Vertebrate Paleontology and Paleoanthropology of Beijing, China) ecarbonell@iphes.cat

The Sima del Elefante site is a major cave infill with a stratigraphic succession 25 m thick and 15 wide. The lower levels of the cave (TE7 to TE16) show a reverse polarity magnetization direction attributed to the Matuyama Chron. Subunit TE9c was dated to  $1.22 \pm 0.16$  Ma years old by the cosmogenic nuclides. TE9c is a complex sedimentary deposit composed by subangular blocks and a clayey matrix. This deposit shows plastic deformations and few fissures. During the excavation it was impossible to define different archaeopaleontological levels within TE9c. However, the morphology of the sedimentary deposit and its fossil content indicate that there are different moments and processes of accumulation.

In this level we recovered a human mandible and a phalanx (*Homo* sp.) apparently associated to a Mode 1 lithic assemblage and faunal remains with anthropogenic processing marks, mainly on Cervidae and large bovid bones.

The main aim is to show the archaeological and paleoecological features of TE9c, so the scenario of the first hominins occupations at Sierra de Atapuerca.

We analyzed level 9 from several disciplines: geomorphology, paleoecology, taphonomy and archaeology.

After the anatomic, taxonomic and taphonomic analyses of the fossil remains recovered in this site, we can observe that the animals recovered from TE9c can be classified in three groups: small animal (mainly birds and lagomorphs), small-medium size carnivores (*Vulpes* cf. *alopeoides*, *Canis* cf. *mosbachensis*, *Lynx* *issiodorensis* ssp. *Pannonictis* cf. *nestii*) and medium-large ungulates (*Equus* *altidens*, *Eucladoceros* *giulii*, *Sus* sp. *Bison* cf. *voigtstedtensis*; *Dama* "nestii" *vallonnetensis*). In the most of the cases, the remains of small animals and carnivores have been recovered in anatomical connection or semi-connection. While in the case of large herbivores, only in a case we recovered a part of an animal (*Bison* sp.) in anatomical semi-connection.

A total of 33 lithic remains, mainly in chert, have been discovered and assigned to Mode 1 technology. These

artefacts have been recovered through the sedimentary deposit, but the absence of refitting does not allow us to confirm that these pieces correspond to the same moment in time.

We consider that there are several events of accumulation and that the origin of each one of the accumulations seems related to the characteristics of each group of fossil remains recovered from this level.

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ORAL

### 7. PHYLOGENETIC RELATIONSHIPS BETWEEN THE EUROASIATIC MEMBERS OF GENUS *URSUS* FROM THE EPIVILLAFRANCHIAN

*Santos, Elena (Centro Mixto UCM-ISCIII de Evolución y Comportamiento Humano. Monforte de Lemos 5. 28029 Madrid. Spain / Laboratorio de Evolución Humana. Universidad de Burgos, 099001 Burgos, Spain) esureta@ubu.es*

*García, Nuria (Centro Mixto UCM-ISCIII de Evolución y Comportamiento Humano. Monforte de Lemos 5. 28029 Madrid. Spain) ngarcia@iciii.es*

*Kahlke, Ralf-Dietrich (Senckenberg Research Institute, Research Station of Quaternary Palaeontology, Am Jakobskirchhof 4, D-99423 Weimar, Germany) rdkahlke@senckenberg.de*

After the 600 ka long Late Villafranchian period of consistent temperature variations 1.8-1.2 Ma BP, a new regime of global climatic evolution developed. Between 1.2 and 0.9 Ma BB the frequency of the global  $\delta^{18}\text{O}$  record became less stable and its amplitudes increased significantly. This interval can be seen as a transitional time, linking the span of 41 ka climate periodicity with the following 100 ka one. Its progressing environmental instability created the ecological preconditions for a ground-breaking faunal turnover in Eurasia. In many groups of larger mammals new forms arose, which replaced preceding Villafranchian elements. Throughout the entire western Palaeartic renewed mammal communities evolved and inhabited a growing variety of habitats. The distinctive character of the resulting faunas of the 1.2-0.9 Ma stretch supports the idea of introducing a separate biochron, the Epivillafranchian. However, extended large mammal records from this period of time remain still rare in Europe.

After the 600 ka long Late Villafranchian period of consistent temperature variations 1.8-1.2 Ma BP, a new regime of global climatic evolution developed. Between 1.2 and 0.9 Ma BB the frequency of the global  $\delta^{18}\text{O}$  record

became less stable and its amplitudes increased significantly (Raymo and Nisancioglu, 2003, fig. 1; Lisiecki and Raymo, 2005, fig. 4). This interval can be seen as a transitional time, linking the span of 41 ka climate periodicity with the following 100 ka one. Its progressing environmental instability created the ecological preconditions for a ground-breaking faunal turnover in Eurasia. In many groups of larger mammals new forms arose, which replaced preceding Villafranchian elements. Throughout the entire western Palaeartic renewed mammal communities evolved and inhabited a growing variety of habitats (Kahlke et al., 2011). The distinctive character of the resulting faunas of the 1.2-0.9 Ma stretch supports the idea of introducing a separate biochron, the Epivillafranchian (Kahlke, 2007) However, extended large mammal records from this period of time remain still rare in Europe (review in Kahlke, 2006).

Untermassfeld shows a combination of cranial traits: some of them are also observed in *U. arctos* and are considered primitive, while others are shared with *U. deningeri*- *U. spelaeus*, and are interpreted as derived towards the speloid lineage. The derived condition of the palate thickness observed in Untermassfeld and the speloid lineage is shared with the cranial remains of *Ursus dolinensis*, from Sierra de Atapuerca (Gran Dolina -TDW4-5).

As a result of our analysis based in cranial traits, we conclude that bears from Untermassfeld and Atapuerca – Trinchera Dolina 4 (TDW4) might represent the ancient stock from which the cave bear arose.

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### 8. PHYLOGENETIC POSITION OF THE GRAN DOLINA-TD6 HOMININS IN THE CONTEXT OF THE HUMAN EVOLUTION IN EUROPE

*Bermúdez de Castro, José María (CENIEH,) josemaria.bermudezdecastro@cenieh.es*

*Martinón-Torres, María (Centro Nacional de Investigación sobre la Evolución Humana, CENIEH, Burgos) maria.martinon@cenieh.es*

The so-called "Aurora Archaeostratigraphic Set" of the TD6 level of the Gran Dolina cave site in Sierra de Atapuerca, northern Spain has yielded about 150 human fossil remains, attributed to *Homo antecessor* (Bermúdez de Castro et al., 1997, Science 276), and dated to the MIS 21 or MIS 25. Our aim is to present a brief analysis of the main features of this sample and to discuss the phylogenetic

position of this hominin assemblage in the framework of the evolutionary scenario of the settlement of Europe.

The TD6 human fossils exhibit a particular mosaic of primitive and derived features for the Homo clade that reinforces the taxonomic identity of H. antecessor. Some dental features are primitive regarding the Homo clade, whereas other are derived and shared with Pleistocene Eurasian hominins. The mandibles show a primitive structural pattern shared with other African and Asian specimens. However, they have lost the massive aspect characteristic of most Homo African mandibles, and present some progressive features also shared with Middle Pleistocene African and, particularly, Asian specimens. None of the mandibular features considered apomorphic in the European Middle and Late Pleistocene hominins are present in the TD6 mandibles (perhaps except the great development of the medial pterygoid tubercle).

In spite that the TD6 hominins are nearly one million years old, it can be stated that they show a clear tendency towards what might be called "modernity". In fact, their brain size was higher than 1000 cubic centimeters and the postcranial skeleton shares most of the features with European Middle and Late Pleistocene hominins, including modern humans. The stature estimations reveal that TD6 hominins were tall, about 175 centimetres. The pattern of dental development is definitively modern, whereas the very complete face ATD6-69 (adolescent) represents the earliest occurrence of a modern face in the fossil record. The remodeling pattern of this specimen is also similar to that of modern humans.

The TD6 hominins also exhibit some postcranial and dental features that are shared with Neanderthals and the European Middle Pleistocene hominins. Obviously, these features cannot be considered as Neandertal apomorphies, but traits that appeared in an old hominin population and were inherited by both H. antecessor and H. neanderthalensis.

Since we no longer support our previous hypothesis about the phylogenetic position of H. antecessor as the last common ancestor of the Neandertals and modern humans, it is necessary to reconcile the present evidence with an alternative hypothesis. We propose a cladogenetic event of the genus Homo, previous to the chronology of H. antecessor, from which gradual branching of hominin lineages (species) would have occurred throughout time. This cladogenesis would have been characterized, among other features, by a cranial size increase and the appearance of a derived modern-

like face morphology. This means that we need to revise the Eurasian fossil record with a different perspective. H. antecessor would represent a side branch confined to Western Europe. Interbreeding between individuals of Homo antecessor and those of other branches of the same cladogenesis, which colonized Europe in later times, cannot be ruled out.

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## 9. MORPHOLOGICAL COMPARISON OF THE PLEISTOCENE HOMININ LOWER MOLARS FROM ATAPUERCA SITES BY MEANS OF MICROCT.

*Martínez de Pinillos, Marina (Centro Nacional de Investigación sobre la Evolución Humana, CENIEH, Burgos) mari-nampg@hotmail.com*

*Martinón-Torres, María (Centro Nacional de Investigación sobre la Evolución Humana, CENIEH, Burgos) maria.martinon@cenieh.es*

*Martín-Francés, Laura (Centro Nacional de Investigación sobre la Evolución Humana, CENIEH, Burgos) laura.martin-frances@fa.cenieh.es*

*Bermúdez de Castro, José María (Centro Nacional de Investigación sobre la Evolución Humana, CENIEH, Burgos) jose-maria.bermudezdecastro@cenieh.es*

Since the Atapuerca fossils are the most representative remains to understand the evolution of the genus Homo in Europe during the Early and Middle Pleistocene, the study of their dentition is becoming increasingly important. Several discoveries (Bermúdez de Castro and Martínón-Torres, 2013; Martínón-Torres et al., 2007a; Meyer et al., 2014) propose that the human occupation of Europe during the Pleistocene depended upon the non-linear recruitment of populations from the central area of dispersals of Eurasia. Morphological comparisons between those populations will provide new and valuable information to investigate the evolutionary scenario of the first European settlement.

The aim of this study is to explore the affinities between extant and extinct human population in Europe. For this purpose, and knowing that the expression of trigonid and talonid crest pattern seems to be of significant taxonomic and phylogenetic value (Bailey, 2002; Martínez de Pinillos et al., 2014; Martínón-Torres et al., 2014), we present a comparative study of these traits at the outer enamel surface (OES) and enamel dentine junction (EDJ) for H. antecessor, H. heidelbergensis (Sima de los Huesos samples), H. neanderthalensis and H. sapiens by means of microtomography (microCT).

Our results reveals that despite of the wider variability of trigonid crests types at the EDJ compared to the OES, the correlation in the morphology of the inner and the outer surface of the lower molars is high. Furthermore and in accordance with previous works (e.g. Bermúdez de Castro et al., 2003; Martínón-Torres et al., 2013), we highlight a more primitive dental conformation in Gran Dolina TD6 hominins in comparison with more derived features in the European Middle Pleistocene hominins from Sima de los Huesos.

To the light of our microCT study, we present some evolutionary interpretations of the relationship among the Early and Middle Pleistocene hominins of Europe, where the divergence of the features -primitive or derived- is considered regarding to *H. sapiens* and *H. neanderthalensis* trigonid and talonid crest expression.

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## ORAL

### 10. CROWN FORMATION TIMES IN HOMO ANTECESSOR MOLARS (GRAN DOLINA-TD6, SIERRA DE ATAPUERCA, SPAIN)

*Modesto-Mata, Mario (Centro Nacional de Investigación sobre la Evolución Humana (CENIEH) / Equipo de Investigación Primeros Pobladores de Extremadura) paleomariomm@gmail.com*

*Bermúdez de Castro, José María (Centro Nacional de Investigación sobre la Evolución Humana (CENIEH) josemaria.bermudezdecastro@cenieh.es*

*Dean, Chris (Department of Anatomy and Developmental Biology UCL) chris.dean@ucl.ac.uk*

*Martínón-Torres, María (Centro Nacional de Investigación sobre la Evolución Humana, CENIEH, Burgos) maria.martinon@cenieh.es*

Human remains from Atapuerca-Gran Dolina TD6 level represent at least 11 individuals that are dated to approximately 0.9 million years. These fossils were recovered in different seasons since 1994 and were the base to name a new human species, *Homo antecessor*. There are several publications regarding the morphological features of this hominin, including teeth. However, information available about *Homo antecessor* dental development is scarce, and those studies did not employed histological variables. Here, we studied the crown formation times of *Homo antecessor* lower molars. Our results are compared with molar crown formation times in other hominin species and great apes obtained from the literature. We studied seven *Homo antecessor* molars that are as-

signed to three individuals: two lower molars (one M1 and one M3) and five upper molars (three M1, one M2 and one M3). Environmental scanning electron microscope (ESEM) was used to estimate the imbricational enamel formation time and microtomography (microCT) was used to estimate the appositional enamel formation time.

Crown formation times of *Homo antecessor* molars fit within the variability of other hominin species.

Molar crown formation times are relatively stable throughout hominid evolution at least from the last common ancestor with chimpanzees, regardless dental morphological differences. Thus, differences in the eruption times might be mostly based on differences in the root extension rates.

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## ORAL

### 11. THE UNGULATES FROM GRAN DOLINA LEVEL TD8 AT ATAPUERCA: EVOLUTION, BIOSTRATIGRAPHY, BIOGEOGRAPHY

*van der Made, Jan (Museo Nacional de Ciencias Naturales, CSIC, Madrid) mcnjv538@mncn.csic.es*

*Rosell, Jordi (IPHES/URV) jordi.rosell@urv.cat*

*Blasco, Ruth (The Gibraltar Museum) rblascolopez@gmail.com*

The locality of Gran Dolina at Atapuerca records the Early-Middle Pleistocene boundary, an extraordinary sequence of fossiliferous levels straddling this boundary, archaeological levels and the level TD6, which yielded over a hundred remains of *Homo antecessor*. These levels are dated by an array of dating techniques and palaeomagnetism situates the Brunhes-Matuyama boundary in the top of level TD7. Level TD8 is the first Middle Pleistocene fossiliferous level.

Ongoing research results in increased data on the ungulates that lived around the Early-Middle Pleistocene transition and new hypotheses on their evolution. Here we present the ungulate association of TD8 in this context and compare it to those of other localities of more or less similar age. The TD8 ungulates are similar to those of lower levels at Gran Dolina, but differ from those from many other European early Middle Pleistocene localities. TD8 is peculiar in retaining a species of the giant deer genus *Eucladoceros* and a small rhinoceros. Such a small rhinoceros is common in the late Early Pleistocene and some believe it to be related to *Stephanorhinus etruscus*,

while others believe it to be related to *S. hundsheimensis*. The persistence of these forms suggests that TD8 is older than the localities with which it is compared. If that is the case, it is the oldest Middle Pleistocene ungulate fauna. Alternatively, it is a geographic difference and relict forms persisted longer in Spain.

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## 12. TRACING ENVIRONMENTAL AND CULTURAL CHANGES THROUGHOUT THE GRAN DOLINA TD10 MIDDLE PLEISTOCENE SEQUENCE (ATAPUERCA, BURGOS, SPAIN)

Ollé, Andreu (IPHES/URV) [aolle@iphes.cat](mailto:aolle@iphes.cat)  
Palmira Saladié (IPHES/URV) [psaladie@iphes.cat](mailto:psaladie@iphes.cat)  
Rodríguez, Jesús (CENIEH) [jesus.rodriguez@cenieh.es](mailto:jesus.rodriguez@cenieh.es)  
Mosquera, Marina (URV/IPHES) [marina.mosquera@urv.cat](mailto:marina.mosquera@urv.cat)  
Rodríguez-Hidalgo, Antonio (IPHES/URV) [ajrh78@gmail.com](mailto:ajrh78@gmail.com)  
de Lombera, Arturo (IPHES/URV) [artulomb@gmail.com](mailto:artulomb@gmail.com)  
Campaña, Isidoro (CENIEH) [isidoro.campanna@cenieh.es](mailto:isidoro.campanna@cenieh.es)  
Vallverdú, Josep (IPHES/URV) [jvallverdu@iphes.cat](mailto:jvallverdu@iphes.cat)  
Pérez-González, Alfredo (CENIEH) [alfredo.perez@cenieh.es](mailto:alfredo.perez@cenieh.es)  
Blain, Hugues-Alexandre (IPHES/URV) [hablain@iphes.cat](mailto:hablain@iphes.cat)  
López-García, Juan Manuel (Univ.Ferrara) [jlopezgarcia1980@gmail.com](mailto:jlopezgarcia1980@gmail.com)  
Cuenca-Bescós, Gloria (Aragosaurus-IUCA, Departamento de Ciencias de la Tierra. Facultad de Ciencias, Universidad de Zaragoza) [cuenca@unizar.es](mailto:cuenca@unizar.es)  
Expósito, Isabel (IPHES/URV) [iexpósito@iphes.cat](mailto:iexpósito@iphes.cat)  
Burjachs, Francesc (ICREA/IPHES/URV) [fburjachs@iphes.cat](mailto:fburjachs@iphes.cat)  
van der Made, Jan (MNCN) [mcnjv538@mncn.csic.es](mailto:mcnjv538@mncn.csic.es)  
García, Nuria (UCM-ISCI) [nuria.garcia.ucm@gmail.com](mailto:nuria.garcia.ucm@gmail.com)  
Cáceres, Isabel (URV/IPHES) [icaceres@iphes.cat](mailto:icaceres@iphes.cat)  
Mateos, Ana (CENIEH) [ana.mateos@cenieh.es](mailto:ana.mateos@cenieh.es)  
Rodríguez, Xosé Pedro (URV/IPHES) [xprodriguex@iphes.cat](mailto:xprodriguex@iphes.cat)  
García-Medrano, Paula (IPHES/URV) [pgarciamedrano@gmail.com](mailto:pgarciamedrano@gmail.com)  
García-Antón, M.Dolores (URV/IPHES) [lgarciaanton@iphes.cat](mailto:lgarciaanton@iphes.cat)  
López, Esther (IPHES/URV) [elopez@iphes.cat](mailto:elopez@iphes.cat)  
Pedernana, Antonella (IPHES/URV) [apedernana@iphes.cat](mailto:apedernana@iphes.cat)  
Rosell, Jordi (URV/IPHES) [jordi.rosell@urv.cat](mailto:jordi.rosell@urv.cat)  
Blasco, Ruth (The Gibraltar Museum) [rblascolopez@gmail.com](mailto:rblascolopez@gmail.com)  
Falguères, Christophe (MNHN) [falguere@mnhn.fr](mailto:falguere@mnhn.fr)  
Moreno, Davinia (MNHN) [daviniamorenog@hotmail.com](mailto:daviniamorenog@hotmail.com)  
de Torres Pérez-Hidalgo, Trinidad (UPM) [trinidad.torres@upm.es](mailto:trinidad.torres@upm.es)  
Ortiz, José Eugenio (UPM) [joseeugenio.ortiz@upm.es](mailto:joseeugenio.ortiz@upm.es)

Ortega, Ana Isabel (CENIEH, GEE) [anaisabel.ortega60@gmail.com](mailto:anaisabel.ortega60@gmail.com)  
Benito-Calvo, Alfonso (CENIEH, GEE) [alfonso.benito@cenieh.es](mailto:alfonso.benito@cenieh.es)  
Canals, Antoni (IPHES/URV/Equipo de Investigación Primeros Pobladores de Extremadura (EPPEX)) [acanal@iphes.cat](mailto:acanal@iphes.cat)  
Rosa Ana Obregón (CENIEH) [rosbregon@hotmail.com](mailto:rosbregon@hotmail.com)  
Bermúdez de Castro, José María (CENIEH,) [jm.ber@cenieh.es](mailto:jm.ber@cenieh.es)  
Carbonell, Eudald (URV, IPHES, IVPP) [ecarbonell@iphes.cat](mailto:ecarbonell@iphes.cat)

The Sierra de Atapuerca sites offer a series of chronological sequences whose correlation allows the paleoenvironmental and cultural evolution during the Early and Middle Pleistocene to be reconstructed. Previous work in these sites showed the difficulties in identifying clear cut-off points separating entirely different environmental episodes along the sequence, which lacks evidences of extremely harsh conditions. Another difficulty was relating the paleo-environmental changes with the cultural ones.

Here we present a multiproxy analysis focused on the Middle Pleistocene unit TD10 of Gran Dolina site, which is the richest archaeological unit being excavated in Atapuerca. Our main goal is to describe in detail the 3m thick stratigraphic succession of TD10, and to situate the most significant geological, geochronological, paleoenvironmental, palaeontological and archaeological information recovered up to now in the most representative profiles.

The main purposes of such a multidisciplinary presentation are to identify specific micro-scale environmental variations through the TD10 sedimentary unit, and to assess how they are reflected in the archaeo-palaeontological record.

A total of twelve "sample units" (layers) have been individualised in the TD10 succession, from top to bottom: four in sub-unit TD10.1, four in TD10.2, two in TD10.3 and two in TD10.4. One extra control point was taken in level TD9, just to record the differences between these apparently so diverse units.

Each of these points has been specifically sampled, and data coming from different fields of study is taken into account separately. Data sources broadly include geology (sedimentology, stratigraphic features, soil micro-morphology observations and geochronology), environment (pollen, small and large fossil vertebrate remains) and archaeology (behavioural data coming from technological and zooarchaeological studies).

A first step in the study involves combination of these

proxy data to characterise each of the control points, which will lead us to define hypothetically synchronic and homogeneous associations. This will allow us to draw preliminary hypotheses, which intent to correlate environmental and cultural data for these homogeneous layers.

A second step involves an analysis of the evolution of the archaeological and palaeontological assemblages from the sucession of TD10, taking into account the evolutionary trends of all those features considered significant, both for environmental and cultural aspects.

The excavation and sampling strategy is demonstrated to be fruitful to characterise specific layers in the TD10 sequence. It allows a better description of both environmental and cultural aspects than previous studies, which were based on larger units of analysis.

The comparison of the different synchronic associations, which have been observed, is useful from an evolutionary perspective. In its turn, the diachronic framework proved to be useful to properly contextualise some of the archaeological issues of TD10 already published.

In general terms, we can conclude than environmental constraints hardly explain by themselves the identified cultural changes. However, the combined information for each selected layer furnished crucial data to contextualise and to improve the characterisation of the varied subsistence strategies of the hominins who left their archaeological evidence in TD10 during the late Acheulean.

## ORAL

### 13. ISOTOPIC ANALYSIS OF MIDDLE PLEISTOCENE FAUNA FROM GRAN DOLINA (SIERRA DE ATAPUERCA, SPAIN) AND THEIR IMPLICATIONS FOR HOMININ PALEOECOLOGY

*García, Nuria (Universidad Complutense De Madrid/Centro Mixto (Ucm-Isciii) De Evolución Y Comportamiento Humanos, C/ Monforte De Lemos 5, Pab. 14, 29029 Madrid, Spain) ngarcia@isciii.es*

*Feranec, Robert S. (New York State Museum, Research And Collections, 3140 Cultural Education Center, Albany, Ny 12230, USA.) rferanec@mail.nysed.gov*

*Saladié Palmira (IPHES, Institut Català De Paleoecologia Humana I Evolució Social, C/Escorxador S/N, 43003 Tarragona, Spain/Àrea De Prehistoria, Universitat Rovira I Virgili (URV), Avinguda De Catalunya 35, 43002 Tarragona, Spain/*

*Gap-Cg, Grupo Quaternário E Pré-História) psaladie@iphes.cat*

*Rodríguez-Hidalgo, Antonio (IPHES/URV/Equipo de Investigación Primeros Pobladores de Extremadura (EPPEX) ajrh78@gmail.com*

*Ollé, Andreu (IPHES, Institut Català De Paleoecologia Humana I Evolució Social, C/Escorxador S/N, 43003 Tarragona, Spain/Àrea De Prehistoria, Universitat Rovira I Virgili (URV), Avinguda De Catalunya 35, 43002 Tarragona, Spain) aollé@iphes.cat*

*Carbonell, Eudald (Àrea de Prehistòria, Universitat Rovira I Virgili (URV), Avinguda de Catalunya 35, 43002 Tarragona, Spain - IPHES, Institut Català de Paleoecologia Humana i Evolució Social, C/Escorxador s/n, 43003 Tarragona, Spain, IVPP, Institute of Vertebrate Paleontology and Paleoanthropology of Beijing, China) ecarbonell@iphes.cat*

*Bermúdez de Castro, Jose María (Centro Nacional De Investigación Sobre La Evolución Humana, Cenieh, Paseo Sierra De Atapuerca, 309002 Burgos, Spain) josemaria.bermudez-decastro@cenieh.es*

Determining the paleoecology and paleoenvironments at fossil localities provides a context in which specific hypotheses can be made about how particular taxa survived and evolved over time. For example, the assumption that Neanderthals consumed predominantly meat derived from large game is supported by the abundance of ungulate bones associated with the Mousterian lithic industry. This idea is reinforced by microwear and stable isotope analyses that identify Neanderthals as dependent on a high protein diet derived mainly from large and medium-sized herbivores. Conversely, other researchers argue that these humans consumed a more varied diet including smaller game, plants, and marine resources. Exploring the paleoenvironment and availability of resources on the landscape would permit a specific test between these different paleodietary proposals (i.e., protein-dominated vs. varied diet) for Neanderthals. This particular study aims to determine the paleoecological conditions present in northern Iberia during the Middle Pleistocene with the ultimate goal of resolving the resources available to the populations of humans within the Neanderthal lineage living there.

Data for this study was obtained from stable isotope analyses of tooth enamel from large mammals (Bison, Cervus, Equus, Panthera) coming from level TD10 of Gran Dolina (Sierra de Atapuerca, Burgos, Spain). TD10 is a layer dated to between  $379 \pm 57$  ka and  $418 \pm 63$  ka (MIS 11) and shows evidence of humans from the Neanderthal lineage on the landscape. Some of the analyzed remains were consumed by humans and therefore can help decipher the subsistence strategies developed by homi-



nids in the European Middle Pleistocene. Two sampling techniques were utilized in this study: most specimens were bulk sampled which provides an average value for diet and habitat use while the tooth was growing. Three samples of bison were serially sampled, taking multiple samples perpendicular to the growth axis of the tooth, which provides finer detail into diet and habitat use.

The results obtained from our samples indicate a habitat dominated by C3 plants. The bovid samples had the highest  $\delta^{13}\text{C}$  values indicating eating in open habitats. The mean  $\delta^{13}\text{C}$  values for *Cervus* and *Equus* are the same, suggesting that horses and red deer overlap in diet/habitat use. For  $\delta^{18}\text{O}$  values, no significant differences were observed among the studied taxa. The values from TD10 are very similar to data from a previous study that included specimens from Atapuerca Faunal Unit 6. The serial samples of the three bison teeth reveal little carbon isotope variation over the time when the tooth was mineralizing. The bison also show the most positive carbon isotope values among the sampled herbivores within TD 10. The isotope values that we find support the idea that there were open habitats as well as more wooded or forested habitats as a Mediterranean habitat would show, as was suggested for this layer from previous studies based on faunal and pollen analysis.

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#### **14. THE FACIES UTRILLAS QUARTZITE VARIETY: FROM A PETROGRAPHIC CHARACTERIZATION TO A FUNCTIONAL ANALYSIS DESIGN. THE EXAMPLE OF GRAN DOLINA SITE, TD10 LEVEL (SIERRA DE ATAPUERCA, BURGOS, SPAIN)**

*Pedergrnana, Antonella (IPHES/URV) apedergrnana@iphes.cat*  
*García-Antón, M.Dolores (URV/IPHES) lgarciaanton@iphes.cat*

The convergence between lithic use-wear and petrographic analyses is an example of the fruitful interaction of different disciplines in order to obtain a more confident interpretation of the archaeological record. Normally, functional analysis is performed showing any or very less regard about the various lithic raw materials specific characteristics. In our opinion, in order to provide a more suitable interpretation of the archaeological use-wear evidence, each rock type should be treated individually underlining the most accurate parameters for describing surface modifications.

Thus, this overall research initiative has been undertaken

with the effort to evaluate the role of lithic raw material variability within the use-wear formation processes, focusing specifically on a number of lithological varieties generally labeled as quartzite (from the very well metamorphosed types to quartz-arenites). With this concern, quartzite varieties coming from TD10 level of Gran Dolina site (Sierra de Atapuerca, Burgos) will be described from a petrographic point of view. Physical differences will be described in terms of chemical composition, grains size, fabric, metamorphism degree, presence or absence of cement, etc... In this work we will focus on the facies Utrillas (FU), which is one of the most representative varieties within the TD10 level quartzite assemblage. Showing the characters of a meta-quartzite, it presents more regular petrographic features than other varieties. The two FU types are also documented in detail through SEM observations. Sequential experiments are done in order to understand use-wear formation processes and to evaluate which petrographic features might influence them.

The obtained results of the experimental observations in the light of the petrographic descriptions provided us with a possible theoretical formulation about quartzite surface modifications due to use, valid at a wide-ranging scale. A general model about use-wear on quartzite tools will be subsequently obtained by applying this analysis pattern to the other quartzite varieties present in the TD10 level assemblage.

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#### **15. QUARTZ AND QUARTZITE REFITS OF GRAN DOLINA SITE (SIERRA OF ATAPUERCA, BURGOS): CONNECTING THE LITHIC ARTEFACTS IN TD10.1 LEVEL**

*López-Ortega, Esther (IPHES, URV) elopez@iphes.cat*  
*Bargalló, Amèlia (IPHES, URV) ameliabarg@gmail.com*  
*de Lombera-Hermida, Arturo (IPHES, URV, GEPN-USC) artu-  
lomb@gmail.com*  
*Mosquera, Marina (IPHES, URV) mmosquera@iphes.cat*  
*Ollé, Andreu (IPHES, URV) aolle@iphes.cat*  
*Rodríguez, Xosé Pedro (IPHES, URV) xprodriguez@iphes.cat*

The preliminary results of lithic refits in the NW sector of Gran Dolina TD10.1 level have shown the existence of short, medium and long connection distances between the artefacts and hence the possibility of identifying activities areas in the site. Continuing this study, the new work presented here, takes into account the entire lithic assemblage recovered from the total surface of TD10.1 (more than 95 m<sup>2</sup>).

The current study is focused on refits of quartz and quartzite artefacts. Even though they are secondary raw materials in the tool production, mainly based on flint, the identification and association of these pieces to different raw material units (RMU) have widely increased the number and the type of refits including both short and long distance connections. The aim of this analysis is to identify different reduction strategies of these raw materials and a distinct spatial distribution of production, transport and use processes that affects them.

The spatial distribution of the artefacts, the projection of RMU-s and the refits present within each RMU indicate about the existence of several accumulations, some of them related to knapping activities, as well as the final use and discard of the items. From the technological point of view, the refits studied support the reduction strategies previously published and provide information about fragmented and complete knapping sequences, which allows inferring intra-site and inter-site patterns of mobility. This information will be completed by use-wear analysis and taphonomic studies, thus inferring more specifically where different activities at the site took place.

The results obtained, along with other taphonomic studies, allow assessing the resolution of the archaeological assemblages, in particular their potential horizontal and vertical movement and the potential time-spans that they represent. The diachronic study through the sequence of TD10.1 allows us to understand the evolution of the different occupational and spatial patterns developed by the hominids in the cave.

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**16. BIG GAME HUNTING BEHAVIOR AT ATAPUERCA: 400-KYR-OLD BISON BONEBED AT THE GRAN DOLINA TD10.2 SITE**

*Rodríguez-Hidalgo, Antonio (IPHES/URV)  
ajrh78@gmail.com*

*Palmira Saladié (IPHES/URV) psaladie@iphes.cat*

*Carbonell, Eudald (URV, IPHES, IVPP) ecarbonell@iphes.cat*

Gran Dolina site is being large scale excavated since 1996. Between 2003 and 2013, it has recovered more than 66,000 faunal and 13,000 lithic remains from TD10.2 sublevel (c.400kyr). In this communication we present the results obtained from the zooarchaeological and taphonomic analysis of the former.

Anatomical and taxonomic composition, mortality profiles and surface damages modification has allowed us to reconstruct the taphonomic history of the assemblage and establish the origin of the accumulation.

The TD10.2 sublevel it's a bison bonebed that represents several events of mass communal hunting in which several bison were slaughtered to be exploited intensively by the hominines that occupy the cave.

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ORAL

**17. BRAIN ASYMMETRIES AND HANDEDNESS IN THE SPECIMENS FROM SIMA DE LOS HUESOS SITE (ATAPUERCA, SPAIN)**

*Poza-Rey, Eva María (Centro Mixto UCM-ISCIID de Evolución y Comportamiento Humanos. C/ Monforte de Lemos, 5. Madrid, Spain. Departamento de Paleontología. Facultad de Ciencias Geológicas. Universidad Complutense de Madrid, Avda. Complutense s/n, 28040 Madrid, Spain) epoza@isciii.es*

*Lozano-Ruiz, Marina (IPHES, Institut Català de Paleoecologia Humana i Evolució Social, Tarragona, Spain. Àrea de Prehistòria, Universitat Rovira i Virgili (URV).Tarragona, Spain) mlozano@iphes.cat*

*Arsuaga, Juan Luis (Centro Mixto UCM-ISCIID de Evolución y Comportamiento Humanos. C/ Monforte de Lemos, 5. Madrid, Spain. Departamento de Paleontología. Facultad de Ciencias Geológicas. Universidad Complutense de Madrid, Avda. Complutense s/n, 28040 Madrid, Spain) jlarsuaga@isciii.es*

The hemispheres of the human brain are asymmetrical, both functionally and structurally, thus avoiding a duplication of neural circuits costs (Levy 1977), and reducing interference between different functions (Galaburda et al., 1978). The division of labor between the two hemispheres is known as lateralization (Kalat, 2004), and it is recognized that various higher cognitive functions are lateralized (Hutsler & Galuske, 2003).

The most common structural asymmetry is known as petalia, the extension of one hemisphere beyond the other (Gilissen, 2001), and is related to the individual's handedness (Geschwind & Levitsky, 1968; LeMay, 1976; Chiarello et al., 2009). In humans, the common pattern is the extension of the right frontal and left occipital hemispheres (Chui & Damasio, 1980; LeMay, 1984; Toga & Thompson, 2003) which corresponds to right handedness (90% of the present-day human population). The

other 10% corresponds to left handedness with a reversed pattern.

The best known functional asymmetry is Broca's area (Brodmann areas 44, 45 and 47), located in the left hemisphere (Geschwind & Levitsky, 1968; Zilles et al., 1996; Kalat, 2004). This is an important neuroanatomical region related to language, but Foundas (1998) noted that there is a significant asymmetry of area 45 in the left hemisphere in both right- and left-handed individuals. In contrast, there is a clear left asymmetry of area 44 in right-handed individuals, and a right asymmetry of this area in left-handed individuals. Foundas (1998) concluded that the use of hands therefore is positively correlated with the asymmetry in area 44.

Petalias have been quantified on the endocasts from human specimens from the Sima de los Huesos site, using the method from LeMay (1982). The results have been matched to handedness. Additionally, Broca's and Brodmann areas have been isolated in each endocast from Sima de los Huesos, and the development of areas 44 and 45 also has been related to handedness. Results were combined to define the possible handedness in every specimen.

Handedness was inferred in a previous cultural dental wear analysis concluding a preferential direction of the labial striation in each dental specimen (Lozano et al., 2008).

Correlation between the orientation of anterior dental striations and particular brain asymmetries was examined in six crania with associated dentitions to examine possible handedness.

The combination of results from the analysis of petalias and Broca's area has resulted in a variety of patterns of brain laterality in the Sima de los Huesos collection. Additionally, handedness was correlated with brain laterality in five of six specimens.

Only one specimen was the exception, because brain laterality does not correspond to right handedness, but the preferential dental striation pattern is right oblique, related to the use of right hand.

One cranial-dental specimen shows a contrary pattern between handedness and brain asymmetries. This specimen therefore used the non-preferential hand for some tasks leaving marks on the anterior teeth, maybe due by any physical problem in the left hand or maybe possible to learning by imitation using the non-preferential hand.

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## 18. THE LATEST MEGACEROIDES SOLILHACUS FROM EUROPE AT GALERÍA, ATAPUERCA?

*van der Made, Jan (Museo Nacional de Ciencias Naturales, CSIC, Madrid) mcnjv538@mncn.csic.es*

*Cáceres, Isabel (Àrea de Prehistòria, Universitat Rovira i Virgili (URV), Avinguda de Catalunya 35, 43002 Tarragona, Spain - IPHES, Institut Català de Paleoecologia Humana i Evolució Social, C/Escorxador s/n, 43003 Tarragona, Spain) icaceres@iphes.cat*

*Ortega, Ana Isabel (CENIEH, Centro Nacional de Investigación sobre la Evolución Humana, Paseo Sierra de Atapuerca 3, 09002 Burgos, Spain - GEE, Grupo Espeleológico Edelweiss, Diputación Provincial de Burgos, Paseo del Espolón 34, 09001 Burgos, Spain) anaisabel.ortega60@gmail.com*

Giant deer were a common elements in the environment of early humans and in fact, most of the time, there was more than one species. A particular species is indicated with the name *Megaceroides solilhacus*, while also other names, such as *Praemegaceros* or *Megaloceros verticornis* are applied. This was a large species, which has been considered to be typical for the Cromerian or early Middle Pleistocene and even to be anterior to the glaciations known as Elsterian or Anglian. This species or the lineage to which it belongs is present in various levels at Atapuerca. The latest record at Atapuerca is in level TG10a of Galería.

New ESR dates for this level (Falguères et al., 2013) suggest that this may by far be the youngest *Megaceroides* known from Europe. These dates suggests ages around 250 ka and TG10a being correlative of stage 8. Though other dating techniques (TL and IRSL) suggest significantly older ages, the possibility of such very young ages are interesting from a biogeographic point of view.

Deer of this genus are known from Europe, the Middle East and from North Africa. The North African species *Megaceroides algericus* is mostly or only known from the late Pleistocene and has a wide array of derived features. Though there is some discussion on its origins, it seems likely that it is a descendant of *M. solilhacus*. There is however, a long temporal gap between the latest *M. solilhacus* and the earliest *M. algericus*. The latest *Megaceroides* from Eurasia is from Petralona in Greece, Azokh in Nagorno-Karabakh and from Atapuerca TG10a, which could bridge the gap between the Eurasian and African records. The appearance of *Megaceroides* in North Africa seems to be part of a Late Pleistocene increase of the presence of Eurasian species in North Africa.

Faunal exchange between Africa and Eurasia shows an overall decreasing trend during past four million years, which is probably related to an increasing aridity in North Africa and the Middle East. Human dispersal out of Africa seems to have coincided with some moments of more intense faunal exchange. Whether this is a mere coincidence, or not, remains to be seen, but the dispersal of *Homo sapiens* out of Africa coincided more or less with a renewed dispersal of Eurasian mammals, including *Megaceroides*, into North Africa.

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**19. GALERÍA COMPLEX SITE (SIERRA DE ATAPUERCA, BURGOS, SPAIN): UPDATING THE MIDDLE PLEISTOCENE OCCUPATIONS**

Ortega, Ana Isabel (CENIEH, Centro Nacional de Investigación sobre la Evolución Humana, Paseo Sierra de Atapuerca 3, 09002 Burgos, Spain - GEE, Grupo Espeleológico Edelweiss, Diputación Provincial de Burgos, Paseo del Espolón 34, 09001 Burgos, Spain) [anaisabel.ortega60@gmail.com](mailto:anaisabel.ortega60@gmail.com)

Cáceres, Isabel (Àrea de Prehistòria, Universitat Rovira i Virgili (URV), Avinguda de Catalunya 35, 43002 Tarragona, Spain - IPHES, Institut Català de Paleoecologia Humana i Evolució Social, C/Escorxador s/n, 43003 Tarragona, Spain) [icaceres@iphes.cat](mailto:icaceres@iphes.cat)

García-Medrano Paola (IPHES, Institut Català de Paleoecologia Humana i Evolució Social, C/Escorxador s/n, 43003 Tarragona, Spain) [paolaoliv@hotmail.com](mailto:paolaoliv@hotmail.com)

Pérez-González, Alfredo (CENIEH, Centro Nacional de Investigación sobre la Evolución Humana, Paseo Sierra de Atapuerca 3, 09002 Burgos, Spain) [alfredo.perez@cenieh.es](mailto:alfredo.perez@cenieh.es)

Vallverdú, Josep (Àrea de Prehistòria, Universitat Rovira i Virgili (URV), Avinguda de Catalunya 35, 43002 Tarragona, Spain - IPHES, Institut Català de Paleoecologia Humana i Evolució Social, C/Escorxador s/n, 43003 Tarragona, Spain) [jvallverdu@iphes.cat](mailto:jvallverdu@iphes.cat)

Pérez, Raquel (TAUP, Topografs Alt Urgell i Pirineus SLT, C/ Joaquim Viola 12, 25700, La Seu d'Urgell, Lleida, Spain/ IPHES, Institut Català de Paleoecologia Humana i Evolució Social, C/Escorxador s/n, 43003 Tarragona, Spain) [rapemar88@hotmail.com](mailto:rapemar88@hotmail.com)

Benito-Calvo, Alfonso (CENIEH, Centro Nacional de Investigación sobre la Evolución Humana, Paseo Sierra de Atapuerca 3, 09002 Burgos, Spain) [alfonso.benito@cenieh.es](mailto:alfonso.benito@cenieh.es)

Campaña, Isidoro (CENIEH, Centro Nacional de Investigación sobre la Evolución Humana, Paseo Sierra de Atapuerca 3, 09002 Burgos, Spain) [isidoro.campanna@cenieh.es](mailto:isidoro.campanna@cenieh.es)

Ollé, Andreu (Àrea de Prehistòria, Universitat Rovira i Virgili (URV), Avinguda de Catalunya 35, 43002 Tarragona, Spain)

- IPHES, Institut Català de Paleoecologia Humana i Evolució Social, C/Escorxador s/n, 43003 Tarragona, Spain) [aolle@iphes.cat](mailto:aolle@iphes.cat)

Bermejo, Lucía (Escuela Interuniversitaria de Posgrado en Evolución Humana, Universidad de Burgos, C/ Don Juan de Austria 1, 09001 Burgos, Spain) [lucia.bermal@hotmail.com](mailto:lucia.bermal@hotmail.com)

Expósito, Isabel (Àrea de Prehistòria, Universitat Rovira i Virgili (URV), Avinguda de Catalunya 35, 43002 Tarragona, Spain - IPHES, Institut Català de Paleoecologia Humana i Evolució Social, C/Escorxador s/n, 43003 Tarragona, Spain) [iexpósito@iphes.cat](mailto:iexpósito@iphes.cat)

Burjachs, Francesc (ICREA, Institutio Catalana de Recerca I Estudis Avançats, Passeig Lluís Companys, 2308010 Barcelona, Spain, Àrea de Prehistòria, Universitat Rovira i Virgili (URV), Avinguda de Catalunya 35, 43002 Tarragona, Spain - IPHES, Institut Català de Paleoecologia Humana i Evolució Social, C/Escorxador s/n, 43003 Tarragona, Spain) [fburjachs@iphes.cat](mailto:fburjachs@iphes.cat)

Marín, Juan (Àrea de Prehistòria, Universitat Rovira i Virgili (URV), Avinguda de Catalunya 35, 43002 Tarragona, Spain) [juan.marin.hernando@gmail.com](mailto:juan.marin.hernando@gmail.com)

Santander, Boris (Àrea de Prehistòria, Universitat Rovira i Virgili (URV), Avinguda de Catalunya 35, 43002 Tarragona, Spain - IPHES, Institut Català de Paleoecologia Humana i Evolució Social, C/Escorxador s/n, 43003 Tarragona, Spain, GQP-CG, Grupo Quaternário e Pré-História do Centro de Geociências (ul and D 73 e FCT, Portugal) [boris.santander@gmail.com](mailto:boris.santander@gmail.com)

Bermúdez de Castro, José María (CENIEH, Centro Nacional de Investigación sobre la Evolución Humana, Paseo Sierra de Atapuerca 3, 09002 Burgos, Spain) [josemaria.bermudez-decastro@cenieh.es](mailto:josemaria.bermudez-decastro@cenieh.es)

Carbonell, Eudald (Àrea de Prehistòria, Universitat Rovira i Virgili (URV), Avinguda de Catalunya 35, 43002 Tarragona, Spain - IPHES, Institut Català de Paleoecologia Humana i Evolució Social, C/Escorxador s/n, 43003 Tarragona, Spain, IVPP, Institute of Vertebrate Paleontology and Paleoanthropology of Beijing, China) [ecarbonell@iphes.cat](mailto:ecarbonell@iphes.cat)

Galería Complex is an archaeological site located at Trinchera del Ferrocarril (Sierra de Atapuerca, Burgos) characterized by a significant Middle Pleistocene human occupation. The systematic excavation includes the areas known as Galería (with the Sinkhole of TN, excavated between 1980-1995) and Cueva de los Zarpazos (excavated between 2002 and 2010). This deposit has a sequence of five stratigraphic units and a soil, with an important archaeological and palaeontological record 500 to 200 ka years old. This site has been related with the hominin fossils found at Sima de los Huesos site and the archaeological sequences of the level TD10 of Gran Dolina site.

New archaeological interventions started in 2010 with the main objective of checking the previous information about the occupations in Galería and extending the archaeological, taphonomical, sedimentological and palynological knowledge about the environmental conditions of these occupations. This paper presents the updated type stratigraphic sequence of Galería site, which includes a synthetic relation of the different sections with the geological and archaeological units. This type sequence intends to be a reference for fieldwork reviewing progresses and for the future research, as well as support the archaeological palimpsest character of the GSU subunits of TG11 level.

The new excavations have provided more than 970 faunal remains and 56 lithic artifacts. The lithics were made basically on Neogene chert and the faunal assemblage is represented mainly by axial and cranial elements of cervid and equid individuals. The overall dynamics observed seem to be the same than those identified in the former interventions, this is, that the humans and carnivores vied for the existing animals resources. We emphasize that the new works have uncovered evidences of human occupation in the GIV unit, traditionally considered sterile.

ORAL

## 20. THE EMERGENCE AND DEVELOPMENT OF THE ACHEULEAN IN ATAPUERCA: THE GALERÍA SITE (C. 500-250KA)

*García-Medrano, Paula (IPHES/URV) pgarciamedrano@gmail.com*

*Cáceres, Isabel (URV/IPHES) icaceres@iphes.cat*

*Ortega, Ana Isabel (CENIEH, GEE) anaisabel.ortega60@gmail.com*

*Ollé, Andreu (IPHES/URV) aolle@iphes.cat*

*Eudald Carbonell (URV-IPHES-IVPP) ecarbonell@iphes.cat*

Galería is one of the main sites of the Trinchera del Ferrocarril (Atapuerca), together with Gran Dolina and Sima del Elefante. This site has a long well dated sequence from 500Ka to 250Ka, which have let us to make a diachronic study of the technology. At the lower levels of Galería, we have documented the first vestiges of Acheulean in Atapuerca. This is characterized by the use of quartzite cobbles to shape Large Tools (mainly handaxes and cleavers) and by the exploitation of large flakes of Neogene chert. As a consequence of the maintenance of the same occupational patterns and the same "toolkit", the technology of Galería has kept an image of technological stability

through the Middle Pleistocene. Nevertheless, we have isolated technological characteristics which reflect technological changes through time.

In addition, we have made a synchronic study of the occupations. The most part of the knapping sequences are made outside the cave and the operative chains are very fragmented, as a consequence of short and sporadic occupations, for the only purpose of obtaining the animals that had fallen into the cave through a natural trap created by the TN shaft, in successful competition with carnivores. In spite of this, through the refits we have characterized not only the spatial distribution of the activities but the knapping sequences developed inside the cave. This two areas, (outside – inside) mean different knap strategies.

The Galería excavations were developed during the 80s and 90s. These were recently restarted at the upper levels of the sequence. This has allowed us to make a synthesis of the ancient dates and plan the whole set of new questions to solve with the new interventions.

1. Is there any change in the occupational pattern at the end of the sequence?
2. Which is the real degree of technological activity inside the cave?
3. Is it possible to consolidate the technological features documented through the Galería's sequence?

ORAL

## 21. MAPPING WITH GIS THE PREHISTORIC SITES AROUND SIERRA DE ATAPUERCA (BURGOS). THE GENERAL SPATIAL DISTRIBUTION OF THE HOLOCENE

*Marcos Sáiz, Francisco Javier (Área de Prehistoria. Universidad de Burgos) fjaviermarcos@hotmail.com*

In recent decades, the area around Sierra de Atapuerca has been the subject of several archaeological interventions (excavations and surveys), both by the Research Projects and Management or Emergency Archaeology. The most significant advance for the archaeological knowledge of this territory, in terms of sites discovered, has been carried out, precisely, by researchers of University of Burgos, Department of Prehistory (Atapuerca Research Team).

In fact, since 1999 to 2007 we have developed a Research Project focused to the analysis of the evolution of prehis-

toric settlement around Sierra de Atapuerca during the Holocene. The fieldwork was based in 10 archaeological surveys, 8 with a full coverage intensive systematic method over 314 Km<sup>2</sup> (10 Km radius of Cueva Mayor), and 2 intensive systematic surveys over the sites.

The purpose of this communication is to present, over this territory, an update cartography until 2014 with all archaeological sites of the Holocene: surveys sites, excavations sites, caves and megalithic structures. Furthermore, we discuss about the mapping techniques with GIS and geospatial databases applied to archaeological surveys, we evaluate the megalithic structures and the settlements excavated in other digs, and we make an assessment of the relevance and contributions of the different archaeological interventions. In this work, we must underline the successful results generated, with a general spatial distribution of the Holocene with more than 200 sites.

GIS and the general spatial distribution of the Holocene with more than 200 sites (caves, sites and megalithic structures), suggest that the territory around Sierra de Atapuerca is one of the North Meseta regions more intensely exploited.

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## ORAL

### **22. THE UNUSUAL HUMAN CONSUMPTION OF EQUIDS FROM THE EARLY BRONZE AGE OF THE EL PORTALÓN SITE (SIERRA DE ATAPUERCA, BURGOS, SPAIN).**

*Galindo-Pellicena, M Ángeles (Centro Mixto UCM-ISCI3 de Evolución y Comportamiento Humanos; Departamento de Paleontología. Facultad de Ciencias Geológicas. Universidad Complutense de Madrid) mgalindo@isciii.es mariangape79@hotmail.com*

*Carretero, José Miguel (Laboratorio de Evolución Humana, Departamento de Ciencias Históricas y Geografía, Universidad de Burgos) jmcarre@ubu.es*

*Iriarte, Eneko (Laboratorio de Evolución Humana, Departamento de Ciencias Históricas y Geografía, Universidad de Burgos) eiriarte@ubu.es*

*Pérez-Romero, Amalia (Laboratorio de Evolución Humana, Departamento de Ciencias Históricas y Geografía, Universidad de Burgos) apromero@ubu.es*

*Arsuaga, Juan Luis (Centro Mixto UCM-ISCI3 de Evolución y Comportamiento Humanos; Departamento de Paleontología. Facultad de Ciencias Geológicas. Universidad Complutense de Madrid) jlarsuaga@isciii.es*

The horse has played an important role in the prehistoric societies along the time. During the Paleolithic the horse was frequently hunted and consumed by man. In the Iberian Peninsula, the horse was a common element at the end of the Late Pleistocene, after which there was a long period during the Early Holocene when sites containing horse remains were very rare. It was not until the Chalcolithic or Bell Beaker culture when more equine remains were found in certain regions.

The horse was exploited for various reasons in the Iberian Peninsula during the Bronze Age. In some cases, horses were used for their meat. They were also used as pack or draft animals, and only after they fulfilled this purpose, were eventually consumed. Another possible purpose of horse exploitation could be to obtain milk. Nonetheless, no evidence has been found at any site in Iberia that indicates mare's milk consumption.

Lastly, during the Bronze Age, horses could have been considered goods that represented prestige. The possession and consumption of horses could have served to distinguish between different social classes living in settlements in that period. This is difficult to verify with the zooarchaeological record.

In this study, an exceptional consumption of horse remains in Early Bronze Age is documented. These remains were discovered during the sixth excavation campaign of the El Portalón site directed by J. M. Apellániz in 1979. The material consists of 103 bones and teeth, belonging to a minimum number of six individuals of *Equus* sp., recovered in a thin stratigraphic interval (around 70 centimeters) and a 2 m<sup>2</sup> of area (called Horse stratigraphic unit: HSU). It is dated c. 2000 yr cal B.C.

The mortality profile (three of the six individuals were slaughtered before reaching four years of age), butchery marks (on 27.18% of the bone remains), thermal alteration and the percussion marks suggest horse meat as an important resource for the inhabitants from the Bronze Age of El Portalón. This is unusual among other Iberian sites where ovicaprines, bovids and suids provide the majority of the meat. The high percentage of equid remains identified in the HSU (43% of total NISP) makes this place one of few Holocene Iberian sites (with Cerro de La Encina and the phase III of Pic del Corbs) where the horse is the most abundant species.

The mentioned evidences and the low representation of the equid remains in the other levels of the whole site's stratigraphic sequence bring forward the exceptional character of equid consumption represented in this site,

and, together with other contextual evidences, suggest that this accumulation of horse remains could be the result of a feast.

ORAL

**23. PRE-BEAKER COPPER AGE BURIAL OF EL PORTALÓN DE CUEVA MAYOR (SIERRA DE ATAPUERCA, BURGOS)**

*Pérez-Romero, Amalia (Laboratorio de Evolución Humana, Departamento de Ciencias Históricas y Geografía, Universidad de Burgos, Edificio I+D+i, Plaza de Misael Bañuelos s/n, 09001, Burgos) apromero@ubu.es*

*Eneko Iriarte Iriarte, Eneko (Laboratorio de Evolución Humana, Departamento de Ciencias Históricas y Geografía, Universidad de Burgos) eiriarte@ubu.es*

*Galindo-Pellicena, María Angeles (UCM-ISCI, Centro Mixto Universidad Complutense-Instituto de Salud Carlos III de Evolución y Comportamiento Humanos, Madrid) marian-gape79@hotmail.com*

*Castilla, María (Laboratorio de Evolución Humana, Departamento de Ciencias Históricas y Geografía, Universidad de Burgos, Edificio I+D+i, Plaza de Misael Bañuelos s/n, 09001, Burgos) mlcastilla@ubu.es*

*Francés, Marta (Laboratorio de Evolución Humana, Departamento de Ciencias Históricas y Geografía, Universidad de Burgos, Edificio I+D+i, Plaza de Misael Bañuelos s/n, 09001, Burgos) martafr86@gmail.com*

*García-González, Rebeca (Laboratorio de Evolución Humana, Departamento de Ciencias Históricas y Geografía, Universidad de Burgos, Edificio I+D+i, Plaza de Misael Bañuelos s/n, 09001, Burgos) mrgarcia@ubu.es*

*Rodríguez, Laura (Laboratorio de Evolución Humana, Departamento de Ciencias Históricas y Geografía, Universidad de Burgos, Edificio I+D+i, Plaza de Misael Bañuelos s/n, 09001, Burgos) lrgagosto@gmail.com*

*Santos, Elena (Centro Mixto UCM-ISCI de Evolución y Comportamiento Humano. Monforte de Lemos 5. 28029 Madrid. Spain / Laboratorio de Evolución Humana. Universidad de Burgos, 099001 Burgos, Spain) esureta@ubu.es*

*Alday, Alfonso (Área de Prehistoria. Universidad del País Vasco) a.alday@ehu.es.*

*Carretero, José Miguel (Laboratorio de Evolución Humana. Universidad de Burgos, 099001 Burgos, Spain) jmcarre@ubu.es*

*Arzuaga, Juan Luis (Centro Mixto UCM-ISCI de Evolución y Comportamiento Humano. Monforte de Lemos 5. 28029 Madrid. Spain) jlarsuaga@isciii.es*

The main goal of this work is to introduce the archaeological characteristics of a collective burial excavated in

the level 7/8 from "El Portalón de Cueva Mayor" site (Sierra de Atapuerca, Burgos). The radiocarbon dating for this funerary level, obtained from seed, faunal and human remains, indicates dates of  $4350 \pm 30$  BP. This, together with the typology of cultural material places this burial in the pre-Bell Beaker pottery Chalcolithic period of the Spanish North Plateau (between 4600 and 3950 BP).

The level 7/8 represents a tumular structure in which several burials were performed. Over 93 human remains have been recovered from this level, belonging to a minimum number of 11 individuals, four adults and seven subadults. Because these burials were disturbed by later chalcolithic dweller, in most cases, it is not possible to establish a clear association among the human remains and the cultural materials (grave goods) found in this level. Therefore the funerary ritual related to these human remains is hard to describe.

Fortunately, during 2012 field season, an intact burial with a complete human subadult skeleton was recovered from this level. The burial was clearly associated to both, cultural and faunal remains. Our study shows that the level 7/8 from El Portalón fits well with the pattern of the Chalcolithic funerary world that is defined by the collective character of the burials and by the no spatial coincidence of them and habitat areas.

This extraordinary discovery provides an important source of knowledge regarding the funerary behaviour during this prehistoric period in the Spanish North Plateau.

19:30 POSTER SESSION

POSTER

**1. FILLING THE GAPS: THE NON POLLEN PALYNO-MORPHS CONTRIBUTION TO THE KNOWLEDGE OF SIERRA DE ATAPUERCA CAVES LOCAL ENVIRONMENT DURING THE PLEISTOCENE**

*Expósito, Isabel (IPHES, Institut Català de Paleoecologia Humana i Evolució Social, C/ Marcel·lí Domingo s/n Campus Sescelades URV (Edifici W3), 43007-Tarragona, Spain. Àrea de Prehistòria, Universitat Rovira i Virgili (URV), Av. Catalunya 35, 43002- Tarragona, Spain) iexpósito@iphes.cat*

*Burjachs, Francesc (ICREA, Institut Català de Recerca i Estudis Avançats, Passeig Lluís Companys, 2308010 Barcelona, Spain, IPHES, Institut Català de Paleoecologia Humana i Evolució Social, C/ Escorxador s/n, 43003 Tarragona, Spain - Àrea de Prehistòria, Universitat Rovira i Virgili (URV), Avinguda de Catalunya 35, 43002 Tarragona, Spain) fburjachs@iphes.cat*

Allué, Ethel (IPHES, Institut Català de Paleoecologia Humana i Evolució Social, C/ Marcel·lí Domingo s/n Campus Sescelades URV (Edifici W3), 43007-Tarragona, Spain. Àrea de Prehistòria, Universitat Rovira i Virgili (URV), Av. Catalunya 35, 43002- Tarragona, Spain) eallue@iphes.cat

Since several decades ago, the conventional pollen analysis has been supplemented with information provided by Non Pollen Palynomorphs (NPP). Generally, the taxa included in this group are microalgae, fungi, insects and arachnid's chitinous remains, plant debris and other organic palynomorphs with an undetermined origin. Most of them have limited dispersal, which implies that their presence can only be inferred predominantly local environmental issues. Thus, although they cannot contribute to the reconstruction of palaeoenvironmental conditions, are valuable tools to characterize the original layers, as well as local environmental features that influence the deposits formation processes.

The pollen results of the Trinchera sites (Trinchera Elefante, Gran Dolina and Galeria), at Atapuerca, always have been statistically not much representative. The different attempts have been demonstrate important taphonomical biases related with the low preservation of pollinical records. There are also other palaeobotanical evidences, such as charcoal and seeds that are poorly represented. These data provide punctual information on taxa presence but do not represent a continuous vegetal record. The input of the NPP results to the incomplete data of the traditional palaeobotanical disciplines could contribute to complete the loose of information, at least in respect of the local environmental condition of the caves. The NPP can provide us information about the presence of decay organic matter accumulations, erosion processes or about moisture conditions, contributing to the understanding of biological, physical or chemical dynamics that resulted in the different sedimentary sequences that cover almost 1, 5 million years.

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#### POSTER

### 2. FIRST RECORD OF THE SOREX RUNTONENSIS-SUBARANEUS (MAMMALIA, SORICIDAE) GROUP IN THE IBERIAN PENINSULA

Juan Rofes (UMR 7209, CNRS-MNHN, Paris) juan.rofes@ehu.es

Cuenca-Bescós, Gloria (Aragosaurus-IUCA, Departamento de Ciencias de la Tierra. Facultad de Ciencias, Universidad de Zaragoza) cuencag@unizar.es

Bennàsar, Maria (IPHES-URV, Tarragona) bennasar.ma-

ria1@gmail.com

Blain, Hughes-Alexandre (IPHES-URV, Tarragona) hablain@iphes.cat

There are a number of *Sorex* (Mammalia; Soricidae) species from the Pleistocene of Europe which are intermediate in size between *S. minutus* and *S. araneus*. Among them we have *S. hundsheimensis*, *S. casimiri*, *S. prealpinus*, *S. bor*, *S. subaraneus* and *S. runtonensis*. Our aim here is to characterize and allocate some 170 *Sorex* specimens from Sima del Elefante (Sierra de Atapuerca, Burgos, Spain) to one of these taxa.

The specimens were obtained by concentrating sediment after a process of washing and sieving the sedimentary materials from the excavation of the Sima del Elefante site between 1996 and 2010. The sample is composed of isolated mandibles, maxillae and teeth that are either loose or in situ. Detailed morphological comparisons and morphometric analysis were performed.

The previous analyses allow us to discard all candidates for the identity of the Sima del Elefante items, with the exception of *S. subaraneus* and *S. runtonensis*. Some morphological features enabling this attribution are the high cusped fourth lower premolar with a strong buccal cingulum, the lower molars with a mesially stretched paraconid and high rear cusp curved distally, the thick buccal cingulum and the well-developed talon of the upper incisor, the squarish shape of the upper first and second molars and their poorly expanded hypoconal flange, the deep external temporal fossa of the mandible with a small spicule very close to the tip of the coronoid process, and the high and triangular internal temporal fossa with a shallow part extending to the tip.

The first record of the *Sorex runtonensis*-*subaraneus* group in the Iberian Peninsula comes from the Lower Red Unit (levels TE7-14) of the Sima del Elefante, which is dated to ca. 1.1-1.5 Ma. These two species, *S. runtonensis* and *S. subaraneus*, are very close in size, shape and appearance, their distinction being very subtle and, in many cases, not reliable. Their broad range of morphological and morphometric variation mostly overlaps when considering all the valid records throughout Europe.

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#### POSTER

### 3. THE FOSSIL BEAVERS FROM THE PLEISTOCENE LOCALITIES OF ATAPUERCA

Cuenca-Bescos, Gloria (University of Zaragoza) cuencag@



*unizar.es*

*Rosell, Jordi (IPHES/URV) jordi.rosell@urv.cat*  
*Morcillo-Amo, Álvaro (c. Ravena 33, Madrid) alvarosas@msn.com*

*Galindo-Pellicena, Maria Angeles (UCM-ISCI) mari-angape79@hotmail.com*

*Santos, Elena (Centro Mixto UCM-ISCI de Evolución y Comportamiento Humano. Monforte de Lemos 5. 28029 Madrid. Spain / Laboratorio de Evolución Humana. Universidad de Burgos, 099001 Burgos, Spain) esureta@ubu.es*

*Alcázar de Velasco, Almudena (UCM-ISCI) huellasdelaetoli@yahoo.es*

Beavers are large rodents that are present in Eurasia since the Oligocene. They are specialized mammals with concrete ecological preferences, so this group presents a great interest for paleoecological reconstructions. The extant European beaver, *Castor fiber* lives in semiaquatic habitats, therefore semiaquatic preferences are attributed to the fossil remains of *C. fiber* as well. The oldest record of *Castor* in Spain, *Castor* sp., is from the Ruscinian of the Guadix-Baza basin, when the wet conditions increased after the aridity maximum of the Turolian. Then it disappears again during the end of the Pliocene, with several aridity peaks such as recorded in i.e. the Zújar section, and never reappears again in Southern Spain.

Then, the beavers reappear again only in the north of the Iberian Peninsula, at the end of the Early Pleistocene, in the localities of Atapuerca. In view of the very complete fossil record from the paleontological localities from the south of Spain, such as Fonelas-1, the Guadix-Baza and the Granada basins, among others, we interpret that the absence of *Castoridae* in the south of Spain is real, and not due to a bias.

We study several cranial, mandibular fragments, isolated teeth, and postcranial fossil remains of beavers present in the Early Pleistocene and late Pleistocene layers of the cave-sites of the Sierra de Atapuerca karst complex. The localities with beaver remains are, from older to young levels, the Lower red levels of Sima del Elefante (TELRU), the Gran Dolina levels TD3/4, TD5, TD6, Galería de las Estatuas, and the Bronze levels of Portalón.

We have studied near 50 specimens of *Castor* from the Atapuerca localities. They reveal the presence of beavers in Atapuerca during the end of the Early Pleistocene and the Upper Pleistocene—Holocene. The beaver does not appear in the Middle Pleistocene layers from Atapuerca such as TD10, Galería, or upper red unit of the Sima del Elefante.

The morphometric analysis of the fossils shows that the *Castor* remains from the different Pleistocene localities of Atapuerca are similar in size and morphology, having small differences in size, of little significance from the point of view of the taxonomy. They are too similar in size and morphology to the skeletal remains of fossil and extant *Castor fiber* compared from the literature and from several institutional collections as well.

The beaver remains found in Atapuerca are scarce, though present in four of the localities of the karst complex of the Sierra de Atapuerca. They are attributed to the species *Castor fiber*, because they are nearly identical to the extant species in size and morphology.

We can thus conclude that the species *Castor fiber* is present in Spain since the early Pleistocene. It was living in aquatic environments, as their extant relatives. Other proxies such as stratigraphy and sedimentology, fossils of small rodents, insectivores, anurans, and aves, show that the early Pleistocene levels of Sima del Elefante and Gran Dolina were formed under humid conditions, and that running water or ponds were near the entrances of the caves.

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## POSTER

### 4. FIRST REPORT OF THE BIRDS (AVES) FROM THE LEVEL TE7 OF SIMA DEL ELEFANTE (EARLY PLEISTOCENE) OF ATAPUERCA (SPAIN)

*Núñez-Lahuerta, Carmen (Aragosaurus-IUCA, Departamento de Ciencias de la Tierra. Facultad de Ciencias, Universidad de Zaragoza) carmenn1989@gmail.com*

*Cuenca-Bescós, Gloria (Aragosaurus-IUCA, Departamento de Ciencias de la Tierra. Facultad de Ciencias, Universidad de Zaragoza) cuencag@unizar.es*

The sites of the Sierra de Atapuerca (Burgos, Spain) are known due to its complete quaternary record, both stratigraphic and paleontologic. The record comprises the cave filling sediments in a karst system, developed in carbonate rocks. The Sima del Elefante site is divided in three units, according to its geological features: the lower red unit TELRU (early Pleistocene), the middle white unit, and the upper red unit (TEURU) (Middle Pleistocene). In this work we present the first results of the study of the bird association from the lower level of the TELRU, TE7, that belong to the *Allophaiomys lavocati* biozone, aged 1.5-1.1 Ma (Cuenca-Bescós et al., 2013).

Unlike in other papers published about the Aves of the

Sima del Elefante (Rosas et al., 2001), all the specimens studied were obtained by concentrating the sediment with the process of washing and sieving the sedimentary materials acquired from excavations of Sima del Elefante. These processes are simultaneous to the Atapuerca excavation campaign, that started in 1996, and about 12-15 tones of sediments are processed each campaign. The product is a concentrate consisting of calcareous fragments from the cave walls, fossil remains of small vertebrates and fragments of large vertebrates. The concentrates are packed and labelled, indicating the campaign year, the site and stratigraphic level from which it came, the grid unit, and the depth. The bird remains are separated from the other groups using a binocular magnifying glass in the laboratory of the University of Zaragoza, and they are photographed with a digital camera attached to the binocular magnifier, then, they are recorded in the data base and provisionally stored in the laboratory. The specimens studied are kept in the Natural Sciences Museum of the University of Zaragoza. The systematic analysis were done using the general nomenclature after Baumel (1983); the identification keys used are Janossy (1982), Tomek & Bochenski (2000; 2009) and Bochenski & Tomek (2009). The reference collection was the Natural Sciences Museum of the University of Zaragoza collection.

Nine avian taxa have been identified in the preliminary study of the fossil assemblage: Anseriformes indet., Falconiformes indet., Galliformes indet., Passeridae indet., Motacilla sp., Turdus sp., Corvidae indet., Corvus monedula, Corvus frugilegus.

The first Aves analysis of the lower level of the TELRU shows nine different avian taxa, but the big amount and variety of the fossils points to a high number of taxa that will be identified in the future, during the next steps of this investigation. Also paleoecological analysis must be done, because there's no reports available yet concerning paleoecological studies of the small vertebrate assemblage.

*dezdecastro@cenieh.es*

*Carbonell, Eudald (URV, IPHES, IVPP) ecarbonell@iphes.cat*

Gran Dolina site is one of the most important Pleistocene archaeological sites in Europe. It has three important archaeo-paleontological layers: TD10, TD6 and TD4, where high densities of anthropogenic bones and lithic remains have been found. In this site, a new hominid has been defined, Homo antecessor. The relevance of this site makes a good definition of the sedimentary process essential for a fine understanding of the archaeological remains. Gran Dolina belong to Torcas multi-level karst system, being a conduct of the middle level cutted by a Railway Trench of XIX century. This level was opened to outside during Lower Pleistocene beginning its infill of sediments that carried on archaeological and palaeontological remains. These sediments have been divided into 11 lito-stratigraphic units defined by major unconformities. By field works and sedimentary, mineralogical and chemical analyses, a revised stratigraphic section and new sedimentary data is showed.

19 sedimentary facies have been distinguished. Each sedimentary facies have been characterized by particle size analysis. Allochthonous facies are differentiated in sediment gravity flow facies and fluvial facies. Gravity deposits have been classified by their clasts/matrix ratio, dividing them in debris fall, debris flow and mud flow. Fluvial facies were sub-divided in channel, floodplain and decantation facies using their particle size and their stratigraphic position. Autochthonous facies were differentiated in speleothem, breakdown, phosphatic accumulation, weathering detritus and autochthonous fluvial.

Analyses reveal a relative homogeneity in the mineralogy and chemistry of Gran Dolina sediments. This can be indicate that allochthonous sediment have the same source (Sierra de Atapuerca), so chemical and mineralogical variations are due to others reasons like environment change or biological activity.

Through these works we have elaborated a detailed sedimentary facies map, which synthesize the processes and environmental changes during the cavity infilling.

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## POSTER

### 5. SEDIMENTARY ANALYSES AND REVISED SEDIMENTARY FACIES OF GRAN DOLINA SITE (SIERRA DE ATAPUERCA, BURGOS)

*Campaña, Isidoro (CENIEH) isidoro.campanna@cenieh.es*

*Pérez González, Alfredo (CENIEH) alfredo.perez@cenieh.es*

*Benito Calvo, Alfonso (CENIEH), alfonso.benito@cenieh.es*

*Bermúdez de Castro, José María (CENIEH) josemaria.bermu-*

POSTER

**6. CARNIVORE AND HUMANS DURING THE EARLY AND MIDDLE PLEISTOCENE IN THE SIERRA DE ATAPUERCA**

*Rodríguez-Gómez, Guillermo (Centro Nacional de Investigación sobre la Evolución Humana (CENIEH), Paseo Sierra de Atapuerca 3, 09002, Burgos, Spain.)- guillermo.rodriguez@cenieh.es -guillerwilson@gmail.com*

*Martín-González Jesús A. (Departamento de Matemáticas y Computación, Universidad de Burgos, Plaza Misael Bañuelos s/n, 09001, Burgos, Spain. Temporarily assigned to CENIEH.)jesus.martin@tfo.upm.es*

*Mateos, Ana (Centro Nacional de Investigación sobre la Evolución Humana (CENIEH), Paseo Sierra de Atapuerca 3, 09002, Burgos, Spain.) ana.mateos@cenieh.es*

*Rodríguez, Jesús (Centro Nacional de Investigación sobre la Evolución Humana (CENIEH), Paseo Sierra de Atapuerca 3, 09002, Burgos, Spain.)jesus.rodriguez@cenieh.es*

Food resource availability strongly influences the survival opportunities of all organisms and it is considered that meat was a relevant food resource for Homo populations during Early and Middle Pleistocene. The availability of resources, the intensity of competition with other secondary consumers and the ability to access meat and fat resources conditioned human presence in Europe in this time period. Mathematical modelling of palaeocommunity trophic dynamics is a powerful tool for investigating food resource availability and intraguild competition.

We selected for this study the richer Early and Middle Pleistocene faunal assemblages from Sierra de Atapuerca. Only assemblages with nine primary consumer and three secondary consumer species were included. Available resources for secondary consumers were obtained from a mathematical model based on Leslie Matrices. The model is developed under two premises: populations should be stable and net reproduction rate is equal to one. This model determines the age structures that make the populations of primary consumers stable, the average biomass that can be sustainably extracted in the long term, and its distribution in body size categories. In a second step, the distribution of resources among secondary consumers is also modeled and sustainable densities for each carnivore are estimated. Expected densities for secondary consumers are estimated from allometric equations. The ratio sustainable density/expected density is taken as a measure of the degree of fulfilment of the secondary consumers requirements.

The faunal assemblage with the highest human fossil

abundances is in TD6 1-2 level from Gran Dolina site, which coincides with the lowest competition intensity among secondary consumers. The single assemblage from Atapuerca dated to the early Middle Pleistocene TD8 level of Gran Dolina site presents higher competition intensity than the Early Pleistocene assemblages and lack evidence of human presence. Nevertheless, there are several assemblages with evidence of human presence at Atapuerca after 0.5 Ma, and some of them exhibit competition intensity values similar for TD8.

Firstly, this model allows estimating food resource availability for the guild of secondary consumers and comparison of competition intensity between different faunal assemblages. Secondly, our results support an environment rich in trophic resources for secondary consumers at Sierra de Atapuerca during the late Early and early Middle Pleistocene. Competition intensity was higher during the early Middle Pleistocene than during the late Early Pleistocene. This results evidence that humans were able to successfully exploit the Atapuerca ecosystems even a moderately high levels of intraguild competition.

POSTER

**7. THE PREPARATION AND CONSERVATION TREATMENTS OF THE HOMO ANTECESSOR FOSSILS**

*López-Polín, Lucía (IPHES) lucia.lopezpolin@iphes.cat*

*Bermúdez de Castro, José María (CENIEH,) josemaria.bermudezdecastro@cenieh.es*

*Carbonell, Eudald (URV, IPHES, IVPP) ecarbonell@iphes.cat*

We report the preparation and conservation work carried out on the human fossils from level TD6 (Gran Dolina) recovered in excavations from 2003 to 2007. Many of them, after excavation, were partially covered or even almost completely included in a compact and hard sediment strongly adhered to the surface, and they required a series of preparation work, without which in many cases, their study would not have been possible. The treatments made were technically simple (mechanical cleaning, consolidation, reconstruction), but they were developed under a strict methodology of conservation whose aim has been to recover and preserve the archaeological information.

Besides the obvious retrieval of information itself, insofar as the fossils were uncovered, reassembled and strengthened, the preparation work of the Homo antecessor fossils has served to establish some criteria that we hope will help to settle the intervention methodol-

ogy designed to treat similar material. Briefly, these proposed criteria consist of adapting the interventions to the needs of the research without contravening the conservation fundamental principles, such as the respect for the integrity of the material, the minimal intervention and the reversibility of products and treatments used. A key aspect in the work here reported is detailed documentation of the whole process, recording both the products and techniques used in interventions, as well as the fossils in the different phases of the treatment (before, during, after treatment). The documentation allows understanding the decisions made about treatment and also to undo the treatment in the future (e.g. to remove consolidants or glues). Additionally, the documentation also helps to retrieve more information, which may be available only before or during the reconstruction of the fossils (e.g. detailed images of the fracture planes before reassembling a fossil); it also helps to interpret part of the changes originated by the treatment (e.g. distinguish between marks caused by the preparation work and traits of taphonomic interest).

With this work we aim to show that the result of the preparation and conservation (hands on) treatments is not the simple recovery of a fossil (to have a clean and reconstructed specimen) but to recover and to save all the information available during all the treatment.

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## POSTER

### 8. EXPERIMENTAL APPROACH TO THE ENERGETIC COST OF RESOURCE PROCUREMENT IN THE MIDDLE PLEISTOCENE POPULATIONS FROM SIERRA DE ATAPUERCA.

*Vidal-Cordasco, Marco (Máster en Evolución Humana, Edificio I+D+I, Universidad de Burgos, Pza. Misael Bañuelos s/n, 09001 Burgos, Spain) marcos-vidall@hotmail.com*

*Prado-Nóvoa, Olalla (Máster en Evolución Humana, Edificio I+D+I, Universidad de Burgos, Pza. Misael Bañuelos s/n, 09001 Burgos, Spain) olalla.9@hotmail.com*

*Mateos, Ana (Centro Nacional de Investigación sobre la Evolución Humana (CENIEH), Paseo Sierra de Atapuerca 3, 09002, Burgos, Spain) ana.mateos@cenieh.es*

*Terradillos, Marcos (Área de Prehistoria, Edificio I+D+I, Universidad de Burgos, Pza. Misael Bañuelos s/n, 09001 Burgos, Spain) mterradillos@hotmail.com*

*Rodríguez, Jesús (Centro Nacional de Investigación sobre la Evolución Humana (CENIEH), Paseo Sierra de Atapuerca 3, 09002, Burgos, Spain) jesus.rodriguez@cenieh.es*

recent humans and their environment, allows us to reconstruct the relationship between the paleolithic hunter-gatherers, their ecosystems and resources availability. We present here a new approach to the catchment of lithic raw material and the gathering of vegetable resources. A bioenergetic point of view has been increasingly used to address key issues in Palaeobiology and Palaeocology. Currently, we have designed two experimental studies: the first one, focused on quartzite catchment from the Trinchera Dolina site; the second one, focused on collection of plant resources conducted by lactating women in the area of Sierra de Atapuerca.

The experimental designs were carried out with a sample of 20 subjects in vivo, 10 men and 10 women. Several protocols have been applied to the participants in the Bioenergy Laboratory at CENIEH and at Sierra de Atapuerca. Protocols of Anthropometric, Bioelectrical Impedance and Indirect Ventilatory Calorimetry have been performed in the bioenergy. Height, weight, other body parameters, body composition and resting metabolic rate were measured in each participant. The activities of material procurement were recreated at Sierra de Atapuerca, monitoring the subjects with a calorimetry mobile device along a set of established itineraries. The route for quartzite catchment run from the Trinchera Dolina site to the closer outcrop while a couple of routes were selected for vegetable gathering: a steep ground walk, and a smooth ground walk. The female participants walked the vegetable gathering routes twice: one to simulate they were carrying a baby, and other one unloaded.

Several variables related to energy expenditure and body composition were obtained for each subject: Total Energy Expenditure, Resting Metabolic Rate, Fat Free Mass, Fat Mass, etc. All these data are useful to quantify the energy cost of each activity corrected by anthropometric measurements. These results have been compared between different physiological conditions.

This experimental project opens new possibilities to correlate different body parameters with energy expenditure and, therefore, to estimate energy expenditure in hominin fossil populations with different body proportions and compositions. Estimation of energy requirements of the human population inhabiting the Sierra de Atapuerca during the Middle Pleistocene, based on their body parameters allow us to reconstruct the energetic costs during two daily tasks in a more reliable way. This research line will improve our understanding of the energetic efficiency of extinct populations.

The study of different aspects of the interaction between

POSTER

**9. METRIC ANALYSIS OF HOMO FIRST MANDIBULAR MOLARS WITH SPECIAL ATTENTION TO SIMA DE LOS HUESOS SITE (ATAPUERCA, BURGOS).**

*Martín-Albaladejo, Marina (Master in Human Evolution. Edificio I+D+, Plaza Misael Bañuelos, s/n, 09001 Burgos, Spain) marina.maralba@gmail.com*

*Martinón-Torres, María (Centro Nacional de Investigación sobre la Evolución Humana, CENIEH, Burgos) maria.martinon@cenieh.es*

*Bermúdez de Castro, José María (Centro Nacional de Investigación sobre la Evolución Humana, CENIEH, Burgos) jose-maria.bermudezdecastro@cenieh.es*

The study of dental remains is a wealthy and stable source of information about phylogenetic relationships between extinct hominin species. Metric dental features are a reliable indicator of the underlying genotype of the individual/species under study. Since the last systematic metric analysis of the Atapuerca-Sima de los Huesos (SH) lower molars (Bermúdez de Castro and Nicolás, *Am. J. Phys. Anthropol.*, 1995) the sample has substantially increased, so an updated assessment is necessary. Lower molars were the most abundant dental remains present in Sima de los Huesos, and first lower molars ( $M_1$ ) are the most stable teeth within the lower molar series.

For this study we excluded  $M_1$  with a wear degree higher than 3 (Molnar, *Am. J. Phys. Anthropol.*, 1971). Thus, the analysed sample results in 26 SH  $M_1$ s, assigned to 19 individuals. SH was compared to a large sample of Contemporary Homo sapiens (N=253) held at the Anthropological Museum of the University of Coimbra (Portugal), Early Homo sapiens (N=7), Homo neanderthalensis (N=6), Homo heidelbergensis (N=2), Homo antecessor (N=2), Early Homo from Africa (N=3) and Early Homo from Asia (N=5) specimens. For each specimen we measured the total crown area and the absolute and relative area of each of the main cusps. The areas were measured with Ushikata X-PLAN360d planimeter over scaled high quality photographs of the teeth. Statistical comparison of the differences among groups, Principal Component Analysis and Linear Correlations between absolute and relative cusp areas were applied using PAST 2.17 and SPSS Statistics software.

SH  $M_1$ s are, in absolute terms, as small as contemporary Homo sapiens and they do not differ significantly from Early Homo sapiens. Furthermore, there are significant differences between the  $M_1$  cusp areas of Early Homo taxa in general and those of later Homo species. SH  $M_1$

protoconid relative area is the largest of all the studied groups. In the Principal Component Analysis (PCA) for the cusps absolute areas we found an area exclusively occupied by contemporary Homo sapiens and SH populations, whereas Homo antecessor falls closer to earlier Homo taxa. In contrast, in the PCA for the cusp relative areas, 4 out of 6 Neanderthal specimens falls within SH variability. Contemporary Homo sapiens presents a wide range of variation that encloses both Neanderthal and SH distributions among other groups.

From a metric aspect,  $M_1$ s are notably stable, although it is possible to find some differences between the larger specimens of Early Homo and the smaller  $M_1$ s in later Homo taxa groups. The highest relative area of the protoconid in SH concurs with the highest area of the homologous cusp in the upper molar series (Martinón-Torres et al., *J. Anat.*, 2013). The reduction in the total crown and absolute cusps areas in both SH and contemporary Homo sapiens suggests a likely case of parallelism. Although in absolute terms neanderthal molars are larger than those of SH, regarding the relative cusp areas SH and Neanderthals are similar. An exploration of other dental classes would be necessary to investigate the processes behind the dental reduction in the genus Homo.

POSTER

**10. SKULL MORPHOLOGY OF THE URSUS DENINGERI FROM SIMA DE LOS HUESOS AND THE CAVE BEARS LINEAGE: A GEOMETRIC MORPHOMETRIC ANALYSIS.**

*Santos, Elena (Centro Mixto UCM-ISCIH de Evolución y Comportamiento Humano. Monforte de Lemos 5. 28029 Madrid. Spain / Laboratorio de Evolución Humana. Universidad de Burgos, 099001 Burgos, Spain) esureta@ubu.es*

*Arzuaga, Juan Luis (Centro Mixto UCM-ISCIH de Evolución y Comportamiento Humano. Monforte de Lemos 5. 28029 Madrid. Spain) jlarsuaga@isciii.es*

*García, Nuria (Centro Mixto UCM-ISCIH de Evolución y Comportamiento Humano. Monforte de Lemos 5. 28029 Madrid. Spain) ngarcia@isciii.es*

*Carretero, José Miguel (Laboratorio de Evolución Humana. Universidad de Burgos, 099001 Burgos, Spain) jmcarre@ubu.es*

The cave bears lineage is an extinct bear clade with a continuous presence during the European Pleistocene. Within this lineage, Ursus deningeri von Reichenau, 1904 is the species which lived through the Middle Pleisto-

cene, evolving into *Ursus spelaeus* Rosenmüller, 1784, the typical representative for the Late Pleistocene. Further study of the craniodental and postcranial remains led to the subdivision of cave bears into two chronospecies: *U. deningeri* and *U. Spelaeus*.

Two complete skulls of *Ursus deningeri*, one recovered from the Middle Pleistocene site of Sima de los Huesos in Sierra de Atapuerca (Spain), and the other one from Petralona (Chalkidiki, Greece), were reconstructed with computed tomography. The cranial morphology of *U. deningeri* was analysed using geometric morphometrics and compared to extinct and extant Ursidae (*Ursus* cf. *dolinensis*, *Ursus spelaeus*, brown, and American and Asiatic black bears). The purpose of this work was to explore the variation in skull morphology between these different taxa.

Landmarks for 2D digitalization of the cranium were chosen to reflect the skull morphology profile and general shape of the cranium. Skulls of extants Ursidae and the fossil remains of *U. cf. dolinensis* and *U. spelaeus* were digitalized with computed tomography. Generalized Procrustes superimposition was performed on the coordinates and allometry corrected for using pooled regression analysis. Principal Component Analysis (PCA) was conducted and interpreted about the skull morphology. PCA differentiates between genera in Ursidae. The position of the *U. deningeri* and *U. cf. dolinensis* in morphospace is between brown and cave bears.

This study allows establishing that genera of the *Ursus* can be differentiated based on cranial shape. Combined studies with computed tomography and geometric morphometrics of endocranial remains will provide important new evidence which can inform about biochronological studies. The resulting analysis supports an ancestor-descendant relationship for the ursids included in the cave bear phylogenetic lineage (*U. cf. dolinensis*, *U. deningeri* and *U. spelaeus*).

*omm@gmail.com*

*Bermúdez de Castro, José María (Centro Nacional de Investigación sobre la Evolución Humana (CENIEH) josemaria.bermudezdecastro@cenieh.es*

*Dean, Chris (Department of Anatomy and Developmental Biology UCL) chris.dean@ucl.ac.uk*

*Martinón-Torres, María (Centro Nacional de Investigación sobre la Evolución Humana, CENIEH, Burgos) maria.martinon@cenieh.es*

*Rodríguez-Hidalgo, Antonio (IPHES/URV/Equipo de Investigación Primeros Pobladores de Extremadura (EPPEX) ajrh78@gmail.com*

*Marín, Juan (Àrea de Prehistòria, Universitat Rovira i Virgili (URV), Avinguda de Catalunya 35, 43002 Tarragona, Spain/Equipo de Investigación Primeros Pobladores de Extremadura (EPPEX) juan.marin.hernando@gmail.com*

*Canals, Antoni (IPHES/URV/Equipo de Investigación Primeros Pobladores de Extremadura (EPPEX) acanals@iphes.cat*  
*Vergès, Josep Maria (IPHES, Institut Català de Paleoecologia Humana i Evolució Social, Tarragona, Spain. Àrea de Prehistòria, Universitat Rovira i Virgili (URV).Tarragona, Spain) jmverges@iphes.cat*

*Lozano-Ruiz, Marina (IPHES, Institut Català de Paleoecologia Humana i Evolució Social, Tarragona, Spain. Àrea de Prehistòria, Universitat Rovira i Virgili (URV).Tarragona, Spain) mlozano@iphes.cat*

Crown formation times can be assessed by adding the imbricational and the appositional enamel formation times, so it can be estimated based entirely on the enamel. Previous research in the last decades have focused in the imbricational enamel because it is relatively easier to count long-period lines (perikymata) on its surface and establish formation times. Some authors have studied the variability of the total number of perikymata in different modern human populations, as well as the rate of enamel extension by dividing the crown height in ten deciles and counting the perikymata in each of the deciles. These authors have found that some modern human populations show a significantly lower number of perikymata, but little is known about the variability of these traits in modern humans. Our aim is to add new data on this topic and discuss imbricational enamel formation time variability in modern humans.

The sample analysed consists in 23 incisors from three different populations: a Calcolithic and a Bronze Age populations from the Atapuerca-Mirador Cave, and a presumably Bronze Age population from Maltravieso Cave. Perikymata were count by obtaining several images using an environmental scanning electron microscope (ESEM).

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## POSTER

### **11. PERIKYMATA NUMBER AND IMBRICATIONAL ENAMEL FORMATION TIMES IN THE INCISORS OF THREE ARCHAEOLOGICAL MODERN HUMAN POPULATIONS FROM MALTRAVIESO CAVE (CÁCERES) AND MIRADOR CAVE (BURGOS)**

*Modesto-Mata, Mario (Centro Nacional de Investigación sobre la Evolución Humana (CENIEH) / Equipo de Investigación Primeros Pobladores de Extremadura) paleomari-*

The perikymata number and imbricational enamel formation times of the incisors from these three archaeological populations are closer to the European and Inuit values rather than to South African values.

The results obtained in our study support the intrapopulation homogeneity of the European and Inuit populations for the perikymata number. However, more information from other African samples is needed to test whether the low number of perikymata is exclusive to the South African group or can be generalized to the whole African continent.

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POSTER

**12. ANOTHER WAY TO ANALYZE THE RAW MATERIAL IN GRAN DOLINA AND GALERÍA (SIERRA DE ATAPUERCA, BURGOS, SPAIN) FROM EXPERIMENTAL ARCHEOLOGY**

*Terradillos-Bernal, Marcos (Área de Prehistoria. Universidad de Burgos/Fundación Atapuerca) mterraddillos@hotmail.com*  
*Rodríguez-Álvarez, Xosé-Pedro (Universitat Rovira i Virgili/ Institut Català de Paleoecologia Humana i Evolució Social) josepedro.rodriguez@urv.cat*

This poster analyses the qualities of the raw materials used in Gran Dolina and Galería and their influence in the development of knapping process. Combining technological analysis and experimental archaeology has proven to be an excellent tool for the understanding the different interpretation of the qualities of raw materials and their relation with the development of the gestures, methods and techniques.

An extensive range of analyses have been conducted on the lithic artefacts recovered from the Sierra de Atapuerca, but in this case we have complemented these analyses with the development of a complex program of experimental knapping that analyses the influence of the qualities of the raw materials in the technological behaviour.

Through this methodological approach we have analyzed the basic characteristics of a large range of raw materials in this environment, their influence in the different processes of knapping and the bases of the selection of each raw material.

Mode 1 of TD6 emphasizes the selection of Palaeozoic materials with thick formats on which an orthogonal knapping is applied, although we can see an important difference with the rest of the Lower Pleistocene European sites

of Mode 1, like the preferential selection of the Cretaceous chert. In Mode 2 of Galería the selection of large and flat blanks of sandstone and Neogene chert for the production of handaxes stands out. Finally, in the transitional assemblages (Mode 2–Mode 3) of TD10-1 and TD10-2 the selection of Neogene chert predominates, which allowed a knapping intensification and the production of a great proportion of flakes with more cutting edge.

The development of an extensive experimental program applied to the study of the lithic technology of Gran Dolina and Galería has allowed us to draw some general conclusions, and has provided answers to some of the specific questions raised by the technological studies.

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POSTER

**13. A TECHNOLOGICAL ANALYSIS OF THE CUTTING EDGE AND WEIGHT OF ARTEFACTS. THE CASE OF THE LOWER AND MIDDLE PALAEOLITHIC OF THE SIERRA DE ATAPUERCA (BURGOS, SPAIN)**

*Terradillos-Bernal, Marcos (Área de Prehistoria. Universidad de Burgos - Fundación Atapuerca) mterraddillos@hotmail.com*  
*Rodríguez-Álvarez, Xosé-Pedro (Area de Prehistoria, Universitat Rovira i Virgili (URV). Tarragona- IPHES, Institut Català de Paleoecologia Humana i Evolució Social. Tarragona. Spain) josepedro.rodriguez@urv.cat*

This poster analyses the relationship between the weight and cutting edge of lithic artefacts from the main Lower Palaeolithic sites of the Sierra de Atapuerca. The weight and cutting edge of a tool determine its cutting ability and the amount of force it is capable of, making them extremely important aspects of study to further our understanding of the potential capacity for human intervention in the environment. We explain that the quantitative and qualitative technological analysis of these two aspects is of fundamental importance in determining the potential of lithic assemblages.

These are the two basic features which influence the potential capacity for the use of a tool. Studying the cutting edge is relevant because it is the part of the object that comes into direct contact with the materials being worked on, while the weight affects the force of the instrument.

The aim of this study is to develop a way to analyse cutting edge productivity and the mass of the knapped stones in order to determine whether there is a relation-

ship between length of cutting edge, the quality of raw materials and the distance from the source of supply. This productivity must be related to the function and length of occupation of the site. We believe that studying the features of cutting edges in relation to the weight of lithic artefacts, together with the management of raw materials and the potential function and duration of occupations, makes it possible to progress in our understanding of the palaeoeconomy and technology of the Palaeolithic.



# A2d Contextualizing Schöningenen and its implications for human evolution during the Middle Pleistocene

Commission on First humans in Europe

(Organisers: Nicholas J. Conard, Sabine Gaudzinski-Windheuser, Jordi Serangeli)

Thursday 4th

9:00-13:30

A02 Meeting Room



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XVII World UISPP Congress  
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XVII Congreso Mundial de UISPP

ORAL CONTRIBUTIONS

ORAL

## 1. OVERVIEW OF THE CURRENT EXCAVATIONS IN SCHÖNINGEN

*Conard, Nicholas (University of Tübingen)*  
*nicholas.conard@uni-tuebingen.de*  
*Serangeli, Jordi (University of Tübingen)*  
*jordi.serangeli@uni-tuebingen.de*

Since 2008 researchers from the University of Tübingen and the Heritage Office of Lower Saxony have conducted a new series of excavations and analyses at the late Lower Paleolithic locality of Schöningen. This complex locality that formed in lakeside deposits during the terrestrial equivalent of MIS 9 includes multiple sites dating to ca. 300 ka BP. Since completing a number of rescue excavations near the active portion of the lignite mine in Schöningen, ongoing fieldwork has focused on the well-known Spear Horizon with its well preserved wooden implements and skeletons of dozens of butchered horses. This paper presents the newest results from these excavations and discusses their implications for our understanding of the technological and social-economic behavior of the hominins who inhabited and used the landscape around the paleo-lake of Schöningen. Using these observations we can begin to reconstruct the settlement dynamics of the hominins who occupied this part of the northern European Plain during the late Middle Pleistocene.

ORAL

## 2. THE CHRONOSTRATIGRAPHY AND ENVIRONMENTAL DEVELOPMENT OF THE MIDDLE PLEISTOCENE SEQUENCE OF SCHÖNINGEN

*Richter, Daniel (MPI Evolutionary Anthropology)*  
*drichter@eva.mpg.de*  
*Urban, Brigitte (LEUPHANA University of Lüneburg)*  
*brigitte.urban@leuphana.de*

The Quaternary sequence of Open Lignite Mine Schöningen represents one of the longest terrestrial records in Europe and has the potential to provide unique insight into Middle Pleistocene environmental and climatic changes and the correlation of terrestrial records to the Marine Isotope Stage system (MIS). Schöningen is famous for the oldest weapons which could have been used for long range hunting – the well-known Schöning-

gen wooden spears. However, formation processes and nature of the sediment trap containing this record, as well as the chronostratigraphic position are debated, including the age of the spears.

Extensive palynological work provides a relative framework for the age of the stratigraphical succession at Schöningen, including the definition of unique interglacial pollen assemblages which are difficult to be placed in the European chronostratigraphical framework. Chronometric dating is therefore needed to provide anchor points. First results are available from U-series dating of peat formation of the Reinsdorf Interglacial of Schöningen site 13 II-2 underlying the archaeological horizon of level 13 II-4 with an age of around 300 ka and from luminescence dating, notably TL ages on heated flint from the oldest human occupation at the site of Schöningen 13 I-1. The dating results provide a nominal age range between MIS 10 and MIS 7 for that layer and by inference of proxy data the human occupation at Schöningen 13 II must have taken place during/around MIS 9.

This work forms the basis of a new project to provide a chronostratigraphical framework for Schöningen, funded by the Ministry of Science and Culture (PRO\*Niedersachsen) of the state of Lower Saxony, which will be based on the dating of the entire sequence with multiple chronometric techniques and refined high resolution palynological and sedimentological studies. We will present first luminescence age results and new palynological data from the project.

ORAL

## 3. A GEOARCHAEOLOGICAL VIEW ON SITE FORMATION AND HUMAN BEHAVIOR AT SCHÖNINGEN

*Stahlschmidt, Mareike C. (Institute for Archaeological Sciences, University of Tuebingen)*  
*mareike.stahlschmidt@uni-tuebingen.de*  
*Miller, Christopher E. (Institute for Archaeological Sciences, University of Tuebingen)*  
*christopher.miller@uni-tuebingen.de*

Geoarchaeological research at Schöningen is focused on describing and evaluating the depositional contexts at Schöningen 13 II-4, Schöningen 13 II-4 Upper Berm and Schöningen 12 II-4. We performed geoarchaeological field analyses and micromorphological analyses to investigate the formation of the find-bearing layers and the obtained data were then used to re-evaluate concepts and ideas about human behavior during the Lower Paleolithic.

Previous researchers (Thieme, 2005; Voormolen, 2008; Lang *et al.*, 2012) suggested, that human activity at Schöningen took place on a surface on the dry lake shore during times of low water levels and that the archaeological assemblage was embedded *in situ* with rising lake level. The micromorphological analyses of the find-bearing layers revealed no evidence for drying events, and instead demonstrated a subaqueous deposition of the associated sediment. Consequently, possible site formation models other than an *in situ* preservation of the archaeological assemblage are discussed, including human disposal of materials into the lake, humans hunting or caching on lake-ice, and geogenic relocations of the artifacts by wave action or slumping.

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ORAL

#### 4. ON THE EVIDENCE FOR USE OF FIRE AT SCHÖNINGEN

Miller, Christopher E. (Institute for Archaeological Sciences, University of Tübingen) [christopher.miller@uni-tuebingen.de](mailto:christopher.miller@uni-tuebingen.de)  
Stahlschmidt, Mareike (Institute for Archaeological Sciences, University of Tübingen)  
[mareike.stahlschmidt@uni-tuebingen.de](mailto:mareike.stahlschmidt@uni-tuebingen.de)

Since its discovery in 1994, the site of Schöningen 13 II-4 has been at the center of discussions on the use and control of fire by Middle Pleistocene hominins in Northern Europe. Among the remains of butchered horses, wooden hunting spears, and other lithic and organic implements, excavators uncovered four circular areas exhibiting potential fire reddening of the sediment. These areas were tentatively identified as the remains of hearths. Following their discovery, the hearths at Schöningen have been widely cited as evidence for human control of fire in the Middle Pleistocene of Northern Europe. Here we present a multidisciplinary study of these reddened features to investigate their origin and formation. Our results show that the reddened areas are the result of natural redoximorphic processes in the sediment, rather than human control of fire. We also discuss other possible lines of evidence for human use of fire at Schöningen, including possibly burnt wooden artifacts.

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ORAL

#### 5. PLANT RESOURCES AND THEIR USE. INDICATIONS FROM BOTANICAL MACRO-REMAINS OF MIDDLE PLEISTOCENE SCHÖNINGEN (GERMANY)

Bigga, Gerlinde (University of Tübingen)

[gerlinde.bigga@uni-tuebingen.de](mailto:gerlinde.bigga@uni-tuebingen.de)

In Palaeolithic contexts organic remains are rarely preserved. Plant remains are thus underrepresented in contrast to animal bones. But the absence of organic remains does not mean that plants have not been used for dietary purposes and raw material. An optimal foraging strategy includes a varying amount of vegetable food, as we can see from ethnobotanical studies. The hunter-gatherer societies illustrate the importance of plants for subsistence purposes, even under subarctic conditions. The sediments in Schöningen contain abundant botanical macro-remains, which offer the opportunity to reconstruct the local vegetation and work out the usefulness for human purposes.

Several hundred wood fragments and 38 sediment samples from different archaeological horizons were available for analysis. The sediments were water screened for botanical macro-remains. A reference collection helped identifying species, wood species identification was possible through thin sectioning.

The reconstructed local vegetation includes more than 21.000 diaspores of aquatic plants, lake shore vegetation, and adjacent shrubs and trees of an elder fen wood. The taxa list from the "Horse Butchery Site" (Schöningen 13II-4) includes a broad spectrum of usable species and provides important sources of food, raw material, medicine and firewood. Young shoots, leaves, berries, fruits and nuts from many different edible plants are available from spring to autumn. During winter the lake shore vegetation reveals a hidden food source in the form of underground storage organs (USOs: roots, rhizomes, tubers). They are rich in starch and can be eaten raw, cooked, dried for later use or grind into flour.

In Schöningen we have evidence for plant use as raw material, such as the spears, the roasting spit, the digging stick and the wooden handles show (Thieme 1997, 1999, 2007). This means *Homo heidelbergensis* was aware of the plant resources and were capable of exploiting them. Indications of plant use for other subsistence purposes is still lacking in the Lower Palaeolithic record and neither the site of Schöningen could shed light into the darkness. Theoretically starch is an excellent source of energy, thus USOs were rarely left unexploited. Special knowledge or sophisticated tools are not necessary to dig them up in the muddy lake shore sediments. Plants are waiting immobile until someone gathers them, so effort and risk are low. As an indication, that this resource was exploited, we have a wooden tool from Schöningen 13II-4, interpreted as a digging stick by its form and wear

patterns. Even when direct evidence is missing, the exploitation of these resources seems inevitable.

ORAL

## 6. HUMAN BEHAVIOURAL STRATEGIES IN INTERGLACIAL ENVIRONMENTS: THE CASE STUDY OF THE 13 II-4 SITE AT SCHÖNINGEN

*Turner, Elaine (MONREPOS Archaeological Research Centre and Museum for Human Behavioural Evolution, RGZM) turner@rgzm.de*

*Gaudzinski-Windheuser, Sabine (MONREPOS Archaeological Research Centre and Museum for Human Behavioural Evolution, RGZM) gaudzinski@rgzm.de*

*García-Moreno, Alejandro (MONREPOS Archaeological Research Centre and Museum for Human Behavioural Evolution, RGZM) garcia@rgzm.de*

*Hutson, Jarod (MONREPOS Archaeological Research Centre and Museum for Human Behavioural Evolution, RGZM) hutson@rgzm.de*

*Villaluenga, Aritza (MONREPOS Archaeological Research Centre and Museum for Human Behavioural Evolution, RGZM) villaluenga@rgzm.de*

A major success story of human evolution is our ability to adapt and survive in various environments. In fact, the relationship between changing environmental circumstance and the development of human behaviour is as old as humanity itself. Despite the causal connection between environmental change and the development of human behaviour being often cited, there is still little real understanding of what processes might be involved. Recently, the MONREPOS Archaeological Research Centre has begun to address these issues through a major core-research project "Human Behavioural Strategies In Interglacial Environments", where we attempt to decipher the complex relationship of human behaviour and climatic change by analysing and comparing specific case studies and high resolution archives. One of these archives is the 13 II-4 "Spear Horizon" site at Schöningen.

Interglacial environments were specifically chosen for our research since they offer very favourable conditions of preservation for well datable archaeological sources and high resolution ecological data. In these contexts, Schöningen holds a unique position. We employ an overall research strategy which guarantees a systematic and methodologically comparable treatment of the subject. At Schöningen we are focussing on a holistic understanding of the site with a detailed and comprehensive analysis of the finds currently being undertaken

in order to extract the maximum information on the archaeozoological, taphonomical and spatial aspects of the assemblage. Our aim is to identify patterns of Middle Pleistocene hominin subsistence behaviours around this lakeshore environment.

The large lake at Schöningen was frequently visited by ungulates, a situation that was known to the Middle Pleistocene hunter groups and was repeatedly exploited by them. In particular, herds of horses died and were dispatched at the edge of the lake. The preliminary archaeozoological evidence points to a systematic butchery of many horse carcasses. GIS applications will later enable us to expand these results in terms of use of space on a local, intrasite scale, as well as in the wider landscape around this lakeshore environment.

The 13 II-4 "Spear Horizon" site at Schöningen presents a unique opportunity to assess hominin behavioural strategies during a Middle Pleistocene warm phase. The results of the Schöningen analysis can be compared with those from other warm stage sites currently being investigated by MONREPOS, which cover a period of several hundred thousand years from the Middle Pleistocene until the beginning of our present interglacial.

ORAL

## 7. AN ARCHAEOZOOLOGICAL AND TAPHONOMIC PERSPECTIVE OF HOMININ BEHAVIOUR AT THE SCHÖNINGEN 13II-4 ?SPEAR HORIZON?

*Hutson, Jarod (MONREPOS Archaeological Research Centre and Museum for Human Behavioural Evolution, RGZM) hutson@rgzm.de*

*Villaluenga, Aritza (MONREPOS Archaeological Research Centre and Museum for Human Behavioural Evolution, RGZM) villaluenga@rgzm.de*

*García-Moreno, Alejandro (MONREPOS Archaeological Research Centre and Museum for Human Behavioural Evolution, RGZM) garcia@rgzm.de*

*Turner, Elaine (MONREPOS Archaeological Research Centre and Museum for Human Behavioural Evolution, RGZM) turner@rgzm.de*

*Gaudzinski-Windheuser, Sabine (MONREPOS Archaeological Research Centre and Museum for Human Behavioural Evolution, RGZM) gaudzinski@rgzm.de*

The "Spear Horizon" is the most well-known of the Schöningen localities, yet the underlying social and economic behaviours of Middle Pleistocene hominins reflected in the archaeological record at this important site are rela-

tively unexplored beyond the elementary associations between the wooden implements, butchered horse bones, and lithic artefacts.

To provide a context for such behaviours, the Monrepos Archaeological Research Centre and Museum for Human Behavioural Evolution has begun a comprehensive archaeozoological and taphonomic analysis of the entire large mammalian faunal assemblage from the Schöningen 13II-4 Spear Horizon, and here we present preliminary results of that research.

Our objective in this presentation, and that of our entire project, is to demonstrate that the site represents much more than a novel accumulation of spears, bones, and stones, but rather provides a unique opportunity to study Middle Pleistocene hominin behaviour in great detail. Building from multi-proxy studies to chronicle animal life histories across the landscape, we use archaeozoological and taphonomic traces of hunting strategies and butchery practices to reconstruct how Middle Pleistocene hominins viewed and used the wider lakeshore environment.

This holistic approach offers critical insight for interpreting the entire Schöningen complex of sites and a further piece of the incomplete record of Middle Pleistocene adaptation and hominin behavioural evolution, in general.

ics, faunal and wooden remains, among them the well-known spears. However, the processes involved in the formation of this site remain unknown, and the former interpretation of the site as the result of a single hunting event has been challenged by ongoing research.

As part of a comprehensive research project piloted by the Monrepos Archaeological Research Centre and Museum for Human Behavioural Evolution, an analysis of the spatial distribution of faunal remains from the "Spear horizon" has been initiated in conjunction with the ongoing zooarchaeological and taphonomical analyses. Through the application of a Geographic Information System, the aim of this spatial analysis is to clarify the taphonomic processes involved in site formation, as well as to identify tangible patterns in the distribution of faunal remains.

This will enable us to understand hominin behavior in terms of use of space, both on a micro-scale (intrasite) as well as in the wider landscape around this lakeshore environment.

The study of hominin spatial behavior from a holistic perspective is a key issue in understanding human evolution and adaptation to interglacial environments.

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ORAL

## 8. THE SPATIAL DISTRIBUTION OF SCHÖNINGEN 13II-4

*García-Moreno, Alejandro (MONREPOS Archaeological Research Centre and Museum for Human Behavioural Evolution, RGZM) [garcia@rgzm.de](mailto:garcia@rgzm.de)*

*Villaluenga, Aritza (MONREPOS Archaeological Research Centre and Museum for Human Behavioural Evolution, RGZM) [villaluenga@rgzm.de](mailto:villaluenga@rgzm.de)*

*Hutson, Jarod (MONREPOS Archaeological Research Centre and Museum for Human Behavioural Evolution, RGZM) [hutson@rgzm.de](mailto:hutson@rgzm.de)*

*Turner, Elaine (MONREPOS Archaeological Research Centre and Museum for Human Behavioural Evolution, RGZM) [turner@rgzm.de](mailto:turner@rgzm.de)*

*Gaudzinski-Windheuser, Sabine (MONREPOS Archaeological Research Centre and Museum for Human Behavioural Evolution, RGZM) [gaudzinski@rgzm.de](mailto:gaudzinski@rgzm.de)*

The interglacial lakeshore site of Schöningen 13II-4 "Spear horizon" hosts a large, exceptionally well preserved assemblage of Middle Pleistocene artefacts, including lith-

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## 9. CONTEXTUALIZING SCHÖNINGEN AND ITS IMPLICATIONS FOR HUMAN EVOLUTION DURING THE MIDDLE PLEISTOCENE

*Terberger, Thomas (Niedersächsisches Landesamt für Denkmalpflege, Hannover) [thomas.terberger@nld.niedersachsen.de](mailto:thomas.terberger@nld.niedersachsen.de)*

*Böhner, Utz (Niedersächsisches Landesamt für Denkmalpflege, Hannover) [utz.boehner@nld.niedersachsen.de](mailto:utz.boehner@nld.niedersachsen.de)*

*Richter, Pascale (Niedersächsisches Landesamt für Denkmalpflege, Hannover)*

*[pascale.richter.boehner@nld.niedersachsen.de](mailto:pascale.richter.boehner@nld.niedersachsen.de)*

*Schoch, Werner H. (Labor für Quartäre Hölzer, Unterrutstrasse 17, CH-8135 Langnau a.A.) [www.woodanatomy.eu](http://www.woodanatomy.eu)*

About 20 years ago first sensational wooden objects were found at the Palaeolithic site of Schöningen 13II-4 in lower Saxony, Germany. In the subsequent years eight wooden spears and a wooden lance were identified in a find layer with many faunal remains at a former lake shore which can be assigned to the end of the interglacial period of OIS 9 dated to c. 300.000 years ago. The last years the GIS-based analysis of the spears and the

find layer made progress and for the first time it is possible now to better understand the find situation in general and the context of the wooden weapons in special. The talk will present results of this analysis and discuss aspects of taphonomy, preservation conditions, time depth, role of human agents and the spears context. The spears and their context argue for repeated hunts at the site and this is in accordance with the evidence of other disciplines.

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ORAL

### 10. NORTHERN EUROPEAN EVIDENCE CITED FOR MIDDLE PLEISTOCENE SPEAR USE

*Milks, Annemieke (UCL) a.milks@ucl.ac.uk*  
*Pope, Matt (UCL) m.pope@ucl.ac.uk*

The evidence for hunting amongst hominin groups in northwestern Europe has emerged as a key archaeological research question over the past century. Predation might be envisaged as a necessary adaptation to more seasonal climates of the region and, significantly, it provides three early and clear archaeological signatures that suggest the possible manufacture and use of hunting weaponry: a wooden implement from Clacton-on-Sea dated to MIS 11, the GTP17 horse scapula with a possible impact fracture from Boxgrove dated to MIS 13, and the collection of wooden spears from Schöningen in Germany.

The two Clacton and Boxgrove artefacts, both from northern Europe, have been used to argue in favour of the possibility that hunting with simple wooden spear technologies emerged as a hominin capability in the early Middle Pleistocene. In 1911 the broken tip of a wooden implement was found in a freshwater deposit outcropping on the West Cliff in Clacton-on-Sea, Essex, dating to MIS 11. This humanly modified yew branch, known as the 'Clacton spear point', was subjected to various lines of analysis in the 1970s and still remains the oldest known wooden tool, but has yet to be conclusively identified as a hunting weapon through these studies. The site of Boxgrove in West Sussex provides complementary evidence from the collection of butchered *Equus ferus* remains at the GTP17 locality. Here a fragment of a scapula bearing a damaged edge with a semi-circular plan, has a cross sectional profile suggested to be consistent with impact from a sharp wooden projectile: a possibility that has yet to be tested through systematic experimental analysis. Given the significant evidence for apparent spear manufacture from Schöning-

en that emerged in the 1990s, it is now imperative to bring these earlier objects under closer scrutiny. It would now be useful to establish, with a greater degree of certainty, the evolutionary history of weapon manufacture and use in the European Middle Pleistocene to help us assess the nature of hominin predation behaviour during the period.

Consequently, it is now timely to develop new and robust research approaches to the Clacton spear point and the Boxgrove horse scapula. Alongside this, it is also important that experimental approaches examining the performance and potential lethality of simple wooden spears are developed further. This paper presents an analytical programme initiated this year at UCL's Institute of Archaeology in response to these research questions. This research will not only address the performance of wooden spears but also use the data collected to re-address the overall morphology and specific features of the Clacton and Boxgrove objects. It outlines why existing interpretations of the Clacton spear point and the Boxgrove scapula fall short of fully demonstrating Middle Pleistocene hunting with wooden spears. This paper is primarily intended to provoke discussion of current analytical and interpretational challenges we face in the study of these rare but important objects, and presents aspects of proposed and on-going research for debate and scrutiny?.

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ORAL

### 11. THE COMPLEXITY BEHIND SIMPLE APPEARANCE: THE WOODEN TOOLS OF SCHÖNINGEN

*Haidle, Miriam Noël (Research Project "The Role of Culture in Early Expansions of Humans" ROCEEH, Senckenberg Research Institute and University of Tübingen, Germany) miriam.haidle@uni-tuebingen.de*

The use of wood as raw material for tool production is neither uniquely human, nor cognitively demanding. Wooden artifacts are rare in the Paleolithic record due to specific preservation conditions. The site of Schöningen situated in a lignite area opens a window to the range of wooden tools in the late Lower Paleolithic.

To assess the specificity of the use of spears, throwing sticks, and clamp shafts the processes of their production have been reconstructed and coded in cognigrams and effective chains. These show the different attention foci (raw materials, tools), actions, and effects of foci on other foci.

The coding in a systematic way allows identifying the concepts behind the tools and comparing it to other tools of other raw materials. It is thus possible to point to the range of conceptual and cognitive foundations behind a rare class of artifacts.

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ORAL

## 12. CARBON AND NITROGEN STABLE ISOTOPES OF BONE COLLAGEN FROM SCHÖNINGEN (MIDDLE PLEISTOCENE, GERMANY) AND THEIR PALAEOECOLOGICAL IMPLICATIONS

*Drucker, Dorothée G. (Department of Geosciences, Biogeology, University of Tübingen)*

*dorothee.drucker@ifg.uni-tuebingen.de*

*Kuitema, Margot (Faculty of Archaeology, Leiden University)- M.Kuitema@Arch.leidenuniv.nl*

*van der Plicht, Johannes (Center for Isotope Research, Groningen University) J.van.der.Plicht@rug.nl*

*van Kolfschoten, Thijs (Leiden University)*

*T.van.Kolfschoten@arch.leidenuniv.nl*

*Bocherens, Hervé (Department of Geosciences, Biogeology, University of Tübingen) herve.bocherens@uni-tuebingen.de*

Stable isotopes in fossil bones and teeth provide information on the habitat and diet of extinct mammals. This approach has been used for the fauna of the Middle Pleistocene site of Schöningen dated to about 300,000 years ago.

Carbon and nitrogen stable isotopes from collagen of exceptionally well-preserved bones of Schöningen were used to decipher the ecological preferences of various herbivorous taxa, including Elephantidae (*Palaeoloxodon antiquus*), Rhinocerotidae (*Stephanorhinus* sp.), Equidae (*Equus mosbachensis*), Cervidae (*Cervus elaphus* and *Megaloceros giganteus*), and Bovidae (*Bison*, *Bos/Bison* and *Bubalus*).

More than half of the tested specimens yielded collagen with chemical composition (%C, %N, C/N) within the range of collagen from fresh bone. The carbon isotopic values indicate a range of dense forest to open habitats. The vegetation consumed by the herbivores from the famous spear horizon originates from open environments. During the climatic Reinsdorf Interglacial optimum, the landscape seems to have been relatively open as well, but certainly included parts that were forested. The results also indicate some niche partitioning; different herbivore species used different plant resources.

For instance, the horses seem to have been predominantly browsers, while the straight-tusked elephants were feeding chiefly on grass. By comparison with other interglacial mammalian faunas from Central Europe for which carbon isotopes were investigated, the landscape in Schöningen appears as a mosaic of patches of dense forest combined with large open areas, in a similar way as during other Pleistocene interglacials. Large herbivores were foraging mainly out of the forested areas, in contrast with the pre-Neolithic Holocene period, during which the surviving large herbivores dwelled essentially in densely forested areas.

These results provide valuable insight on the palaeoenvironmental setting in which the Middle Pleistocene hominins operated in Schöningen. Despite a high proportion of tree species in the vegetation, the landscape was still relatively open, probably due to the impact of megaherbivores (elephants, rhinoceros) that led to the maintenance of open pasture areas beneficial to a high and diverse biomass of herbivores.

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ORAL

## 13. HORSE PALAEODIET AND ACCUMULATION PROCESSES AT SCHÖNINGEN 13 II-4: A MULTI-PROXY ANALYSIS COMBINING MESOWEAR, MICROWEAR, AND STABLE ISOTOPES

*Rivals, Florent (ICREA, Institut Català de Paleoecologia Humana i Evolució Social (IPHES) frivals@iphes.cat*

*Julien, Marie-Anne (University of Southampton)*

*m.a.julien@gmail.com*

The Schöningen site became particularly famous with the discovery of well preserved wooden spears at the 13 II-4 locality. The stratigraphical and the biostratigraphical records of Schöningen 13 II-4 indicate a correlation with the Marine Isotope Stage (MIS) 9 and an age of about 300 ka B.P. Among the archaeological remains (including the wooden spears), the site yielded a rich and well-preserved bone assemblage consisting mainly of large mammal remains. At Schöningen 13 II-4 the main large mammal species is the horse (*Equus mosbachensis*), and part of this horse assemblage is known to be the result of hominid hunting activities, and possibly from a single mass-kill event. We tested the hypothesis that the assemblage from Schöningen 13 II-4 is the result of a single hunting event. The study is based on the inter-individual variability dietary traits of the horses.

We used an approach combining tooth microwear (microscopic scars produced by the interaction of food items on the occlusal surface of the teeth), mesowear (cusp relief and shape), and stable isotopic analyses. The application of tooth wear and stable isotopic analyses on archaeological assemblages offers, besides the classical identification of ungulates dietary behavior, the possibility to disentangle between single or multiple depositional events.

The paleodiet of the horses from Schöningen 13 II-4 was characterized through tooth meso- and microwear analyses as browse-dominated mixed feeders. Stable isotopic analysis of enamel carbonate points as well to an unselective dietary behavior, with intermittent grazing and browsing. Schöningen horses fed in a mosaic-like vegetation habitat, composed of woodland patches interspersed with open areas, or in an open vegetation with dispersed trees and bushes.

Microwear patterns in herbivorous ungulates provide a signal used to identify differences between samples of animals accumulated during a single season and those that were accumulated over an entire year or longer periods. The coefficient of variation calculated on the micro-scratches values at Schöningen 13 II-4 indicates a high variability, significantly different from localities with short occupations. The oxygen and carbon isotopic intra-tooth analysis was performed on different individuals from Schöningen 13 II-4. The inter-individual variability is similar to the variability recorded for horses from multi-layered localities and the intra-tooth isotopic variations are different enough to suggest that the horses did not live together during the formation time of their crown, likely resulting from different seasonality of death.

The results from the two methods are concordant and suggest that the assemblage from Schöningen 13 II-4 cannot be the result of a single event, but is the consequence of an accumulation during multiple events, likely in various seasons of the year.

The two methods used in this study lead to consistent results concerning the feeding behavior and the process of formation of the horse assemblage. Combining independent proxies such as tooth wear and isotopic analysis allows here a fine scale reconstruction of animal behavior and a better understanding of the processes of fossil faunal accumulation.

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#### 14. THE SABER-TOOTHED CAT FROM SCHÖNINGEN. CONTEXT AND PRELIMINARY RESULTS.

*Serangeli, Jordi (Universität Tübingen)*

*jordi.serangeli@uni-tuebingen.de*

*Bocherens, Hervé (Department of Geosciences, Biogeology, University of Tübingen) herve.bocherens@uni-tuebingen.de*

*Drucker, Dorothee G. (Department of Geosciences, Biogeology, University of Tübingen)*

*dorothee.drucker@ifg.uni-tuebingen.de*

*van Kolfschoten, Thijs (Leiden University)*

*T.van.Kolfschoten@arch.leidenuniv.nl*

*Rivals, Florent (ICREA, Institut Català de Paleoeologia Humana i Evolució Social (IPHES) frivals@iphes.cat*

*Starkovich, Britt (Universität Tübingen)*

*britt.starkovich@uni-tuebingen.de*

*Verheijen, Ivo (Leiden University)*

*theskullcollector@hotmail.com*

The Middle Pleistocene archaeological site of Schöningen 13 II-4 became famous by the discovery of the oldest, complete wooden spear in the world. Over the last 20 years, the site yielded the remnants of at least 10 wooden spears, a throwing stick, 20 to 30 stone tools, about 1500 smaller flakes and thousands of bones with a variety of hominin butchery marks. The majority of these bones were concentrated in an area containing more or less complete carcasses of 20-25 horses. The archaeological layer is also known as the "Spear horizon".

In 2011, a new archaeological area was discovered at the site Schöningen, nearly 50m south of the site 13 II-4. Based on a similar stratigraphical sequence and archaeological assemblage, the archaeological layer at this new excavation was interpreted as a continuation of the Spear Horizon. Therefore, this area is referred to as "Spear Horizon South". In October 2012, the first find of *Homotherium latidens* was made from this area, a serrated lower 3rd incisor. In 2013, ongoing excavation produced more *Homotherium* remains, including another incisor, two carnassials, a humerus, a scapula and a rib. By combining archaeological, archaeozoological, isotopic and microwear analysis, more insight will be gained on the life and possibly the death of this individual.

The numerous stone artifacts of Schöningen 13 II-4 show a clear lower Paleolithic concept. The layers of this site are dated to approximately 300 Ka, which correlates with MIS 9. Therefore, this discovery is among the youngest records of *Homotherium latidens* in Europe. An astragalus from the Mealhada cave in Portugal comes from



an old excavation and has been questionably dated to the Riss-Würm interglacial. The well-known *Homotherium* remains from the Late Pleistocene site of Kents cavern in England were recently studied using geochemical analysis. The results show that they were probably transported to Kents Cavern and buried there during the Upper Paleolithic. In 2000, a mandible of a *Homotherium* was dredged up by fishermen from the bottom of the North Sea. It has been dated using <sup>14</sup>C dating to 28,000 years BP, but this date has been questioned due to the lack of stratigraphic context. In 1956 a canine was discovered at Steinheim an der Murr, which has been dated between the end of the Holsteinian and the beginning of the Saalian glaciation. This *Homotherium* might have the same age as the remains from Schöningen, but the documentation of the stratigraphic position of canine from Steinheim is very modest. Therefore the remains of the saber-toothed cat from Schöningen are considered to be the youngest finds from a recently excavated, well-documented site with stratigraphic and chronologically well-analyzed layers.

In Schöningen 13 II-4 we have the opportunity to analyze possible relationships and interaction between the Early Paleolithic hominins and saber-toothed cats. It is probable that new finds from the same individual will be discovered in future, since only a section of the new area has been excavated so far.

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### 15. ORDER, DISORDER, MEAT SHARING, AND LOGISTICS. MIDDLE PLEISTOCENE BUTCHERY PATTERNS AT SCHÖNINGEN (GERMANY)

*Starkovich, Britt (University of Tübingen)*

*britt.starkovich@uni-tuebingen.de*

*Conard, Nicholas (University of Tübingen)*

*nicholas.conard@uni-tuebingen.de*

This paper presents the results of an ongoing analysis of the faunal remains from the "Spear horizon south" (13II-4 layer) at the Lower Paleolithic site of Schöningen. Though the focus of this presentation is on the new excavation area, comparisons are drawn with previously presented data (i.e., van Kolfschoten 2014; Voormolen 2008). Taxonomic data indicate that, as with the main excavation area, hominins primarily hunted large Pleistocene equids (*Equus mosbachensis*), which were likely attracted to the lake shore or a nearby stream to drink. The representation of equid body parts from both areas is quite even, suggesting that elements were not trans-

ported away from the site by either hominins or carnivores. A major focus of this study is hominin butchery of the faunas. Cut and butchery marks are common, and are often arranged somewhat haphazardly on the bones. This observation prompted an investigation of the relative "orderly" or "disorderly" nature of the cuts. Following Stiner and colleagues (2009; 2011), cut mark angles were measured and compared between adjacent cuts on each individual bone. Presumably, a single hominin defleshing one bone would produce multiple parallel, or "orderly" marks, while multiple hominins or several butchery events would result in scattered, non-parallel, or "disorderly" cuts. Like previous research, we found that cut mark angles on Schöningen long bones tend to be less "orderly" than similar data from Middle and Upper Paleolithic sites. Stiner and colleagues interpret this as less standardization in meat provisioning and greater access to carcasses by multiple hominins. Cut mark angles on Schöningen long bones are even less "orderly" than data from the Lower Paleolithic site of Qesem Cave. In addition to social explanations regarding meat provisioning, this might also reflect the logistics of butchering a large amount of meat from one or multiple ungulate carcasses over the course of hours or days. Indeed, axial elements such as ribs and vertebrae have more "orderly" cuts than long bones, reflecting the physical practicalities of orienting one's body in relation to a large carcass during butchery. Overall, hunting and butchery evidence from the "Spear horizon south" indicates that Lower Paleolithic hominins at Schöningen were intelligent, cooperative hunters that understood the behaviors of prey species on the landscape, and hunted socially to procure and butcher large game. Butchery strategies differ from later and contemporary hominins, which may provide insight into evolving social structures in the Paleolithic, as well as reflecting behaviors at a different kind of site.

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### 16. RESIDUE AND MICROWEAR ANALYSES OF THE STONE ARTEFACTS FROM SCHÖNINGEN

*Rots, Veerle (University of Liège) veerle.rots@ulg.ac.be*

*Hardy, Bruce (Kenyon College) hardyb@kenyon.edu*

Stone artefacts from Schöningen 12 and 13 were examined microscopically to identify residues, wear and manufacturing traces in order to clarify their possible anthropogenic origins and their function.

We present evidence showing that the stone tools were used for working wood and hide, and for cutting

meat. The results from the use-wear and residue analysis proved complementary in several instances. Suggestive though uncertain evidence of hafting was observed on a few pieces. This could be particularly interesting given the identification of wooden hafts at the locality. The results of this analysis demonstrate the potential of these techniques for Lower Palaeolithic sites such as Schöningen.

(C. Pasda, 2012, 37ff) and the geological setting of the site (L. Fiedler, 2012).

The assemblage of Schöningen 13 I is a good case example to highlight the possibilities and limits of studying ephemeral lower Palaeolithic sites.

POSTER

POSTER

**17. EARLIEST HUMAN TRACES IN LOWER SAXONY ?  
STONE TOOLS FROM THE SITE SCHOENINGEN 13 I**

*Felix, Hillgruber K. (Lower Saxony State Office for Cultural Heritage) felix.hillgruber@nld.niedersachsen.de*

The lower Palaeolithic site of Schoeningen is one of the most important Stone Age sites in Germany, providing the earliest reliable evidence for human occupation in northern Germany. During the last 20 years various Middle Pleistocene find locations were unearthed in the open cast mine. Of special importance is Schoeningen 13 I which is located a few hundred meters north of Schöningen 13 II, where the famous wooden spears were found. At Schöningen 13 I H. Thieme documented, a middle Pleistocene sequence which can probably be attributed to the earliest part of OIS 9 (Holsteinian) which is older than the "spear horizon". During three months of work 120 m<sup>2</sup> were excavated (H. Thieme 2007, 212). The low density scatter of finds included a small number of probable stone tools, especially notched and carinated pieces. The number of typologically unambiguous tools is very low. In addition a large number of burnt flints might indicate the early use of fire.

A first chronometric TL-date is assigning the layer at least to OIS 9 (D. Richter & H. Thieme 2012, 171-182). In order to verify and quantify the human impact at this site a systematic study of the flint assemblage was started. Inventories from the Lower Palaeolithic in many cases yield objects ranging from obvious non-artefacts to man-made tools. In between a wide range of lithic chunks, thermal flakes and naturally chipped stones appear. In contrast to the spear horizon, where no natural admixture of flint stones is present, the sediments of 13 I included coarse grain particles like gravel and larger stones. The separation of the natural pieces and man-made tools can be difficult and the criteria for the acceptance of true artefacts may vary considerably depending on the scientist

# A2e The Early and Middle Pleistocene succession in the Guadix-Baza Basin (Andalusia, southern Spain): geology, paleontology, archaeology

Commission on First humans in Europe

(Organisers: Robert Sala, B. Martínez-Navarro, J. Agustí, D. Barsky, I. Toro-Moyano)

Thursday 4th  
14:30-19:30  
A04 Meeting room



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OPENING CONFERENCE:

**DMANISI: NEW EVIDENCES ABOUT HISTORY OF EARLY HOMO.**

*Prof. David Lordkipanidze (General Director of the Georgian National Museum, GNM)*

ORAL

**1. FRESHWATER AVAILABILITY IN THE GUADIX BASIN DURING THE PLEISTOCENE: POTENTIAL EFFECTS ON HOMININ OCCUPATION OF THE GUADIX-BAZA DEPRESSION (BETIC CORDILLERA, S. SPAIN)**

*Pla-Pueyo, Sila (Institute of Petroleum Engineering, Heriot-Watt University, Conoco, Riccarton Campus, EH14 4AS, Edinburgh (UK) sila.pla@gmail.com*

*Schreve, Danielle (Dpt. Geography, Royal Holloway University of London, TW20 0EX, Egham, Surrey (UK) Danielle.Schreve@rhul.ac.uk*

*Candy, Ian (Dpt. Geography, Royal Holloway University of London, TW20 0EX, Egham, Surrey (UK) Ian.Candy@rhul.ac.uk*

*Viseras, César (Dpto. Estratigrafía y Paleontología, Universidad de Granada, Av/ Fuentenueva s/n, 18002 Granada (Spain) viseras@ugr.es*

The central sector of the Guadix Basin (Betic Cordillera, Spain) is a key area for unravelling the evolution and migration routes of early hominins and associated fauna into Europe from Africa and Asia. Its importance stems from the presence of continuous sedimentation over the last 4 million years and the excellent preservation of a large number of archaeological and palaeontological sites from this time range in its fluvio-lacustrine facies. A number of detailed stratigraphical, sedimentological, petrological and geochemical studies have been carried out in the area, with the aim of characterising the palaeoenvironmental evolution of the Guadix Basin over the last 4 Ma.

The nature of the sediments in the Guadix Basin, mainly fine grained fluvial sediments and all types of continental carbonates, has prevented the preservation of palaeoenvironmental proxies such as pollen, beetles and chironomids. However, the geochemistry of the abundant continental carbonates outcropping in the area has proved crucial in reconstructing the environments in which early hominins and vertebrate faunas of Asian, European and African origin lived during the Plio-Pleistocene in southern Spain.

The Pleistocene sites appear in the Axial System facies, a high sinuosity fluvial system that developed wetlands in its floodplain. Our interest is focused on the palustrine

carbonates forming the ponds and wetlands. From the Early Pleistocene to the Middle Pleistocene, a pronounced change is observed in the carbonate beds, from isolated, periodically-desiccated shallow ponds in the floodplain to extensive wetlands in the central valley, resulting in vertically stacked palustrine limestones showing a lower edaphisation degree. This drastic change in the sedimentary style and lithology is related to lower sedimentation rates, to the redistribution of the three drainage systems and to the flatter topography coinciding with the change between genetic units V and VI.

After field and petrographical studies, samples of the palustrine carbonates were analyzed, using a VG PRISM series 2 mass spectrometer by analyzing CO<sub>2</sub> liberated from sample reaction with phosphoric acid at 90° C. Internal (RHBNC-PRISM) and external (NBS-19, LSVEC) standards were analyzed every 8 samples.

The results include a range of values for δ<sup>13</sup>C and δ<sup>18</sup>O which coincide with the expected isotopic values for palustrine carbonates. The low correlation between the isotopic values for the Pleistocene carbonates indicates that the water bodies in which the carbonates were deposited experienced free water circulation, and therefore, evaporation was not the main factor driving isotopic fractionation. This lack of correlation, even in the small Early Pleistocene ponds, means that there would be a fairly continuous water supply for the animals and the early hominins living in the Guadix-Baza Depression throughout the Early and Middle Pleistocene.

A number of studies examine salinity changes in the water in the Baza Basin and comment on the presence of hot springs. The present study reveals for the first time that even when the lakes in the Baza area became more saline and potentially non-potable for fauna and hominins, the Guadix Basin remained a key focal point for access to freshwater, enabling survival in an otherwise hostile environment.

ORAL

**2. CHRONOLOGICAL AND ENVIRONMENTAL CONTEXT OF THE FIRST HOMININ DISPERSAL INTO WESTERN EUROPE: THE CASE OF BARRANCO LEÓN**

*Agustí, Jordi (ICREA-IPHES) jordi.agusti@icrea.cat*

*Blain, Hugues-Alexandre (IPHES-URV) hablain@iphes.cat*

*Lozano-Fernández Iván (IPHES) ilozano@iphes.cat*

*Piñero, Pedro (IPHES) ppinero@iphes.cat*

*Oms, Oriol (Universitat Autònoma de Barcelona) joseporiol.*

oms@uab.cat

Furió, Marc (ICP) marc.furio@icp.cat

Blanco, Angel (Universitat Autònoma de Barcelona) angel.blanco.geoterna@gmail.com

López-García Juan Manuel (Università de gli studi de Ferrara) lpzjnm@unife.it

Sala Robert (URV-IPHES) robert.sala@urv.cat

In this paper a detailed description of the archeological and paleontological levels D 1, D 2 and E of the Barranco León section (Guadix-Baza Basin, SE Spain) is presented. Sedimentological and paleontological analysis based on small vertebrates provide new significant data regarding the chronology of the site and its paleoenvironmental and paleoclimatic evolution. The microvertebrate analysis includes rodents, insectivores, squamate reptiles, amphibians and fishes.

According to this analysis, an age close to 1.4 Ma is assumed after numerical and biochronological proxies, close in age to the site of Sima del Elefante in Atapuerca (Spain). From an environmental and climatic point of view, the mean annual temperature at the time of deposition was significantly higher than 13 °C, with prevalent humid conditions. However, although most of the species were inhabitants of water edges, an open landscape was present in the vicinity of the lake. Across the D1-E profile, a trend towards open dry conditions is recorded.

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#### ORAL

### 3. THE LARGE MAMMALS ASSEMBLAGES FROM THE LATE VILLAFRANCHIAN SITES OF ORCE (VENTA MICENA, FUENTE NUEVA-3, AND BARRANCO LEÓN): HUMAN AND FAUNAL DISPERSALS INTO EUROPE

Martínez-Navarro, Bienvenido (IPHES, Institut Català de Paleoeologia Humana i Evolució Social (IPHES), 43007, Tarragona, Spain. /Àrea de Prehistoria, Universitat Rovira i Virgili (URV), 43002, Tarragona, Spain./ ICREA, Barcelona, Spain) bienvenido@iphes.cat

Ros-Montoya, Sergio (Departamento de Geología y Ecología, Universidad de Málaga, Campus de Teatinos, 29071 Málaga, Spain./ Museo de Prehistoria y Paleontología, 18858 ? Orce (Granada) Spain) sergiorosm@gmail.com

Espigares, María-Patrocínio (Departamento de Geología y Ecología, Universidad de Málaga, Campus de Teatinos, 29071 Málaga, Spain./ Museo de Prehistoria y Paleontología, 18858 ? Orce (Granada) Spain) mpespigares@gmail.com

Madurell, Joan (Dipartimento di Scienze della Terra, Sapienza Università di Roma, Piazzale Aldo Moro 5, 00185 Roma,

Italy) joan.madurell@icp.cat

Medin, Tsegai (Institut Català de Paleoeologia Humana i Evolució Social-IPHES, C/ Marcel·lí Domingo s/n, Edifici W3, Campus Sescelades, 43007 Tarragona, Spain; National Museum of Eritrea, P.O. Box 5284, Asmara, Eritrea) eldatse@gmail.com

Palmqvist, Paul (Departamento de Geología y Ecología, Universidad de Málaga, Campus de Teatinos, 29071 ? Málaga, Spain) ppb@uma.es

Since the discovery of site of Venta Micena in 1976, and after nearly four decades of continuous survey and research at the region of Orce (Guadix-Baza Basin, Andalusia, southeastern Spain), with 350 m<sup>2</sup> systematically excavated at this site, 140 m<sup>2</sup> at Barranco León, and 106 m<sup>2</sup> at Fuente Nueva-3, this region has provided one of the most important Early Pleistocene collections of large mammals from the European continent, with more than 25,000 fossil specimens housed at the Palacio de los Segura-Museo de Prehistoria y Paleontología de Orce.

The mammal lists from Venta Micena, Barranco León and Fuente Nueva-3 show typical pre-Jaramillo, Late Villafranchian assemblages, with a chronology for Venta Micena of ca. 1.5 Ma, ca. 1.4 Ma for Barranco León, and ca. 1.2-1.3 Ma for Fuente Nueva-3.

The best-known site is Venta Micena (VM), placed in the biozone of *Allophaiomys ruffoi*, with a typical faunal list of the middle Late Villafranchian, marked by the presence of *Soergelia minor*, a small sized, mesodont bovid that is also recorded at the site of Dmanisi. By the moment, no evidence of human presence has been found at Venta Micena, but most of the recorded species from this site are also present in assemblages with human remains and/or lithic tools from other sites of Europe and Western Asia.

The sites of Barranco León (level D) (BL) and Fuente Nueva 3 (FN3) are situated in the biozone of *Allophaiomys* aff. *lavocati*. Although they are stratigraphically positioned above Venta Micena, they are also placed below the Jaramillo normal subchron (1.07 Ma). Both sites are marked by a record of human presence, and by the absence of *Soergelia*. Their assemblages provide evidence of an important event, the arrival of a large hypsodont Caprini, *Ammotragus europaeus*, which survives until the Jaramillo event at the site of Vallonnet in southern France. There is also evidence of the arrival of a new large stenohippid horse, *Equus sussenbornensis*, detected at Barranco León, which survives until the end of the Early Pleistocene. Both species are typical grazers that inhabited open plain environments, which suggests a

process of aridification during the latest Villafranchian, previous to the arrival in Europe of the classical Galerian species. These are especially characterized by the presence of *Sus* (gr. *scrofa*), which earliest records in Europe are at the site of Sima del Elefante of Atapuerca, level TE9, dated ca. 1.2 by cosmogenic nuclides, and in Untermaassfeld (Germany) and Vallparadís Estació layer EVT10 (Catalonia, Spain), which are both placed in the Jaramillo normal subchron.

In summary, on the basis of the data analyzed we can affirm that the arrival of humans into Western Europe pre-dates clearly the Jaramillo subchron (ca. 1.07 Ma).

Faunistical list:

*Homo* sp. BL, FN3-only lithic-tools  
*Ursus etruscus* VM, *Ursus* sp. BL-FN3  
*Canis mosbachensis*, *Lycaon lycaonoides*, *Vulpes* cf. *praeglacialis* VM-BL-FN3  
*Pachycrocuta brevirostris* VM-BL-FN3  
*Homotherium latidens* VM-BL, *Megantereon whitei* VM  
*Panthera gombaszoegensis* VM  
*Lynx* sp. VM-FN3

*Meles meles*, *Pannonictis* cf. *nestii* VM-BL-FN3  
*Mammuthus meridionalis* VM-BL-FN3  
*Stephanorhinus hundsheimensis* VM-BL-FN3  
*Equus altidens* VM-BL-FN3, *Equus sussenbornensis* BL-FN3  
*Hippopotamus antiquus* VM-BL-FN3  
*Bison* sp. VM-BL-FN3, *Hemibos* aff. *gracilis* VM  
*Praeovibos* sp., *Soergelia minor* VM  
*Ammotragus europaeus* FN-3, *Hemitragus albus* VM-BL-FN3  
*Praemegaceros* cf. *verticornis*, *Metacervoceros rhenanus* VM-BL-FN3

#### ORAL

#### 4. PALEOECOLOGICAL INFERENCES ON THE LARGE MAMMALS FROM THE LATE VILLAFRANCHIAN SITE OF VENTA MICENA (ORCE, GUADIX-BAZA BASIN): INSIGHTS ON THE ENVIRONMENTAL CONTEXT OF THE FIRST HUMAN DISPERSAL IN EUROPE

Palmqvist, Paul (Departamento de Geología y Ecología, Universidad de Málaga, Campus de Teatinos, 29071 - Málaga, Spain) ppb@uma.es

Ros-Montoya, Sergio (Departamento de Geología y Ecología, Universidad de Málaga, Campus de Teatinos, 29071 Málaga, Spain./ Museo de Prehistoria y Paleontología, 18858 - Orce (Granada) Spain) sergiorosm@gmail.com

Espigares, María-Patrocínio (Departamento de Geología y Ecología, Universidad de Málaga, Campus de Teatinos, 29071 Málaga, Spain./ Museo de Prehistoria y Paleontología, 18858 - Orce (Granada) Spain) mpespigares@gmail.com

Madurell, Joan (Dipartimento di Scienze della Terra, Sapienza Università di Roma, Piazzale Aldo Moro 5, 00185 Roma, Italy) joan.madurell@icp.cat

Figueiridol, Borja (Departamento de Geología y Ecología, Universidad de Málaga, Campus de Teatinos, 29071 - Málaga, Spain) frafigcas@uma.es

García, José Manuel (Departamento de Geología y Ecología, Universidad de Málaga, Campus de Teatinos, 29071 - Málaga, Spain) chemacyanos@msn.com

Medin, Tsegai (Institut Català de Paleoecologia Humana i Evolució Social-IPHES, C/ Marcel·lí Domingo s/n, Edifici W3, Campus Sescelades, 43007 Tarragona, Spain; National Museum of Eritrea, P.O. Box 5284, Asmara, Eritrea) eldatse@gmail.com

Martínez-Navarro, Bienvenido (IPHES, Institut Català de Paleoecologia Humana i Evolució Social (IPHES), 43007, Tarragona, Spain. /Àrea de Prehistoria, Universitat Rovira i Virgili (URV), 43002, Tarragona, Spain./ ICREA, Barcelona, Spain) bienvenido@iphes.cat

The Late Villafranchian site of Venta Micena, in the north-east of the Guadix-Baza Basin, preserves a huge number of large mammal remains. Paleoecological study of this assemblage, based on combined taphonomic, biomechanical, ecomorphological and biogeochemical approaches, has provided compelling evidence on the environmental context inhabited by the first human populations that dispersed in Western Europe. The nearby sites of Barranco León and Fuente Nueva-3 document patterns of anthropic activity for these early human populations (Oldowan tool assemblages and cut marks on bones).

Taphonomic study of the main excavation quarry of Venta Micena has shown that most herbivore remains come from carcasses of ungulate prey selectively hunted by hypercarnivores (coursers *Homotherium latidens* and *Lycaon lycaonoides*; ambushers *Megantereon whitei* and *Panthera gombaszoegensis*). Evidence of prey selection includes the finding for ungulate species of a direct relationship between the percentage of juveniles with deciduous teeth and the body mass estimated for adults; U-shaped, attritional mortality profiles deduced from tooth wearing classes; and arthropathies and bone exostoses in the postcranial skeleton, which would handicap these individuals to escape from predators.

Major taphonomic biases of the assemblage include the kleptoparasitism of ungulate carcasses by the giant hyenas (*Pachycrocuta brevirostris*), which had a body mass

in excess of 120 kg; the transport of ungulate prey as whole carcasses or anatomical parts, depending on the size of the species scavenged; and the selective fracturing of bones by the hyenas as a function of their marrow contents and mineral density.

Biomechanical analyses of *P. brevirostris* remains have shown the bone-crushing adaptations of this hyena, which had a mandible more resistant to vertical bending in the region behind the premolars than any living hyaenid.

Ecomorphological inferences on the Venta Micena ungulates were derived from values of hypsodonty and relative length of the premolar tooth row. Biogeochemical analyses included stable isotope ratios (carbon, nitrogen and oxygen) and relative abundances of trace elements (strontium and zinc) measured in bone collagen and hydroxylapatite. These proxies were used for estimating the feeding and habitat preferences of ungulate species, which allowed to classify them as grazers in open plain (*Equus altidens*, *Hemitragus* cf. *albus*, *Bison* sp., *Praeovibos* sp., *Hippopotamus antiquus*), mixed feeders (*Hemibos* aff. *gracilis*, *Soergelia minor*, *Metacervocerus rhenanus* and *Mammuthus meridionalis*) and browsers in forest (*Stephanorhinus* aff. *hundsheimensis* and *Praemegaceros* cf. *verticornis*). The comparison of the abundance of these ecological categories with those present in modern African and Indomalayan communities showed that the fauna of Venta Micena inhabited a mixed environment with a predominance of open plains and tree patches in the surroundings of a lake fed by hydrothermal waters, similar to the Rift Valley in East Africa. Contribution of thermal springs resulted in a mild environment, with a permanent water sheet in the lake that favored the presence of drought intolerant megaherbivores and a high level of organic productivity due to the saline contents of these waters. Unexpectedly high values of nitrogen isotopes in the hippos indicate that this species did not graze on terrestrial grasses, as do modern hippos, but fed exclusively on aquatic vegetation.

ORAL

## 5. THE LITHIC ASSEMBLAGES FROM BARRANCO LEÓN AND FUENTE NUEVA 3: A NEW VIEW OF OLD STONES

Barsky, Deborah (IPHES-URV) [dbarsky@iphes.cat](mailto:dbarsky@iphes.cat)  
Sala, Robert (URV-IPHES) [robert.sala@urv.cat](mailto:robert.sala@urv.cat)  
Menéndez, Leticia (IPHES) [letimenendez@gmail.com](mailto:letimenendez@gmail.com)  
Toro, Isidro (Museo Arqueológico de Granada) [toromoya-no@hotmail.com](mailto:toromoya-no@hotmail.com)

The archeological sites of Barranco León and Fuente Nueva 3 (Orce, Andalusia, Spain) are representative of the considerable advancements made in recent years in the study of Oldowan stone industries and the context of their occurrence in Western Europe. The sites, dated to 1.4-1.3 Ma, are amongst the first to have been globally accepted to provide indisputable evidence for a hominin presence in Western Europe well over one million years ago. Since their discovery, these two sites continue to provide the most complete and numerically significant lithic sample known to date in this area of the world. Furthermore, the exceptional preservation of lithics and faunal remains in a lake basin context provides an opportunity- rarely documented for this chronology, to study the lithics in association with the remains of large to medium-sized herbivores and carnivores. New discoveries and applied methodologies have increased the dataset of first industries, widening the range of morpho-technological descriptions and opening up new pathways to discerning the behavioral and cognitive features of their artisans. Ongoing excavations have recently enlarged the lithic sample from each of these two key Oldowan occurrences, continuously widening perspectives for inter and intra site investigations. This paper provides a technological analysis of the main features of these industries, highlighting new data obtained during the last years of fieldwork and lithic studies. Recent advancements include: a re-appraisal of the behavioral aspects of hominin raw material collection and use, progress in the study of the role of the limestone macro-tools, as well as a new vision of some of the specificities of the industries, such as *pièces esquillées*, heavy-duty scrapers and polyhedral morpho-types. Finally, some subtle differences distinguishing these two, largely analogous assemblages, will be examined.

ORAL

## 6. RAW MATERIALS AND TECHNOLOGICAL ANALYSIS OF THE BARRANCO LEÓN LITHIC ASSEMBLAGE, ORCE (ANDALUSIA, SPAIN)

Cánovas, Isabel (IPHES, Institut Català de Paleocologia Humana i Evolució Social Campus Sescelades. C/Marcel·lí Domingo s/n (Edificio W3) 43007 Tarragona y Area de Prehistoria, Universitat Rovira i Virgili (URV) Avinguda de Catalunya 35, 43002 Tarragona) [sabelitta@hotmail.com](mailto:sabelitta@hotmail.com)  
Sánchez, Lidia (IPHES, Institut Català de Paleocologia Humana i Evolució Social Campus Sescelades. C/Marcel·lí Domingo s/n (Edificio W3) 43007 Tarragona y Area de Prehistoria, Universitat Rovira i Virgili (URV) Avinguda de Catalunya

35, 43002 Tarragona) [lidia.s.g@hotmail.com](mailto:lidia.s.g@hotmail.com)  
Tarrío, Andoni (Dpto de Geografía, Prehistoria y Arqueología de la U.PV.-E.H.U. Y Dpto. de Mineralogía y Petrología de la U.PV.-E.H.U.) [antonio.tarrino@gmail.com](mailto:antonio.tarrino@gmail.com)  
Menéndez, Leticia (IPHES, Institut Català de Paleocologia Humana i Evolució Social Campus Sescelades. C/Marcel·lí Domingo s/n (Edificio W3) 43007 Tarragona) [letimenez@gmail.com](mailto:letimenez@gmail.com)  
Sala, Robert (IPHES, Institut Català de Paleocologia Humana i Evolució Social Campus Sescelades. C/Marcel·lí Domingo s/n (Edificio W3) 43007 Tarragona y Area de Prehistoria, Universitat Rovira i Virgili (URV) Avinguda de Catalunya 35, 43002 Tarragona) [robert.sala@urv.cat](mailto:robert.sala@urv.cat)  
Barsky, Deborah (IPHES, Institut Català de Paleocologia Humana i Evolució Social Campus Sescelades. C/Marcel·lí Domingo s/n (Edificio W3) 43007 Tarragona y Area de Prehistoria, Universitat Rovira i Virgili (URV) Avinguda de Catalunya 35, 43002 Tarragona) [dbarsky@hotmail.fr](mailto:dbarsky@hotmail.fr)  
Toro, Isidro (Museo Arqueológico de Granada, Carrera. Del Darro 41-43, 18010 Granada, Spain) [toromoyano@gmail.com](mailto:toromoyano@gmail.com)

Lithic tools from Barranco León site (1.4 my) provide information about the oldest known European Mode 1 assemblages. The site is located in Guadix-Baza Basin (Andalusia, Spain). We have related our raw materials results and morphological analysis in order to know the occupation models and mobility patterns of the hominids intra and extra site.

The analyzed lithic assemblage was recovered at 2005, 2010 and 2011 fieldwork seasons.

On the one hand only the lithic assemblage made in flint have been analysed for the raw material study. The study of the lithic raw materials has been carried out using microscopic and petrographic analysis to describe the flint characteristics as well as to locate the raw material catchment areas.

On the other hand it has been made a morphotechnic analysis using the Logical Analytical System to define the technology.

The main raw materials used are flint and limestone. Using the petrographic analysis it has been possible to define a calcedonic bioclastic flint with oolites which we are called "Orce Jurassic Flint". Primary flint sources belong to the same unit of oolitic limestone and are assigned to Dogger period (Jurassic).

This flint is irregular in shape and very breakable, due to the presence of fractured joints in its primary formation. This flint appears in a secondary conglomeratic deposit

too, situated 720 metres from the site. The average dimension of the flint does not exceed 50 mm in these deposits. Raw materials size is important to define the knapping strategies. A percentage of 58% of the lithic assemblage is made in this flint. We therefore propose the conglomeratic secondary deposit as the main raw material supply area.

The analyzed lithic assemblage presents small and non cortical flint cutting tools in contrast with large-sized limestone percussion tools. The presence of retouched flakes is not numerically significant. However a few flakes present a non standardized retouch and a double patina that seems to mean the use of discarded flakes to be re-knapped and re-used.

The technique used to reduce the nodule was direct hammer percussion and bipolar on an anvil technique. Knapping strategies were adapted to raw material constraints and the initial nodule morphologies. Unidirectional-unifacial and orthogonal methods predominate as opportunistic techniques. Usually, the *Chaîne Opératoire* is brief and incomplete. Nevertheless the artifacts were knapped, used and discarded at the same place. The aim of the acquisition of the local flint was to produce flakes with cutting edges and without a standardized morphology.

The hominids used the raw materials immediately available on the secondary deposits. The technological features of the lithic assemblage associated with faunal remains that presents cut marks, allow us to interpret the occupation model of Barranco León as a butchery site, where it has been carried out an opportunistic exploitation of animal carcasses, with a sporadic but repeated occupation.

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## ORAL

### 7. TAPHONOMIC ANALYSIS OF PATTERNS OF ANTHROPIC AND CARNIVORAN ACTIVITY IN THE EARLY PLEISTOCENE SITES OF ORCE

Espigares, María-Patrocínio (Departamento de Geología y Ecología, Universidad de Málaga, Campus de Teatinos, 29071 Málaga, Spain./ Museo de Prehistoria y Paleontología, 18858 ? Orce (Granada) Spain) [mpespigares@gmail.com](mailto:mpespigares@gmail.com)

Palmqvist, Paul (Departamento de Geología y Ecología, Universidad de Málaga, Campus de Teatinos, 29071 ? Málaga, Spain) [ppb@uma.es](mailto:ppb@uma.es)

Ros-Montoya, Sergio (Departamento de Geología y



*Ecología, Universidad de Málaga, Campus de Teatinos, 29071 Málaga, Spain./ Museo de Prehistoria y Paleontología, 18858 ? Orce (Granada) Spain) sergiorosm@gmail.com*

*Madurell, Joan (Dipartimento di Scienze della Terra, Sapienza Università di Roma, Piazzale Aldo Moro 5, 00185 Roma, Italy) joan.madurell@icp.cat*

*Medin, Tsegai (Institut Català de Paleoeologia Humana i Evolució Social-IPHES, C/ Marcel·lí Domingo s/n, Edifici W3, Campus Sescelades, 43007 Tarragona, Spain; National Museum of Eritrea, P.O. Box 5284, Asmara, Eritrea) eldatse@gmail.com*

*Martínez-Navarro, Bienvenido (IPHES, Institut Català de Paleoeologia Humana i Evolució Social (IPHES), 43007, Tarragona, Spain. /Àrea de Prehistoria, Universitat Rovira i Virgili (URV), 43002, Tarragona, Spain./ ICREA, Barcelona, Spain) bienvenido@iphes.cat*

The Early Pleistocene (Late Villafranchian) sites of Orce, placed in the northeastern sector of the Guadix-Baza Basin (Granada, southeastern Spain), are key to the study of the first human settlements in the European subcontinent. Evidence of human presence and anthropic activity has been found in two sites, Barranco León and Fuente Nueva-3. Carnivoran modifications identified in these sites, together with Venta Micena, were mostly originated by the giant, short-faced hyena *Pachycrocuta brevirostris*.

A deciduous tooth of *Homo* sp. has been identified recently in the site of Barranco León, with a chronology of ~1.4 ma. In addition, a huge assemblage of Oldowan (i.e., Mode 1) tools, abundant cut-marks on large mammal bones resulting from disarticulation and defleshing activities, and percussion marks that evidence bone fracturing for accessing marrow contents have been identified in this site, as well as in Fuente Nueva-3, a nearby locality with a slightly younger chronology.

In this sedimentary basin, the hominins inhabited a mild environment rich in vegetation, that provided all resources necessary for their living, including the presence of a lake with a permanent water sheet fed by thermal springs and abundant ungulate carcasses. However, these animal resources were also focus of attention for the scavenging carnivores, particularly *P. brevirostris*.

Taphonomic study of the huge assemblage of large mammals preserved in the site of Venta Micena has shown the behavior of this hyena, which followed specific patterns of bone consumption for each anatomical element of the ungulate skeleton. This model has been extrapolated to the other two sites, where carnivores are

less represented, Fuente Nueva-3 and Barranco León. Comparative taphonomic analyses of the three assemblages shows that, apart from other carnivores of smaller body size, *P. brevirostris* was the main collecting and modifying agency of bones in Venta Micena. In contrast, anthropic activity predominates in both Barranco León and Fuente Nueva-3 (mainly in the lower archaeological level), which suggest a secondary access of carnivores to these areas.

However, the upper archaeological level of Fuente Nueva-3, which has provided ~150 coprolites and several tooth remains of *P. brevirostris*, is an exception to the pattern of competitive exclusion depicted above for hominins and scavenging carnivores. Taphonomic analysis of ungulate postcranial remains preserved in this level has shown increased carnivoran activity, thus evidencing an intense competition for ungulate carcasses between *Homo* and *Pachycrocuta*. Systematic excavations during the year 2001 unearthed a partial skeleton of *Mammuthus meridionalis*, in which the limbs and cranium were absent. Surrounding the bone remains, which are mostly in anatomical connection, there are 34 dark-colored coprolites, rich in organic matter, and 17 flint flakes. This finding allows discussing on a competition event for hominins and hyenas, although there is no evidence of direct confrontation between them. Instead, the most parsimonious interpretation points to a sequence of carcass consumption in which hominins had primary access to this elephant, dismembered its limbs and transported them to a safer place, while the hyenas arrived later and exploited in further depth the resources linked to the axial skeleton.

ORAL

## 8. SPATIAL ANALYSIS AND ITS OCCUPATIONAL IMPLICATIONS AT BARRANCO LEÓN AND FUENTE NUEVA 3 (ORCE, ANDALUSIA, SPAIN)

*Menéndez, Leticia (IPHES, Institut Català de Paleocología Humana i Evolució Social Campus Sescelades. C/Marcel·lí Domingo s/n (Edificio W3) 43007 Tarragona) letimenez@gmail.com*

*Canals, Antoni (Area de Prehistoria, Universitat Rovira i Virgili (URV) Avinguda de Catalunya 35, 43002 Tarragona-IPHES, IPHES, Institut Català de Paleocología Humana i Evolució Social Campus Sescelades. C/Marcel·lí Domingo s/n (Edificio W3) 43007 Tarragona) acanals@iphes.cat*

*Sala, Robert (Area de Prehistoria, Universitat Rovira i Virgili (URV) Avinguda de Catalunya 35, 43002 Tarragona-IPHES) robert.sala@urv.cat*

*Guerra, David (Area de Prehistoria, Universitat Rovira i Virgili (URV) Avinguda de Catalunya 35, 43002 Tarragona) dguer-rar@gmail.com*

*Martínez-Navarro, Bienvenido ( IPHES, Institut Català de Paleoeologia Humana i Evolució Social (IPHES), 43007, Tarragona, Spain. /Àrea de Prehistoria, Universitat Rovira i Virgili (URV), 43002, Tarragona, Spain./ ICREA, Barcelona, Spain) bienvenido@iphes.cat*

*Espigares, María-Patrocínio (Departamento de Geología y Ecología, Universidad de Málaga, Campus de Teatinos, 29071 Málaga, Spain./ Museo de Prehistoria y Paleontología, 18858 ? Orce (Granada) Spain) mpespigares@gmail.com*

*Ros-Montoya, Sergio (Departamento de Geología y Ecología, Universidad de Málaga, Campus de Teatinos, 29071 Málaga, Spain./ Museo de Prehistoria y Paleontología, 18858 ? Orce (Granada) Spain) sergiorosm@gmail.com*

*Barsky, Deborah (IPHES, Institut Català de Paleocologia Humana i Evolució Social Campus Sescelades. C/Marcel·lí Domingo s/n (Edificio W3) 43007 Tarragona) dbarsky@iphes.cat*  
*Toro, Isidro (Museo Arqueológico de Granada, Carrera. Del Darro 41-43, 18010 Granada, Spain) toromoyano@gmail.com*

Barranco León and Fuente Nueva 3 are amongst the oldest archeological sites of Europe. They are especially significant because of their anthropological, lithic and faunal remains, as well as the characteristics of their occupation models. The aim of this paper is to present the preliminary results from the spatial analysis realized in of both sites from 2010 and obtained using innovative scientific techniques.

The spatial analysis of the artifacts from both sites has been carried out by applying different technical components and software systems, developed with the aim of improving the excavations and laboratory work. This methodology provides reliable information and creates a unified platform to access specific data. The use of a Robotic Total Station has allowed us to identify the precise location of each artifact and to individualize each archeological level.

More than 1 million years ago, the Orce environment was characterized by the existence of a large lake, located in the eastern sector of the Guadix basin, as well as by the presence of a fluvial system composed by a large river and its affluents, which extended through the western sector of the basin. The region was characterized by a savannah landscape, with abundant large herbivores, and also numerous carnivores that left their prey, previously exploited, to other scavengers. Hominins, also present in the landscape, took advantage of the abundant water

sources and the wide variety of wildlife resources. They exploited the animal carcasses, establishing small, opportunistic occupations on the shores of the lake.

Thanks to the spatial analysis, the zooarchaeological, taphonomical and technological studies in both sites, we may characterize these sites as sporadic occupations occurring either within the sites themselves, or in some nearby location. In both cases, we may observe an opportunistic or marginal intervention center. The sites are short-term occupations, characterized by relatively simple spatial organization and sparse artifact accumulations, as well as by short lithic operative chains and fragmentary bone remains showing a differential use of certain anatomical parts and / or bones in the final stages of consumption.

## ORAL

### 9. MAMMAL FOSSIL REMAINS FROM EARLY PLEISTOCENE SITES OF ORCE (GRANADA, SPAIN): PRESERVATION AND CONSERVATION

*Gómez-Merino, Gala (IPHES, Institut Català de Paleoeologia Humana i Evolució Social (IPHES), 43007, Tarragona, Spain./ Àrea de Prehistoria, Universitat Rovira i Virgili (URV), 43002, Tarragona, Spain) ggomez.merino@iphes.cat*

*Lorenzo, Carlos (Àrea de Prehistoria, Universitat Rovira i Virgili (URV), 43002, Tarragona, Spain./ IPHES, Institut Català de Paleoeologia Humana i Evolució Social (IPHES), 43007, Tarragona, Spain) carlos.lorenzo@urv.cat*

*Solé, Àlex (IPHES, Institut Català de Paleoeologia Humana i Evolució Social (IPHES), 43007, Tarragona, Spain./ Àrea de Prehistoria, Universitat Rovira i Virgili (URV), 43002, Tarragona, Spain) alexsole1@gmail.com*

*Ros-Montoya, Sergio (Departamento de Geología y Ecología, Universidad de Málaga, Campus de Teatinos, 29071 Málaga, Spain./ Museo de Prehistoria y Paleontología, 18858 ? Orce (Granada) Spain) sergiorosm@gmail.com*

*Espigares, María-Patrocínio (Departamento de Geología y Ecología, Universidad de Málaga, Campus de Teatinos, 29071 Málaga, Spain./ Museo de Prehistoria y Paleontología, 18858 ? Orce (Granada) Spain) mpespigares@gmail.com*

*Sala, Robert (Àrea de Prehistoria, Universitat Rovira i Virgili (URV), 43002, Tarragona, Spain./ IPHES, Institut Català de Paleoeologia Humana i Evolució Social (IPHES), 43007, Tarragona, Spain) robert.sala@urv.cat*

*Martínez-Navarro, Bienvenido ( IPHES, Institut Català de Paleoeologia Humana i Evolució Social (IPHES), 43007, Tarragona, Spain. /Àrea de Prehistoria, Universitat Rovira*

*i Virgili (URV), 43002, Tarragona, Spain./ ICREA, Barcelona, Spain) bienvenido@iphes.cat*

The Orce sites (Barranco León, Fuente Nueva-3, and Venta Micena) in the Guadix-Baza Basin (southern Iberian Peninsula, Andalusia, Spain) are exceptional Early Pleistocene locations in Europe. These sites are found in fluvio-lacustrine deposits which are very rich in paleontological remains. Moreover, Barranco León and Fuente Nueva-3 have yielded archaeological materials with abundant lithic tools associated with large mammals, as well as a human decidual tooth from Barranco León Level D, being the earliest evidences for the early human presence in Western Europe. The Orce localities provide extraordinary well-preserved large fossil mammals, which give remarkable data for paleobiological studies (taxonomy, biochronology, taphonomy, paleoecology, etc.). In addition, these paleontological levels provide interesting information to understand the fossil preservation processes in the context of lacustrine-open air sites. The field work at Orce is conducted by a multidisciplinary team, where conservators are directly involved and play an important role. In this study we present the preservation of the large mammal remains, explain the techniques applied to conserve them, and show the obtained results during the last four years period at the Orce sites research.

The principal problems for fossil preservation are due to weathering, diagenetical processes and the big dimensions of some large mammal, that difficult the excavation and delay the extraction of the fossils. Besides all, another important added difficulty, which is directly linked to the others, is the extreme climatic condition in the Orce region, with important variations of temperature (T) and relative humidity (RH) between day and night during the field work seasons. These changes seem to affect the structure of the fossil bones and their preservation while stay exposed during the excavation procedures. We have used a data logger to record variations in T and RH during the field work to know if climatic changes are really producing damage in the bones, and have applied three dimensional surface scanning to record the conservation state of the *in situ* remains before to extract them from the site. These techniques provide us interesting information on the preservation of the fossils and allows us to perform a methodology to protect them while they are kept *in situ* between one field season to another.

# A2f Pleistocene human dispersals: climate, ecology and social behavior

Commission on First humans in Europe  
(Organizers: José Luis Lanata, Sergi Lozano, Bienvenido Martínez-Navarro)

Tuesday 2nd (9:00-13:30 to 15:00-19:30)  
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ORAL

## 1. DOPAMINERGIC SYSTEMS EXPANSION AND THE ADVENT OF HOMO ERECTUS

*DeLouize, Alicia M. (University of Colorado, Colorado Springs) Alicia.davis@ucdenver.edu*

*Coolidge, Frederick L. (University of Colorado, Colorado Springs) fcoolidg@uccs.edu*

It is well accepted that a grade shift occurred in hominin evolution approximately 1.9 million years ago with the appearance of *Homo erectus*. With the challenges of complete terrestrial life, new cognitive abilities were selected for that allowed this species to thrive for the next million and a half years. It has also long been recognized that there was a change in diet with the advent of *Homo erectus*, that is, a greater reliance on meat. However, the relationship between additional meat and the cognitive abilities of *Homo erectus* has mostly remained unclear.

The present paper proposes that an increase in dietary meat protein and fats may have led to an increase in dopamine and dopaminergic systems, a critical chemical neurotransmitter in the brain. This purported change in dopaminergic systems may have played a key role in many of the traits and abilities exhibited by *Homo erectus* at that time, including increases in body and brain size, dispersion, and a greater aptitude for spatial and social cognitions.

ORAL

## 2. EARLY PLEISTOCENE ECOLOGICAL RELATIONS AMONG OMNIVOROUS SPECIES AND LARGE CARNIVORE TAXA

*Medin, Tsegai (Institut Català de Paleoeologia Humana i Evolució Social-IPHES, C/ Marcel·lí Domingo s/n, Edifici W3, Campus Sescelades, 43007 Tarragona, Spain; National Museum of Eritrea, P.O. Box 5284, Asmara, Eritrea) eldatse@gmail.com*

*Martínez-Navarro, Bienvenido (IPHES, Institut Català de Paleoeologia Humana i Evolució Social (IPHES), 43007, Tarragona, Spain. /Àrea de Prehistoria, Universitat Rovira i Virgili (URV), 43002, Tarragona, Spain./ ICREA, Barcelona, Spain) bienvenido@iphes.cat*

*Rivals, Florent (ICREA, Institut Català de Paleoeologia Humana i Evolució Social (IPHES) frivals@iphes.cat*

*Rook, Lorenzo (Dipartimento di Science della Terra, Università degli Studi di Firenze) lorenzo.rook@unifi.it -*

*lrook@geo.unifi.it*

The main subject of this work is to study the ecological relationships, the (co)variation and evolutionary trends, and the geographical dispersal patterns of the large omnivorous mammal taxa - pigs, bears, monkeys, and hominins - as represented in a number of Early Pleistocene fossil assemblages from eastern Africa, the Levantine Corridor, the Caucasus, and southern Europe, chronologically spanning from ca. 1.8 to 1.0 Ma. The main question of the research relies upon two basic broad assumptions: (i) the dispersal patterns of the omnivorous species within and out of Africa are primarily and intimately related to climatic, thus to paleoecological determinants; (ii) within mammal fossil series, dental morphology and micro-wear analysis are helpful tools for comparatively assessing evolutionary changes, biogeographic habitats, and dietary habits.

The study provides critical information to the ongoing debate on the dispersal and adaptive hominin patterns during the Early Pleistocene in different eco-geographic contexts related to other large mammal taxa similarly relying upon a wide spectrum of resources, and thus acting as direct potential competitors together with large carnivores (Canids, Hyaenids). The methodologies include systematics, microwear analysis (extinct and extant species), statistical applications and inclusion of stable isotopes data.

ORAL

## 3. TESTING THE MOVIOUS LINE WITH AGENT-BASED MODELLING

*Romanowska, Iza (Institute for Complex Systems Simulation Centre for the Archaeology of Human Origins University of Southampton, UK) I.Romanowska@soton.ac.uk*

The Movius Line controversy is one of the most persistent research themes in Early Palaeolithic Archaeology. A number of hypotheses have been put forward to explain the pattern of the spatial distribution of Mode 1 and Mode 2 industries. It has been suggested (Lycett & Von Cramon-Taubadel 2008; Lycett & Norton 2010) that in areas further away from the origins of the first 'Out of Africa' dispersal the population density was lower than in the zones closer to Eastern Africa. As a result, smaller and less well connected human groups could not sustain the sophisticated technological knowledge necessary to produce Mode 2 implements and reverted to simpler knapping strategies i.e. Mode 1.

An Agent-based model was developed to test the above hypothesis. It consists of an paleoenvironmental reconstruction of the Old World coupled with a dynamic simulation of the sea level fluctuations in which large areas of dry land would occasionally (on a geological time scale) become submerged and reappear due to climatic changes, acting as an 'environmental pump' driving human movement.

The goal of this study is to compare population density in the Acheulean and Oldowan regions throughout the simulation to evaluate if the proposed demographic disparity between the two regions is plausible. If, under a wide sweep of parameters informed on contemporary hunter-gatherer but also mammalian data, the model will show no differences between the Mode 1 and Mode 2 areas in terms of population density then the aforementioned hypothesis can be rejected.

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ORAL

#### **4. THE ENVIRONMENT OF EARLY HUMANS IN SOUTHERN CAUCASUS - HIGH-RESOLUTION RECONSTRUCTION OF CLIMATE AND VEGETATION IN ARMENIA AT THE MATUYAMA/JARAMILLO REVERSAL**

*Bruch, Angela (ROCEEH Research Centre) [abruch@senckenberg.de](mailto:abruch@senckenberg.de)*

*Gabrielyan, Ivan (Armenian National Academy of Sciences) [ivangabrielyan@yahoo.com](mailto:ivangabrielyan@yahoo.com)*

*Scharrer, Steffen (ROCEEH Research Centre) [steffen.scharrer@senckenberg.de](mailto:steffen.scharrer@senckenberg.de)*

The Southern Caucasus is the area of earliest human occupation in Eurasia, proven by findings of *Homo* fossils in Georgia with an age of ca. 1.8 Ma. The pace and causes of the early human colonization, in one or several migratory waves from Africa into new environments of the Eurasian continent during the Early Pleistocene, are still a matter of debate. However, climate change is considered a major driving factor of hominin evolution and dispersal patterns. In fact directly or indirectly by its severe influence on vegetation, physiography of landscape, and animal distribution, climate modulates the availability of resources.

Lake sediments from Sisian Formation, Vorotan River Basin, southern Armenia, provide detailed information on environmental changes during late Early Pleistocene. Based on magnetostratigraphic and radiometric dating,

the exposed part of the succession covers a stratigraphic age from ca. 1.3 to 0.9 Ma and includes the Jaramillo subchron. Due to the precise age control high-resolution pollen analysis was conducted at the Matuyama/Jaramillo reversal spanning from 1.12 to 1.035 Ma (MIS 33 - MIS 30) with a mean resolution of ca. 250 years per samples.

Results document a clear vegetation response on orbitally forced climatic changes with open vegetation during the less pronounced cycles MIS 33/34, the expansion of broadleaved deciduous forests during the cooling phase of the very warm and humid MIS 31, and the expansion of needleleaved forests during the long, cool and humid MIS 30. Furthermore, the age of the numerous macro floral assemblages could be constrained to warm and humid parts of the climatic phases, most of them connected to MIS 31 confirming the dominance of mosaic vegetation at that time.

Plant species compositions show strong relations to Euxinian and Hyrcanian forests occurring today at the coasts of the Black Sea and Caspian Sea, respectively, which must have been expanded considerably during warmer and more humid periods of the Early Pleistocene. Climate quantifications show substantially warmer and 50-100% more humid conditions for most pronounced interglacials. Based on those results we extrapolate the maximum extend of forests and mosaic landscapes in Southern Caucasus for different climatic phases during Early Pleistocene as a prerequisite for the reconstruction of early human environments in this region.

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ORAL

#### **5. PARALELLISM OF IMMIGRANT LARGE MAMMALS WITH OLDOWAN AND ACHEULIAN CULTURES INTO EUROPE**

*Martínez-Navarro, Bienvenido ( IPHES, Institut Català de Paleoecologia Humana i Evolució Social (IPHES), 43007, Tarragona, Spain. /Àrea de Prehistoria, Universitat Rovira i Virgili (URV), 43002, Tarragona, Spain./ ICREA, Barcelona, Spain) [bienvenido@iphes.cat](mailto:bienvenido@iphes.cat)*

*Madurell-Malapeira, Joan (Dipartimento di Scienze della Terra, Sapienza Università di Roma, Piazzale Aldo Moro 5, 00185 Roma, Italy) [joan.madurell@icp.cat](mailto:joan.madurell@icp.cat)*

*Ros-Montoya, Sergio (Departamento de Geología y Ecología, Universidad de Málaga, Campus de Teatinos, 29071 Málaga, Spain./ Museo de Prehistoria y Paleontología, 18858 ? Orce (Granada) Spain) [sergiorosm@gmail.com](mailto:sergiorosm@gmail.com)*

Espigares, María-Patrocínio (Departamento de Geología y Ecología, Universidad de Málaga, Campus de Teatinos, 29071 Málaga, Spain./ Museo de Prehistoria y Paleontología, 18858 ? Orce (Granada) Spain) mpespigares@gmail.com

Medin, Tsegai (Institut Català de Paleoecologia Humana i Evolució Social-IPHES, C/ Marcel·lí Domingo s/n, Edifici W3, Campus Sescelades, 43007 Tarragona, Spain; National Museum of Eritrea, P.O. Box 5284, Asmara, Eritrea) eldatse@gmail.com

Palmqvist, Paul (Departamento de Geología y Ecología, Universidad de Málaga, Campus de Teatinos, 29071 ? Málaga, Spain) ppb@uma.es

Research during more than 25 years of this team working on Early and Middle Pleistocene fossil collections of large mammals around Europe, Asia and Africa, with special interest in the Ibero-Mediterranean sites of the Guadix-Baza, Besalú-Banyoles, Vallès-Penedès and Francolí Basins, has helped to build up new biochronological and paleoecological issues on the faunal and human dispersals from Subtropical Africa into the middle latitudes of Eurasia.

The first, well-recorded evidence of human dispersal into Eurasia was found at the site of Dmanisi, in the Caucasian region, dated ca. 1.8 Ma. Five skulls and thirty-five postcranial human remains, together with a large collection of Oldowan lithic artifacts corroborate these findings. This site is also characterized by the record of a few but very significant species of African origin, like the saber-toothed cat *Megantereon whitei*, an ambush predator that inhabited mixed habitats, with powerfully developed forelimbs, elongated and non-crenulated upper canines, and a short mandible with reduced precarnassial cheek teeth. It was well-adapted to hunt medium-to-large sized ungulates, but its masticatory structure only allowed it to eat the softer parts of its prey, leaving most of the carcass intact for scavengers, especially for the starring of the ecosystem, the giant, short-faced hyena *Pachycrocuta brevirostris*, but probably also for hominins. Later, *M. whitei* and *P. brevirostris* are common inhabitants of Europe and Asia during the late Early Pleistocene.

Another important African immigrant recorded in the Late Villafranchian is the giant hippo *Hippopotamus antiquus*, which is a sister species, if not the same, of *Hippopotamus gorgops*, with a mean body mass estimated in 3200 kg. Although it is cited at the site of Coste San Giacomo in Italy, around 2.0 Ma, it becomes a common species in the ecosystems of southern and central Europe since 1.5 Ma, as recorded at Venta Micena in the Guadix-Baza Basin and many other sites. Apart from its

enormous size, it shows anatomical adaptations in the skull and the postcranial to the aquatic environment, with more elevated orbital and nasal cavities, a narrower and more elongated muzzle, and shorter distal limb segments than in the extant, less aquatic and more amphibious species *Hippopotamus amphibius*. There is only evidence for the arrival of one African origin species during the latest Early Pleistocene in Europe, the giant cercopithecoid monkey *Theropithecus cf. oswaldi*, which is found at the site of Cueva Victoria, southeastern Spain (ca. 1.0 Ma).

The discussion of other African origin species during the latest Early Pleistocene into Europe, such as *Panthera fossilis*, *Panthera pardus*, *Crocuta crocuta*, *Hyaena hyaena*, or *Elephas (Palaeoloxodon) antiquus*, still remains open, but it is clear that all of these species are well known and become common in the continent during the early Middle Pleistocene, when the developed Acheulian culture arrived and colonized most of the subcontinent. This dispersal was also accompanied by the arrival of the large Bovini *Bos primigenius*, evolved from the latest African Early Pleistocene form *Bos buiaensis* (found at Buia, Eritrea), which also evolved from the giant African buffalo *Peloroavis oldowayensis*.

ORAL

## 6. THE ACHEULIAN OF GESHER BENOT YA'AQOV: CLIMATE, CULTURE AND SOCIAL BEHAVIOR

Goren-Inbar, Naama (Institute of Archaeology, The Hebrew University of Jerusalem) goren@cc.huji.ac.il

The excavations at the Acheulian site of Gesher Benot Ya'aqov (GBY) provide unprecedented multidisciplinary research opportunities and have consistently yielded unique data that are relevant to issues of climate, culture and social behavior. Along a stratigraphic-temporal record beginning at 1.1 Ma, a Mediterranean landscape rich in floral and faunal taxa of different biogeographic origins prevailed in the Upper Jordan Valley of the Levantine corridor. The sites at GBY (over 15 rich superimposed cultural entities located on the edge of paleo-Lake Hula) are present along the entire stratigraphic record and furnish insights into Acheulian technology and cognition over a time trajectory. They have yielded an unprecedented archive of different behavioral patterns that shed light, among others, on the mechanisms and character of human dispersals.

ORAL

## 7. PALEOLITHIC OCCUPATIONS OF KUZFINDIK VALLEY AND PLEISTOCENE HUMAN DISPERSALS IN NW ANATOLIA

*Dinçer, Berkay (Istanbul University) berkaydincer@gmail.com*

*Türkcan, Ali Umut (Anadolu University) aturkcan@anadolu.edu.tr*

*Erikan, Ferhat (Anadolu University) ferikan1988@gmail.com*

Anatolia (Asian part of Turkey) is accepted to be one of the main Out of Africa hominin dispersal routes in the Pleistocene. Despite its crucial role as a route, research in Anatolia is very limited and this large peninsula remains as a *terra incognita* for the Paleolithic archaeology. Excavated Paleolithic sites are very few in number and located in separate geographical areas.

Kuzfindik Valley in northwestern Anatolia was subject to systematical archaeological surveys and 8 Paleolithic open-air sites were revealed. Due to its location on the southeast-northwest oriented natural land-routes within Anatolia, the Paleolithic sites in Kuzfindik Valley may help understanding the early hominin dispersals.

Techno-typological analyses of nearly 300 lithics collected from eight different open-air sites.

ORAL

## 8. ON CULTURE AND GENETICS: SOME OBSERVATIONS ON THE FIRST INHABITANTS OF ANATOLIA

*Gil Fuensanta, Jesús (UAM - Spain) jesus.gil@uam.es*

*James, Ariel José (UAM - Spain) arieljose.james@gmail.com*

*Mederos Martín, Alfredo (UAM - Spain) alfredo.mederos@uam.es*

*Boynikoglu, Ediz (Trakya Üniversitesi, Turkey) boynik@gmail.com*

Recently there have been several issues for discussion on the idea that culture and genetics are intertwined. This theory considers that there are cultural and genetic elements throughout evolution. An example of support appears to be based on neurological evidence that moral cognition occurs in the frontal lobe (cf. Joshua Greene Cognitive Laboratory at Harvard).

The influence of social rules of a given culture cannot be removed entirely from the picture, but from a logical point of view it cannot be an element of our universal genetic programming.

The hereby research presented in Burgos contains some personal observations that depart from fieldwork conducted primarily in Eastern Thrace (West Turkey) and also Northern Mesopotamia (Euphrates and Tigris region) on some characteristics of a cultural horizon of the Middle Paleolithic industries within the framework of the Tilbes Archaeological rescue Project.

On the other hand, the climate although seems not to be the "prime mover" in many cases for the researched area, it can act as a trigger or important conditioning.

ORAL

## 9. REGIONAL HUMAN CORRIDOR AND VARIABILITY OF THE MIDDLE PALAEOLITHIC LITHIC ASSEMBLAGES DURING THE UPPER PLEISTOCENE IN THE GUADALQUIVIR-GUADAIRA RIVER VALLEYS (SOUTHERN SPAIN)

*Díaz del Olmo Fernando (Universidad de Sevilla) delolmo@us.es*

*Caro, José Antonio (Universidad de Sevilla) jacaro@uco.es*

*Borja, César (Universidad de Sevilla) cesarborja@us.es*

*Recio, José Manuel (Universidad de Córdoba) bv1reesj@uco.es*

The lithic industries of the Middle Paleolithic in the Guadalquivir River valley (South of Spain) have been studied in relation to their geomorphological units and stratigraphic position. Based on the raw materials these pebble industries are gathered in two general kinds: quartzites, from the North; and flint, from the South. The biggest extension of the Guadalquivir's alluvial terraces are spreading over its left river catchment, that is toward the South, because of the stream network from the Subbetic dissect the piedmont of liaison between the Subbetic and the Guadalquivir Basin as well as its alluvial terraces system.

The Middle Palaeolithic archaeological sites network in the Guadalquivir's affluent valleys by the left, with the two kinds of raw materials, allows us to reconstruct fluvial geographical areas of human circulation and raw material provisioning (*Regional Human Corridor*, RHC). Focusing the study on the Guadaira River, Guadalquivir's affluent by the left, twenty archaeological sites has been recognized in Sierra de Esparteros piedmont (link Subbetic-Guadalquivir Basin) and in the alluvial terraces system. It is about a regional geoarchaeological context with high technotypological variability in the sites, chronostratigraphically dating from MIS6.



They are studied 20 geoarchaeological sites (28 assemblages) with industries of the Middle Palaeolithic in the Guadalquivir-Guadaira (G-G)'s alluvial sediments and in piemont's karstic fillings (Sierra de Esparteros). The methods applied are: geomorphological map, absolute dating (OSL and U/Th), technotipological analysis and use-wear analysis of the lithic industries (binocular microscope and SEM).

The geomorphological *continuum* established between the Guadaira River and its connection with the Guadalquivir's alluvial terraces shows that these archaeological sites constitute a fluvial RHC since late MIS6 with two leading stages:

1) A short time, transit Middle-Upper Pleistocene (MIS6/MIS5) (>129 ky and under 104 ky), with predominance of industries in quartzites (notches, scrappers and pebble tools).

2) A long time (under 110 ky, and even of 50 ky), made up by lithic assemblages in quartzites and flints with high diversity of flakes tools, with presence of Levallois technique and handaxes testimonies.

The technotipological analysis of the industries shows three RHC kinds of activities: provisioning and distribution of raw materials, knapping and anthropic activities, which imply the use of industry (workshop and settlement of character regular, occasional and indeterminate):

- The connection G-G means a model of alluvial and multifunctional character RHC during the Middle Palaeolithic with two noticeable stages.

- The G-G RHC allows the anthropic circulation and explains the provisioning area of flint and quartzite.

- The technotipological variability is seen in the maintenance of Acheulean characters, increase in the use of flint and intensification of high complexity knapping techniques (Levallois, thorougher retouchings and diversification of tools on flakes).

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ORAL

## 10. NEANDERTHAL LIFEWAYS IN NORTH-WEST EUROPE: THE CHALLENGE OF THE EEMIAN FOREST

*Bringmans, Patrick M.M.A. (The 'Veldwezelt-Hezerwater' Neanderthal Research Centre - Belgium) Patrick.Bringmans@*

*hotmail.com*

*de Warrimont, Jean-Pierre (Archeologische Vereniging Limburg - The Netherlands) warri009@planet.nl*

*Pierre M. Vermeersch (Catholic University Leuven - Belgium)*

*Pierre.Vermeersch@ees.kuleuven.be*

*Schirmer, Wolfgang (Heinrich-Heine-Universität Düsseldorf - Germany) schirmer@uni-duesseldorf.de*

The 'Eemian' interglacial (Marine Isotope Stage [MIS] 5e) seems to represent an exceptionally warm period. It has been argued by Clive Gamble (1986) that the 'Eemian' probably represented a hostile ecological niche to Neanderthals, because the majority of the biomass was stored in non-edible form. In spite of these claims, Roebroeks *et al.* (1992) refuted the basis of Gamble's model by stating, that Neanderthals were present in North-West Europe during the Eemian interglacial with deciduous forests. However, this latter hypothesis seems inconsistent with the lack of observational evidence to support it.

New data from the 'Lower Sites' at Veldwezelt-Hezerwater (Bringmans 2006) show that the incipient soil horizons there seem to represent late Late Saalian phases of pedogenesis under boreal conditions just prior to the MIS 6/5e transition. The pedostratigraphical position provides a firm basis to conclude that these soil horizons represent the terrestrial equivalent of the late Late Saalian 'Zeifen Interstadial' (MIS 6.01). It seems that many of the so-called 'Eemian' Neanderthals sites in North-West Europe should be dated to the MIS 6/5e transition and not to the 'Eemian' itself.

On the other hand, it appears that the remaining 'Eemian' sites should actually be dated to the early part of the 'Eemian', because analysis shows high percentages of herbaceous *taxa*, which suggests that the forest was relatively open. For instance, both Neumark-Nord (Germany) and Caours (France) were occupied during the 'Eemian' by Neanderthals. However, there is evidence that supports a major time lag of 5,000 years between the onset of the 'Eemian in the south' and the 'Eemian in the north' of Europe (Sier 2013). The evidence uncovered at Neumark-Nord shows that the Neanderthals were present there during the *Corylus*-phase (120,000 BP), which was more open compared to the later stages of the Eemian (Gaudzinski *et al.* 2013). No traces of Neanderthal presence were recovered from sediments deposited during the later *Carpinus*-phase of the Eemian when a closed canopy forest prevailed. New investigations at Caours (Antoine *et al.* 2006) have allowed the discovery of several Middle Palaeolithic layers with interglacial large mammal remains, which can also be dated to the early Eemian. However, the oldest Middle Palaeolithic layers

at Caours exhibit late-glacial characteristics, which we claim should also be dated to the late Late Saalian Zeifen Interstadial (MIS 6.01).

The 'Eemian' climax forests in North-west Europe appear to have been deserted by Neanderthals, because they were less suitable places for food collecting. It is however possible, that river valleys were ecologically more diverse. Although the palaeo-environmental data suggest dense forests at some of these 'Eemian' sites, the faunal remains are actually a mix of closed forest species (e.g., deer) and open country species (e.g., horse). So, although some of the palaeo-environmental data seem to point to climax forests, the sites themselves represent open swatches such as lake and river shores. The 'Eemian' would then become a generic term that only refers to a vague ecological mosaic, rather than to a specific environment.

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ORAL

**11. WERE LARGE CARNIVORANS AND GREAT CLIMATIC SHIFTS LIMITING FACTORS FOR HOMININ DISPERSALS? EVIDENCE OF THE ACTIVITY OF PACHYCROCUTA BREVIROSTRIS DURING THE MID-PLEISTOCENE REVOLUTION IN THE VALLPARADÍS SECTION (VALLÈS-PENEDÈS BASIN, IBERIAN PENINSULA)**

*Madurell-Malapeira, Joan (Institut Català de Paleontologia Miquel Crusafont, Universitat Autònoma de Barcelona, Edifici ICP, Campus de la UAB s/n, 08193 Cerdanyola del Vallès, Barcelona, Spain. Dipartimento di Scienze della Terra, Sapienza Università di Roma) joan.madurell@icp.cat*

*Alba, David M. (Institut Català de Paleontologia Miquel Crusafont, UAB) david.alba@icp.cat*

*Espigares, María-Patrocínio (Departamento de Geología y Ecología, Universidad de Málaga, Campus de Teatinos, 29071 Málaga, Spain./ Museo de Prehistoria y Paleontología, 18858 ? Orce (Granada) Spain) mpepigares@gmail.com*

*Vinuesa, Víctor (Institut Català de Paleontologia Miquel Crusafont, UAB) victor.vinuesa@icp.cat*

*Martínez-Navarro, Bienvenido ( IPHES, Institut Català de Paleocologia Humana i Evolució Social (IPHES), 43007, Tarragona, Spain. /Àrea de Prehistoria, Universitat Rovira i Virgili (URV), 43002, Tarragona, Spain./ ICREA, Barcelona, Spain) bienvenido@iphes.cat*

*Moyà-Solà, Salvador (ICREA & Institut Català de Paleontologia Miquel Crusafont, UAB) salvador.moya@icp.cat*

The oldest evidence of hominin presence in the Iberian Peninsula comes from three localities (Barranco León,

Fuente Nueva 3 and Sima del Elefante) from the latest Early Pleistocene. In Iberia, this time interval was characterized by warm temperatures, with landscapes dominated by open dry grasslands and several wooded areas. Several authors suggested that the paleoenvironmental conditions most favorable for the dispersal of hominins across Europe would correspond to open landscapes, similar to the African environments in which early *Homo* had evolved. The Iberian Peninsula apparently displayed these kind of environments, although other factors might have conditioned the survival of these early *Homo* populations. In particular, taphonomic studies carried out in the Orce localities suggest that large carnivorans, such as *Pachycrocuta brevirostris*, were responsible of an intense bone modification activity during the late Early Pleistocene. Evidences of early *Homo* modification are also recorded, although the analysis of available data has thus far suggested a primary access to the carcasses by humans only under occasional circumstances. In fact, several scholars established a parallelism between the composition of the carnivore guild and the impact of hominin activities in the record. Thus, in the localities with Villafranchian carnivorans, hominin activities have a much scarcer impact than in the localities with Galerian carnivorans.

Shortly after the record of the Guardix-Baza Basin, a global climatic event, known as *Mid-Pleistocene Revolution* and elapsing from 1.25 Ma to 0.7 Ma, started in the Northern Hemisphere. During this time interval, the previous low-amplitude, 41 ka obliquity-forced climate cycles were progressively replaced by high-amplitude, 100 ka cycles. The latter implied a transition towards a strongly non-linear forced climate system, and were accompanied by a substantial increase in global ice volume at 0.94 Ma. These climatic changes, had a profound effect on the biota and the physical landscape—and, as a consequence, probably also in the interaction of European early *Homo* with the environment.

There are only a few European localities that record this time interval of great climatic shifts and therefore enable to study the impact of the latter on the taphocenoses. The Vallparadís Section (Vallès-Penedès Basin) chronologically well-constrained and ranging from 1.2 to 0.6 Ma, records during the MPR the same carnivore guild as the Orce localities, at last until 0.83 Ma. This evidence suggests that, in the Iberian Peninsula, the carnivore guild remained stable during most of the MPR, thus probably constituting a persisting limiting factor for the subsistence and dispersal early *Homo* populations. This is further supported by the taphonomical evidence provided by the bone remains from the various layers

of the Vallparadís section, which show that the distribution of skeletal elements and their preservation closely resemble those documented from the Early Pleistocene site of Venta Micena, which has been attributed to the activity of *Pachyrocuta brevirostris*.

The reported evidence reinforces the idea that large carnivores were an important limiting factor for hominin dispersal and subsistence throughout the whole second half of the Early Pleistocene, including the latest portion of this stage, when climatic conditions became unstable.

ORAL

## 12. PLEISTOCENE HUMAN DISPERSAL ABOVE 55° NORTHERN LATITUDE: EVIDENCE OF ABSENCE OR ABSENCE OF EVIDENCE?

Nielsen, Trine Kellberg (Aarhus University) farktnielsen@cas.au.dk

The early dispersal into and colonisation of Europe has been the focus of an increasing amount of research. The relatively recent discoveries of evidence supporting the so-called "long chronology" (Roebroeks 2006) (including such famous sites as Atapuerca (c. 42°N) in Spain and Dmanisi (c. 41°N) in Georgia) has certainly encouraged this development. Evidence from Britain (e.g. Happisburgh, Boxgrove, Pakefield) even supports an early colonisation of high northern latitudes around 52°.

To what degree these occupations represent continuous habitation or local extinction-events is difficult to unambiguously ascertain due to the relatively poor time resolution (Hublin & Roebroeks 2009). Despite these obvious chronological challenges, the current site data available does seem to suggest that north-western Europe up to 55°N was colonised by at least 800.000 BP and thereafter subjected to a series of occupations. However no uncontested sites have, as of yet, been recognised above 55°N latitude. This signal may be an outcome of the major advances of the Scandinavian ice sheet causing poor preservation and mixed stratigraphic conditions in the area of impact. Perhaps these glaciotechtonic activities were even powerful enough to completely cover the tracks of Neanderthals reaching these northern hunting grounds during intermediate periods of favourable conditions. As population density seems to decrease along the northern gradient, sites becoming more scattered in the landscape in the North, one could argue that if such northern expeditions did occur, the impact and possible debris-accumulation for archaeologists to find today is minimal

even without the destructive power of the glaciers.

However, there is of course another possible explanation – that this absence indicates actual adaptive constraints among the early inhabitants of Europe. In this scenario 55°N latitude would constitute the 'maximum northern range' of a species that, at many other occasions, have proved highly successful in adapting to a wide variety of environments. Understanding the dynamics of such an 'adaptive boundary' thus becomes essential, especially the climatic, ecological, and social factors controlling it.

In this paper the archaeological data available in proximity to 55°N latitude (with a focus on Germany above the Elbe River basin and southern Scandinavia) will be discussed in conjunction with the ecological evidence present for the same region. Since a majority of the lithic finds from the area have very low (to non-existing) chronological affiliation, it can be challenging to achieve a satisfactory resolution when trying to accurately model the distribution and successfully explain the variables controlling it. Despite this, the development of a methodological approach based on eco-cultural niche modelling (Banks et al 2006) will be attempted and evaluated.

ORAL

## 13. PALEOLITHIC PERIOD IN SEYMAREH VALLEY, CENTRAL ZAGROS, WESTERN IRAN: SOME OBSERVATION

Zeynivand, Mohsen (Department of Archaeology, Islamic Azad University, central Tehran Branch) zeynivand@gmail.com

Mazaheri, Khoda karam (Department of Archaeology, Islamic Azad University, Ilam Branch) Kh.Mazaheri@yahoo.com

Bahramiyan, Saeid (Department of Archaeology University of Tarbiat Modares, Tehran, Iran) Bahramiyan.saeid@gmail.com

Seymareh Valley is referred to central sector of Dareh Shahr township of Ilam Province at the extreme south of Pish-kuh in central Zagros and western Iran. Prehistoric sites of the region resurveyed in 2010 and for the first time, an evidence of presence of Hunter-Gathering groups is discovered. The Seymareh valley has importance from two aspects; the first, it is one of the folded Zagros's lateral valleys that was original location of human movement in the region and due to laying between the lowlands of southwest of Iranian plateau and central Zagros Highland is considered as intermediate zone. Second, it has a remarkable environment due to

the climate conditions and being of Seymareh River and Kabir-Kuh Mountain. In addition, the significant and interest Information from Paleolithic periods was found at the Hulailan and Kuran Buzan Valley and from northern part of the Susiana plain, respectively at north and south of the Seymareh valley. These evidences and potential environment of Seymareh valley itself may to be representing somewhat the possibility of communities Pleistocene's presence in the Valley.

But the most important natural event was major Seymareh landslide that has remarkable impact on Landscape and environment and also difficulty in identification of prehistoric sites as by falling Anticline of southeastern part of Kabir-Kuh, length of 16 Km., its debris have been spread to limited area about 20Km in the southeastern of Seymareh Valley, and by blocking the course of Seymareh and Kashkan Rivers, makes a natural dam. This huge natural event caused formation of a great Lake behind this dam and major parts of Seymareh was drown which results accumulation of alluviums and deposits at the valley floor with about 40m thickness. However, the Seymareh landslide have been remarkable impact on Structure of the Seymareh valley in the early Holocene and limited the ability to identify of possible sites, duo to the alluvium, before this event, It was rather optimistic that the evidences of remains belonging to Paleolithic periods was identified in altitudes laying higher from the alluvium of the Valley floor and on rocky outcrop located in the valley floor. In fact this assemblage is the first known evidences relating to this period at the Valley. The most of lithic artifacts collected from this open sites and rock shelters is made on flake and no traces of blade and microliths. Except to a few flakes and Cores, the rest of findings have not the known Characteristics of Zagros industry. Such assemblages was identified from the Folded Zagros, included Pol-Dokhtar, Baba Zeid, several parts of Kuhdasht and Locales at Islamabad plain, before this time.

The Notable point about the assemblage of the rock shelters is lack of remarkable open sites in the valley floor. It seems evident that the lack of Paleolithic remains at the valley floor is influenced by geological factors and sedimentation factors.

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ORAL

#### 14. THE NORTHEASTERN MEDITERRANEAN AND THE ORIGINS OF SEAFARING

*Papoulia, Christina (University of Crete) christina\_papoulia@hotmail.com*

By focusing on the lithic evidence from the islands of the Aegean and Ionian Seas this paper discusses the arguments for early Palaeolithic sea-crossings. Based on the geomorphology and the proposed sea-level reconstructions, the recently published lithic collections together with new, under study data from the Inner Ionian Sea Archipelago are presented and the possible sea-routes are proposed. Were the early hominins which occupied the northeastern Mediterranean during the Lower and the Middle Palaeolithic cognitively, socially and technically competent for such an innovative and challenging task? The evidence at hand cannot but imply -at least- Neanderthal presence on certain islands of the Mediterranean.

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ORAL

#### 15. EXAMINING THE ROLE OF CLIMATE, ECOLOGY AND ADAPTATION IN MODELS OF HUMAN DISPERSALS INTO THE AMERICA

*Schurr, Theodore G. (Department of Anthropology, University of Pennsylvania) tgschurr@sas.upenn.edu*

The peopling of the Americas has long been viewed as a case study in human migration and adaptation. Colonizing groups entered regions uninhabited by other human populations at the end of the Pleistocene and then lived in relative isolation from other Eurasian groups for many millennia before the arrival of Europeans in the 15<sup>th</sup> century CE. They entered the New World during the last glacial maximum, either through coastal and/or interior routes, from the Beringian landmass, and then rapidly dispersed through the American continents. However, the timing, points of dispersal and number of population expansions that occurred during this period remain unresolved, particularly in light of new genomic data from Siberia and Native American populations. While genetic data have clearly delineated founding lineages in these populations and are forcing a rethinking of migration scenarios, they are often not considered in the context of the environmental and climatic conditions of the Late Pleistocene period, which would have shaped potential settlement areas in Eurasia, dispersal routes in and out of Siberia, and biological and cultural adaptation that ancestral Native American populations would have undergone prior to entering the Americas.

This paper will review the paleoclimatological and paleoenvironmental records for Siberia and the Americas and attempt to situate the current genetic data from indigenous Siberian and Native American populations in

this context to assess the validity of different migration scenarios for the Americas and characterize the demographic and adaptive features of the human groups living during the LGM.

ORAL

## 16. HUMAN BEHAVIORAL ECOLOGY AND THE PLEISTOCENE COLONIZATION OF NORTH AMERICA

*Daniel S. Amick (Loyola University Chicago) damick@luc.edu*

*Matthew J. Root (Rain Shadow Research and Washington State University, Pullman) rainshadow@completebbs.com*

Colonization of North America by anatomically modern humans appears to have followed the Last Glacial Maximum. Current evidence suggests migration from Northeast Asia using coastal routes followed by the eventual colonization of the interior including the notably sophisticated adaptations known as Clovis. Multiple migrations likely occurred resulting in considerable complexity to this early archaeological record. These early migrants encountered and sometimes hunted now extinct species, but the degree to which they caused those extinctions remains debatable.

Substantial and geologically rapid environmental change during this interval presented humans with new challenges and opportunities which seem to have resulted in a unique set of adaptive strategies that resulted in the rapid settlement of a vast continent. Those behaviors are often characterized as large-scale mobility, regionalization of subsistence and settlement patterns, advanced systems of resource and technological knowledge, rapid responses to different resources and their shifting spatial and seasonal configurations, the use of functional and symbolic forms of artifact caching, and maintaining social ties through periodic aggregation and down-the-line exchange.

Evidence of such swift colonization presents a range of problems for understanding the human behavioral ecology of these hunter-gatherers. Understanding how humans succeeded in this exceptional accomplishment have been advanced by considerations of landscape learning, cultural transmission, and demographic modeling.

ORAL

## 17. RECENT ARCHAEO-PALEONTOLOGICAL FINDINGS FROM BARRANCA DEL MUERTO SITE, SANTIAGO CHAZUMBA, OAXACA, MEXICO.

*Viñas, Ramon (Institut Català de Paleoeologia Humana i Evolució Social (IPHES); Universitat Rovira i Virgili (URV), Tarragona, Spain) rupestrologia@yahoo.es*

*Arroyo, Joaquín (Instituto Nacional de Antropología e Historia (INAH), México) arromatu@hotmail.com*

*Irán I. Rivera (Escuela Nacional de Antropología e Historia (ENAH), México) ldp\_enah@yahoo.com.mx*

*Rodríguez, Xosé Pedro (Institut Català de Paleoeologia Humana i Evolució Social (IPHES); Universitat Rovira i Virgili (URV), Tarragona, Spain) xprodriguez@iphes.cat*

*Rubio, Albert (Seminari d'Estudis i Recerques Prehistòriques (SERP), Universidad de Barcelona (UB), Spain) albert.rubio.mora@gmail.com*

*Eudave, Itzel N. (Postgraduate Student Universidad Rovira i Virgili (URV), Tarragona, Spain) itzel.grinch@gmail.com*

*Solís, Óscar R. (Postgraduate Student Universidad Rovira i Virgili (URV), Tarragona, Spain; Scholarship Holder Fundación Atapuerca, Burgos, Spain) zolhiz@yahoo.com.mx*

Over the past seven years, an archaeo-paleontological research has been carried out in the Barranca del Muerto site, located in souther Sierra Madre, Santiago Chazumba, Oaxaca, Mexico (18° 11'44"N latitude and 17° 40'15"W longitude, at an altitude of 1,774 m., in a semi-desert environment with desert scrub).

The excavation works are part of the larger project "Biodiversidad y Sociedades cazadoras recolectoras del Cuaternario de México" co-directed by the Instituto Nacional de Antropología e Historia de México and the Institut de Paleoeologia Humana i Evolució Social de Tarragona (Spain). The project's main goal is the study of the hunter-gatherers and their relationships with the fauna and the rock art.

We have undertaken four fieldwork seasons and all materials were recorded by coordinates X, Y, Z. There have been sampling of pollen seriations for its study (to be conducted in the laboratories of ENAH and IPHES) and several osteological materials have been analyzed through the electronic microscope in search of cut Mark. Few other materials were sent to Beta Analytic laboratories for C14 analysis.

The number of animal species discovered includes both megaherbivores (giant sloth, gomphothere and gliptodont, among others), and mesoherbivores (deer, prong-

horn, rabbit), and even small mammals, reptiles and amphibians.

Associated to the megafauna there have been found some lithic remains of little significance, although it has been detected a cut mark on a giant sloth bone. Initial pollen analyzes showed the existence of a temperate coniferous forest with several springs draining into a former lake. However, no radiometric dates for the site were obtained until now.

The Barranca del Muerto site provides a context that corresponds to the Late Pleistocene and more specifically to an indeterminate range of the Rancholabrean NALMA. In relation to its most significant characteristics, we must emphasize the abundance of large mammals, among which stand out three taxa of the Xenarthran group: the giant sloth (*Eremotherium laurillardi*), the mylodon (*Paramylyodon harlani*) and the glyptodont (*Glossotherium* sp.), as well as the Proboscidean *Cuvieronius* sp. Moreover, the known fauna indicates the occurrence of a warm and humid climate, which favoured, in one hand, the development of a tropical deciduous forest, and secondly, of grasslands and savannas. However, it should be noted that the final conclusions must await the detailed study of the materials and their final identification.

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## ORAL

### 18. EARLY HOMO SAPIENS, AND THE NATIVE FAUNA EXTINCTION IN THE SOUTH AMERICA SOUTHERN CONE

Chichkoyan, Karina Vanesa (*Institut Català de Paleoecologia Humana i Evolució Social (IPHES); Àrea de Prehistoria, Universitat Rovira i Virgili (URV)*) [karinavch@gmail.com](mailto:karinavch@gmail.com)

Belinchón, Margarita (*Museum of Natural Science of Valencia*) [museociencias@valencia.es](mailto:museociencias@valencia.es)

Martínez-Navarro, Bienvenido (*IPHES, Institut Català de Paleoecologia Humana i Evolució Social (IPHES), 43007, Tarragona, Spain. /Àrea de Prehistoria, Universitat Rovira i Virgili (URV), 43002, Tarragona, Spain./ ICREA, Barcelona, Spain*) [bienvenido@iphes.cat](mailto:bienvenido@iphes.cat)

Lanata, José Luis (*IIDyPCa, CONICET, UNRN*) [jllanata@gmail.com](mailto:jllanata@gmail.com)

Dispersion is a survival *Homo sapiens* adaptive strategy to confront variable environmental stresses in different spaces. To compare how it developed in diverse paleoecological settings is useful in order to understand how this adaptive capacity was used in niche construction or modification. Resources to be exploit, competency with

other species and passing through different climatic or geological barriers, are keys items in this question.

America is an excellent opportunity to understand how dispersion was, in a landscape free from previous Hominini intervention. Focus emphases over the Pampean Region, Argentina, located at 36° S and 64 W. *Homo sapiens* would have created new niches of predation which would have allowed a fast dispersion timing.

Taphonomical analysis was done in Rodrigo Botet Collection housed in the Museo de Ciencias Naturales de Valencia, Spain. This is the result of non-systematic excavations done at the north-eastern sector of the Pampas Region at the end of XIX century. Taphonomical history of these bones, species and skeletal parts can give information about agents involved in its burial, ecology of the native fauna and its habitat. This evidence can be related with human's movements into the region at a coarse-grain level and thus understand how ecological relationship were constructed.

11,466 elements were analysed, from which 10 elements, coming from different species, were detected showing different kinds of anthropic traces: four *Mylodontidae* bones, one *Megatherium* sp. rib and other two from *Macrauchenia patachonica*, three osteoderms with pentagonal and hexagonal shape, one from *Glyptodontidae* and two from *Eutatus*.

These native fauna developed during Pleistocene times and extinct just after humans colonized the region –except *Eutatus*, which survived until recent times. Because its size, they have low carnivore predation and consequently few avoidance behaviours. Also slow sexual maturity and low reproduction structure. In these populations, stressed by paleoenvironmental changes, sporadic human predation could have influenced its extinction. Dispersion into empty Hominini continents constituted a new ecological situation into human's evolution. Therefore different dispersion dynamics can be compared and evaluated between first entries of humans in South America and Iberic Peninsula. While in Europe early *Homo sapiens* dispersions could have taken at least 10.000 years, in America, the dispersion would have been fastest, between 3.000 or 2.000 years.

This contrast with the general idea that fast dispersion is favored with previous knowledge. This should have happened in Europe, were previous hominid incursions happened since early Pleistocene. America, in return, was an uninhabited. Recognition of resources and geophorms should have taken longer time. Thus in contrast

with what was proposed for America, in Iberic Peninsula, adaptation to previous Hominini existing niches and competition for resources would have delay dispersion in this space.

ORAL

### 19. LATE PLEISTOCENE AND EARLY HOLOCENE HUMAN ADAPTATIONS IN THE URUGUAY RIVER BASIN: ECOLOGY, CLIMATIC CONDITIONS AND TECHNOLOGICAL INNOVATIONS

*Suárez, Rafael (Depto. Arqueología Facultad de Humanidades y Ciencias de la Educación, Universidad de la República) suarezrafael23@gmail.com*

This paper present and review the current investigations on the middle basin of Uruguay River. Starting from actual archaeological evidences, it discusses around different models and interpretations generated in Argentina, South of Brazil and Uruguay. The most recent research on Northern Uruguay has yielded the earliest records of fauna (extinct and actual) in an early archaeological site situated within the Uruguay River basin. The data from the Pay Paso 1 site is compared with previous evidence from other sites of the region, like K87 (Uruguay) and RS-I-66 y RS-I-69 sites (Southern Brazil) in order to establish that, during the early peopling of this area, there was an interesting cultural and ethnic diversity reflected in the material culture manifested through different designs of projectile points.

I suggest that chronological and cultural variability in the different projectile point types respond to an internal social reorganization of hunter-gatherers groups that had to deal with climate change, faunal, ecologic shifts associated with the expansion of the subtropical forest by the riverbanks that occurred during the Pleistocene Holocene transition. At a regional level, a settlement pattern emerges where the early sites are located on the banks of Uruguay River near the mouth of rivers and arroyos, near *rapidos*, natural passages (*pasos*), and small cascades (*cachoeiras*). This pattern suggests that the sites are located in strategic places, closely related to hunting, fishing and raw material procurement. Finally, an archaeological and behavioural model for the early peopling for the Uruguay middle River basin is presented.

ORAL

### 20. THE HUNTER-GATHERER AS SUSPECT: A BIOGEOGRAPHIC AND ECOPHILOSOPHIC REVIEW ON THE CONTROVERSY MAN/EXTINCTIONS IN SOUTH AMERICA

*Monjeau, Adrián (Fundación Bariloche & Consejo Nacional de Investigaciones Científicas y Técnicas (CONICET) amonjeau@gmail.com*

*Rapoport, Eduardo H. (Laboratorio Ecotono, Centro Regional Universitario Bariloche, Universidad Nacional del Comahue) rapoport@cab.cnea.gov.ar*

The myth of the *bon savage* has exerted a wide influence over anthropological thinking. The myth advances the idea that humans are a "natural" component of nature, a noble hunter-gatherer living in ecologically sustainable harmony with the environment. In many protected areas, this idea has shaped policies on the management of natural resources. However, the correlation between the entrance of humans into new environments and the peaks of extinction that follow seem to contradict this view of humans. A complex variety of positions have been taken on this issue: were humans guilty of causing the Quaternary extinctions? This controversy space hinges around an intricate web of cause and effect interactions ranging from climate, area, fire, technology, the differential coevolution, available energy, natural and anthropic causes, to current problems of scale in the interpretation of what is politically correct or ecologically incorrect in protected areas.

In the present review, we propose a multivariate model, based on a multi-causal vision of the scenario produced by the extinctions of the megafauna. The patterns of extinction between 100,000 BC and 1,500 AC are analyzed and compared with those of the European influence (1500 AC to the present time). There is a disproportionate rate of large mammal and bird extinction in relation with the appearance of man on islands or in partially isolated environments. Most extinctions (68% in mammals and 82% in birds) occurred on islands during the first 100 years of human occurrence. On the other hand, the percentage of genera extinctions in continents (Eurasia 1%, Africa 7%, North America 73%, South America 79%, Australia 86%) are correlated with the continental area. There is also a strong positive correlation between the maximum mammal mass and the continental area. During the glacial ages, predators (including *Homo sapiens*) and preys were pushed together to the same refuges. Similarly, at present, hunter-gatherers and their potential preys are pushed into non-developed areas. Since 1500,

at least 83 species of mammals, 128 species of birds, 21 reptiles, 5 amphibians, 81 fish, 375 invertebrates and 380 species of plants have become globally extinct. In modern times, an average of 20 to 25 species of mammals and birds is extinguished every 100 years, which raises the rate of extinction 200 times the natural background. A theoretical model of faunal extinction related with a body mass/area relationship, energy available and human presence is proposed.

According to this multi-causal proposition, we claim that the persistence of a species in the ecosystem will depend on their available energy for biomass productivity. Therefore, extinction rates should be related with the carrying capacity of the predator/prey system, rather than on an alleged ethical content attributed to hunter-gatherers, because they were part of an inescapable ecological melt-down process. The link between the situation of hunter-gatherers and indigenous populations in protected areas is confusing, and must be thought of in terms of similarities and differences, so that theory can contribute to decision-making.

#### ORAL

### 21. GENETIC DIVERSITY IN MATERNAL AMERINDIAN LINEAGES IN ARGENTINIAN PATAGONIA.

*Crespo, Cristian Marcelo* (1. Departamento de Antropología Biológica, CEBBAD-Universidad Maimónides; 2. CONICET; 3. Fundación Félix de Azara) [cristianmcrespo@gmail.com](mailto:cristianmcrespo@gmail.com)

*Postillone, María Bárbara* (1. Departamento de Antropología Biológica, CEBBAD-Universidad Maimónides; 2. CONICET; 3. Fundación Félix de Azara) [mariba\\_postillone@hotmail.com](mailto:mariba_postillone@hotmail.com)

*Russo, Gabriela* (1. Departamento de Antropología Biológica, CEBBAD-Universidad Maimónides; 2. CONICET; 3. Fundación Félix de Azara) [gabulabis@gmail.com](mailto:gabulabis@gmail.com)

*Bravi, Claudio M.* (4. IMBICE; 5. Facultad de Ciencias Naturales y Museo-Universidad Nacional de La Plata;) [cmbravi@yahoo.com.ar](mailto:cmbravi@yahoo.com.ar)

*Avena, Sergio* (1. Departamento de Antropología Biológica, CEBBAD-Universidad Maimónides; 2. CONICET; 3. Fundación Félix de Azara; 4. IMBICE) [sergioavena@gmail.com](mailto:sergioavena@gmail.com)

*Dubois, Cristian Favier* (1. Instituto de Ciencias Antropológicas FFyL, UBA; 5. CONICET- INCUAPA, Departamento de Arqueología, Facultad de Ciencias Sociales, UNICEN) [cfavier@coopenet.com.ar](mailto:cfavier@coopenet.com.ar)

*Hajduk, Adam* (1. CONICET Administración de Parques Nacionales) [adamhajduk@bariloche.com](mailto:adamhajduk@bariloche.com)

*Arrigoni, Gloria* (1. Área de Investigación del Museo Regional Rada Tilly-Chubut) [arrigonigi@speedy.com.ar](mailto:arrigonigi@speedy.com.ar)

*Lanata, José Luis* (1. CONICET-IIDyPCa) [dejeancr@gmail.com](mailto:dejeancr@gmail.com)

*Dejean, Cristian* (1. Departamento de Antropología Biológica, CEBBAD-Universidad Maimónides; 2. CONICET; 3. Fundación Félix de Azara; 4. IMBICE;) [jllanata@gmail.com](mailto:jllanata@gmail.com)

Recently new approaches about American regional peopling are being produced from several disciplines and contribute to explain different social and biological aspects from ancient populations. Patagonia, the southern region of South America, presents evidence of early archaeological sites, with an accepted chronology of 14,500 cal BP in Chile and 13,900 – 12,800 cal BP for Argentinian locations.

The study of mitochondrial DNA can be used to determine the genetic structure and the evolutionary history of human groups. Different clades have been described so far in South America. They exhibit different mutations and sometimes a geographic specific dispersion. For example: B2 haplogroup is more frequently found in the Andean region, A2 in extant samples of Argentinian Mesopotamia, and C1, D1, D4h3a and some of their variants in ancient Patagonian groups. The aim of this study is to provide new data about the maternal lineages that inhabited Patagonia during the Late Holocene and determine their regional distribution.

A total of 58 human samples were analyzed, their chronology go from 4800 ybp to contact period, they belong to museum collections or archaeological sites from different locations in Patagonia. DNA was extracted after demineralization, proteinase K digestion, organic solvent extraction and concentration with silica columns and/or with QIAamp DNA Investigator kit (Qiagen). Haplogroups were typified by PCR-RFLP and sequencing of the hypervariable region I (HVR I). Analyses were performed to calculate genetic diversity, their association with the geographic distribution (Mantel Test) and the differentiation among Patagonia populations (AMOVA).

So far DNA of 33/58 samples (57.0%) could be assigned by RFLP, 19 (57.6%) samples belong to D haplogroup, 12 (36.4%) to C and 2 (6.0%) to A. HVR-I sequences were obtained in 20/33 individuals. The following lineages were identified: A2, C1, D1, D1g, D1j and D4h3a. Statistical analysis revealed that no genetic differentiation would exist among the studied groups.

As previously described, most of the individuals analyzed were characterized C1 and D1. We also detected D1j, D1g and D4h3a on the Atlantic coast, traditionally



accepted as founder lineages coming south by a Pacific coastal route, and present in extant natives. This raises the question about whether the initial peopling occurred from the Pacific coast with a subsequent expansion or it came from the North through an Atlantic route, or both. Finally, we could postulate a reduced genetic diversity and no population structure, perhaps the result of founder effect and/or genetic flow among the Patagonian natives.

Our results suggest a better explanatory performance of the Recurrent Gene Flow (RGF) model and support the idea that the phylogenetic history is better recovered in the integrated morphospace. We suggest that incorporating modern concepts of the Evolutionary Developmental field can be crucial to enhance the interpretation of morphological diversification on the skull and other complex phenotypes in the context of micro and macro evolutionary studies.

ORAL

## 22. CRANIOFACIAL EVIDENCE AND THE NEW WORLD SETTLEMENT: USING EVO-DEVO CONCEPTS TO ENHANCE THE PHYLOGENETIC SIGNAL OF SKULL SHAPE DATA.

*de Azevedo, Soledad (Centro Nacional Patagónico, Consejo Nacional de Investigaciones Científicas y Técnicas) deazevedo@cenpat.edu.ar*

*González-José, Rolando (Centro Nacional Patagónico, Consejo Nacional de Investigaciones Científicas y Técnicas) rolando@cenpat.edu.ar*

Skull size and shape data has been widely used to infer past and modern within and among group affinities. However, we are far from an extensive knowledge about the causation and underlying factors determining the patterns of skull variation and covariation. Its relevance for reconstructing dispersal of anatomically modern humans and among-population diversification processes relates to the fact that phylogenetic signals, even when massive evidence indicates their presence, are often blurred due to the fact that the vertebrate skull is a complex phenotype where morphological integration and modularity coexist and simultaneously act as covariance generators and structuring processes.

In this context, we applied the Factor Model (Mitteroecker and Bookstein 2007), Geometric Morphometric techniques and basic and partial Mantel tests to analyze the integrated and modular shape spaces on Early and Late skull samples of Native American, Asiatic and Australian populations. We have tested the congruence of different competing scenarios against observed biological distances matrices computed on the different morphospaces: a shape space where covariation sources are summarized by a few common integrator factors between modules, or modular shape spaces where local factors influence specific regions of the skull (face and neurocranium).

ORAL

## 23. UNDERSTANDING PROCESSES AND CONDITIONS SURROUNDING EARLY CULTURAL EVOLUTION ON THE CANADIAN PLATEAU

*Villeneuve, Suzanne (Simon Fraser University) suzanne\_villeneuve@sfu.ca*

Understanding the processes and conditions surrounding early cultural developments and emergent complexity is of central concern in studies of human and cultural evolution in the Americas and elsewhere. One of the major themes in research on this topic has involved understanding why transitions from more egalitarian organizations to non-egalitarian, hierarchical relations occur. This transition is one of the most important issues in hunter/gatherer adaptations on the world stage today since it represents a major threshold in cultural developments leading to contemporary types of societies with all their inequalities and complexities.

Most prehistorians believe that small groups of simple hunter/gatherers, or foragers, undertook the initial peopling of the Americas and that these groups characterized early human adaptations until sometime during the Archaic period. As simple foragers, these Paleo-Indian and possible pre-Clovis groups are generally thought to have consisted of highly mobile, low density, small egalitarian bands. It is generally assumed that these groups did not rely on stored foods, they lacked any significant notions of private ownership, they had few or no prestige objects, they had no socioeconomic inequalities and no economically-based competition. However, at various times in different regions, fundamental changes began to occur in this simple forager system together with some new fundamental technological innovations. Population densities increased, band sizes increased, some sites were repeatedly occupied or used by semi-sedentary groups, more permanent architecture became established, storage of food was adopted, prestige items

began to appear (implying private ownership), cemeteries with notable grave goods occurred together with other evidence that makes it possible to begin thinking about emerging socioeconomic inequalities. Groups with these new adaptations are generally referred to as complex or transegalitarian and hunter/gatherers.

In the Americas, one of the key geographical areas for studying the transition to more complex hunter/gatherer societies has been the Northwest Coast and Plateau of North America. As in other regions, debates have arisen over the timing and conditions surrounding the emergence of inequalities. Models focus on whether inequality emerged with early village developments under conditions of resource abundance and changes in procurement or storage technology, or whether inequalities occurred later in village development under resource and demographic pressures during periods of climate change. These models are testable by examining the timing of cultural changes in relation to coterminous environmental conditions or technological changes and their magnitude.

Attempts have been made to use various types of analysis to monitor economic, social and climatic changes over time in Canadian Plateau sites (Hayden 1997, 2000, 2004; Prentiss et al. 2003, 2007). However, a number of new techniques and methods have recently provided an improved means of monitoring changes over time, and are helping build a more comprehensive dataset and approach to evaluating models (Villeneuve 2014).

This research on the Canadian Plateau is of considerable importance as it is making theoretical progress possible in the discipline, especially for understanding processes surrounding early cultural developments and early adaptive patterns and changes of hunter/gatherers.

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ORAL

#### **24. CULTURAL DIVERSIFICATION AND ACCELERATED PHENOTYPIC EVOLUTION: A CASE STUDY ON THE XAVÁNTE INDIANS**

*Hünemeier, Tábita (Departamento de Genética, Instituto de Biociências, Universidade Federal do Rio Grande do Sul) hunemeier@gmail.com*

*Gómez-Valdés, Jorge (Departamento de Anatomía, Facultad de Medicina, Universidad Nacional Autónoma de México) pollosapiens@yahoo.com.mx*

*Ballesteros-Romero, Mónica (Escuela Nacional de Antropología e Historia) ballesterosrgm@gmail.com*

*de Azevedo, Soledad (Centro Nacional Patagónico, Consejo Nacional de Investigaciones Científicas y Técnicas) deazevedo@cenpat-conicet.gob.ar*

*Martínez-Abadías, Neus (Department of Anthropology, Pennsylvania State University) nmartinezabadias@gmail.com*

*Esparza, Mireia (Secció d'Antropologia, Departament de Biologia Animal, Universitat de Barcelona) mirashka@gmail.com*

*Sjøvold, Torstein (Osteologiska enheten, Stockholms Universitet) Torstein.Sjovold@ofl.su.se*

*Bonato, Sandro L. (Faculdade de Biociências, Pontifícia Universidade Católica do Rio Grande do Sul) slbonatto@pucrs.br*

*Salzano, Francisco M. (Departamento de Genética, Instituto de Biociências, Universidade Federal do Rio Grande do Sul) francisco.salzano@ufrgs.br*

*Bortolini, Maria-Cátira (Departamento de Genética, Instituto de Biociências, Universidade Federal do Rio Grande do Sul) maria.bortolini@ufrgs.br*

*González-José, Rolando (Centro Nacional Patagónico, Consejo Nacional de Investigaciones Científicas y Técnicas) rolando@cenpat-conicet.gob.ar*

Changes in social structure and cultural practices can potentially promote unusual combinations of allele frequencies that drive the evolution of genetic and phenotypic novelties during human evolution. These cultural practices act in combination with geographical and linguistic barriers and can promote faster evolutionary changes shaped by gene-culture interactions. However, specific cases indicative of this interaction are scarce.

Here we show that quantitative genetic parameters obtained from cephalometric data taken on 1,203 individuals analyzed in combination with genetic, climatic, social, and life-history data belonging to six South Amerindian populations are compatible with a scenario of rapid genetic and phenotypic evolution probably mediated by cultural shifts.

We found that the Xavánte experienced a remarkable pace of evolution: the rate of morphological change is far greater than expected for its time of split from their sister group, the Kayapó that occurred around 1,500 years ago. We also suggest that this rapid differentiation was possible due to strong social-organization differences that probably triggered reproductive isolation.

Our results demonstrate how human groups deriving from a recent common ancestor can experience variable paces of phenotypic divergence, probably as a response to different cultural and/or social determinants. Assem-

bling composite databases involving cultural and biological data will be of key importance to unravel cases of evolution modulated by the cultural environment.

POSTERS

POSTER

**25. FAUNAL DYNAMICS IN SOUTHERN EUROPE AT THE TIME OF THE FIRST HUMAN DISPERSAL**

*Palombo, Maria Rita (Dip. Scienze della Terra, Sapienza Università di Roma, Italy) mariarita.palombo@uniroma1.it*

Deconstructing the dynamics of Southern European mammalian faunas during the Early Pleistocene is of crucial importance to infer to what extent, if any, climate changes might have promoted dispersals, diffusion and at least temporary settlements of archaic human populations in these regions before and during the marked transition of Earth's climatic system known as the Mid-Pleistocene Revolution.

The South European Quaternary fossil record is particularly suitable for studying the role of climate change at local and regional levels because of the complex physiographic and climatic heterogeneity of the study area, the complex history of invasions of species of varying geographical origin and provenance, and the presence of important barriers that at times either prevented the range of some taxa from reaching some regions or caused delays in the dispersal of a taxon in some territories.

This research aims to provide fresh data by analysing timings and mode of dispersal in South Europe of large mammals, focusing on asynchronous versus diachronous bioevents across geographical and ecological boundaries, and analysing the changes in local versus regional functional dynamics through time. The data base consists of taxonomically revised lists of species from selected faunal assemblages ranging in age from about 1.6 to 0.5 Ma.

By combining the strands of available information, we can observe that during most of the Pleistocene, cause-and-effect relationships between climatic oscillations and faunal changes were the cumulative result of the response of individual species to physical and biotic environmental changes. The major environmental perturbations, triggering dispersal events and removing keystone species, modified the structure of the pre-existing mammalian faunas, merging previously indepen-

dently-evolved taxa into new palaeo-communities. The altered internal equilibrium gave rise to new inter-guild and intra-guild competition/coevolution dynamics, thus leading to shifts in community structures over periods generally exceeding Milankovitch's cycles. Diachroneity in local turnover across the study region probably relied on differences in local biotic dynamic patterns, though different manifestations of global climate changes in different geographic settings would have contributed to the scale of local appearance/disappearance bioevents. Over the post-Olduvai Early Pleistocene, climatic changes led in most of SW Europe to an environmental instability in a more arid, open context. This might have facilitated the dispersal of hominin groups, because the increased habitat heterogeneity and the rebuilding of the structure of mammal palaeo-communities possibly allowed more flexible, opportunistic species, such as hominins, to exploit a broad spectrum of resources. The new scenario likely allowed pursuit, ambush, and pack hunting predators to differentiate better their niches and to partition resources, thus reducing inter-specific competition. This might have given certain new opportunities to archaic hominins viewed as opportunistic scavengers with limited technological capabilities.

POSTER

**26. MAJOR ATMOSPHERIC CHANGES IN THE TROPICAL REGION DURING THE EARLY PLEISTOCENE (1.9 MA) AND OCEANOGRAPHIC IMPLICATIONS IN EASTERN EQUATORIAL PACIFIC**

*Povea de Castro, Patricia (Universidad de Barcelona) patriciapovea@ub.edu*

*Cacho Lascorz Isabel (Universidad de Barcelona) icacho@ub.edu*

*Moreno Caballud, Ana (IPE-CSIC) amoreno@ipe.csic.es*

*Pena, Leopoldo (Lamont-Doherty, U.Columbia), Luis Valero Montesa - luisvalero@ub.edu (Universidad de Barcelona) leopoldo@ldeo.columbia.edu*

Climate variability has shaped the major environmental changes along the Quaternary and it is believed to be closely tied with human evolution. The early Pleistocene, around 1.9 Ma, was a critical period in hominid evolution and some hypothesis link evolutionary changes in this period to climate change. In particular, it has been proposed that during this period occurred a strong development of Walker circulation (Ravelo et al., 2004). But there are not evidences of the impact of these changes in the Intertropical Convergence Zone (ITCZ) which ultimately control rain patterns at low latitudes.

This study aims to identify coupled atmosphere-ocean changes in the Eastern Equatorial Pacific (EEP), by means of the ODP Site 1240 lithic and biogenic components. We analysed  $\delta^{18}\text{O}$  in benthic and planktonic foraminifera, Total Organic Carbon (TOC), biogenic Silica (Si), terrigenous content, and Fe XRF composition. The obtained results are compared with other tropical records from Equatorial Atlantic Ocean and Indian Ocean in order to evaluate those changes in a broad context.

$\delta^{18}\text{O}$  benthic record provides a robust chronological framework, extending from 1.6 to 2.2 Ma.  $\delta^{18}\text{O}$  planktonic and benthic records show a glacial-interglacial variability paced by changes in the obliquity cycle, and the  $\delta^{18}\text{O}$  planktonic indicates the occurrence of relatively cold interglacial between 1.8 and 1.65 Ma. Throughout the studied period, Fe and lithogenic content, show an extraordinary resemblance. In base to these records, it can be clearly distinguished the glacial periods prior to 1.85 Ma, dominated by low Fe and sparse lithogenic grains, poorly sorted and coarser, which could reflect the dominance of stronger trade winds. This would stimulate the equatorial upwelling which is consistent with high TOC and Si fluxes. Diatom mats deposition during these periods suggests a major upwelling of rich-silica waters probably from the Southern Ocean (Calvo et al., 2011). Moreover, glacial periods after 1.85 Ma show an increase of Fe and fine/better sorted lithic grains which suggest weaker trade winds and reflect an enhanced wet deposition with an ITCZ southern position.

The high resolution of the studied period allow to establish a sequence of changes demonstrating a complex evolution of the ITCZ during glacial but also during interglacial periods which were likely linked to the progressive enhancement of the Walker circulation. Strong changes occurred from 2.1 Ma with an ITCZ northward location only during glacial periods. At 1.85 Ma moved slightly southwards during glacial periods but it have and likely changed the position also during interglacial. The 1.85 Ma shift can be also detected in other areas under ITCZ influence, also suggesting an intensification of upwelling and winds on the west coast of Africa. These changes could be related to the drier conditions described in African low latitudes which triggered a gradual replacement from woodland to savannah grasslands (deMenocal, 2004). Defining a clear sequence of climate changes during the early Pleistocene will serve to place the context for the environmental changes that may have a role in the evolution from *Homo habilis* to *Homo erectus*.

## 27. THE EARLY MIDDLE PLEISTOCENE MICROVERTEBRATE ASSEMBLAGE FROM WADI SARRAT (TUNISIA)

*Mtimet, Moncef-Saïd (Faculté des Sciences de Bizerte, Département de Géologie, Université de Carthage, 7021 Bizerte, Tunisia) moncef\_mtimet@yahoo.fr*

*Karoui-Yaakoub, Narjess (Faculté des Sciences de Bizerte, Département de Géologie, Université de Carthage, 7021 Bizerte, Tunisia) narjess1999@yahoo.fr // Narjess.ElKaroui-Yaakoub@fsb.rnu.tn*

*López-García, Juan Manuel (Sezione di Scienze Preistoriche e Antropologiche, Dipartimento di Studi Umanistici, Università degli Studi di Ferrara, C. so Ercole I d'Este, 32, 44100 Ferrara, Italy) lpzjnm@unife.it*

*Blain, Hugues-Alexandre (Institut Català de Paleoecologia Humana i Evolució Social-IPHES, C/ Marcel·lí Domingo s/n, Edifici W3, Campus Sescelades, 43007 Tarragona, Spain / Àrea de Prehistoria, Universitat Rovira i Virgili, Avda. Catalunya 35, 43002 Tarragona) hablain@iphes.cat*

*Agustí, Jordi (Institut Català de Paleoecologia Humana i Evolució Social-IPHES, C/ Marcel·lí Domingo s/n, Edifici W3, Campus Sescelades, 43007 Tarragona, Spain / ICREA, Barcelona, Spain / Àrea de Prehistoria, Universitat Rovira i Virgili, Avda. Catalunya 35, 43002 Tarragona) jordi.agusti@icrea.cat*

*Amri, Lamjed (Faculté des Sciences de Bizerte, Département de Géologie, Université de Carthage, 7021 Bizerte, Tunisia) amjadamal2@live.fr*

*Martínez-Navarro, Bienvenido ( IPHES, Institut Català de Paleoecologia Humana i Evolució Social (IPHES), 43007, Tarragona, Spain. /Àrea de Prehistoria, Universitat Rovira i Virgili (URV), 43002, Tarragona, Spain./ ICREA, Barcelona, Spain) bienvenido@iphes.cat*

The Oued Sarrat (Kef area, northwestern Tunisia) is an endorheic basin with a wide extension. It shows a well exposed series of grey and clastic shales with a thickness which exceeds 10 m.

Clay sediments coming from the systematic excavation of the lower palustrine-lacustrine black deposit are washed through sieves with water and then dried. Residues are sorted and observed under the binocular microscope. The microvertebrates seem to be abundant and diversified, so we have identified an association of different kind of fossil teeth belonging to seven small mammals species, including one insectivora (*Crociodura* sp.) and six rodents (*Mus aff. spretus*, *Mus cf. hamidae*, *Paraethomys cf. rbiae*, *Praomys* sp., *Meriones* sp., and *Eliomys* sp.). There are also some bone fragments from other small vertebrates such as one freshwater fish (*Cyprinidae*

indet.), two anurans [*Discoglossus pictus* (Alytidae) and *Bufo bufo* (Bufonidae)], one terrapin [*Emys* sp., or *Mauremys* sp.], three squamates [an indeterminate small lacertid or scincid lizard, *Natrix maura* (Natricidae) and an indeterminate colubrid snake (Colubridae)], and one small-sized bird (*Passeriformes* indet.).

The combination of the paleomagnetic data together with those coming from the biochronology provided by the most significant taxa (*Mus aff. spretus*, *Mus cf. hamidae*, *Paraethomys cf. rbiae*, *Praomys* sp. and *Meriones* sp.) suggest an age for the lower black palustrine level related to the early Middle Pleistocene, close to 700 ka BP (Martinez-Navarro *et al.* 2014).

This microvertebrate fossil assemblage also informs on the good climatic and paleoecological conditions, basically supported by amphibians and reptiles, for the dispersal and colonization of the northern African latitudes by early hominins carrying with them the Acheulian technology.

# A3b Transition from Lithic to Metal – appraisal on global changes

Commission on The Metal Ages in Europe  
(Organizers: Rama Krishna Pisipaty)

Tuesday 2nd  
14:00-19:30  
S3 Meeting Room



2014 burgos  
1-7 sept.

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ORAL

## 1. TRADITIONS AND INNOVATIONS OF THE LATE BRONZE AGE MATERIAL CULTURE OF SOUTHERN TRANSURALS

*Shcherbakov, Nikolai (Bashkir State Pedagogical University named after M.Akmulla, RF,Ufa) sherbakov@rambler.ru*

*Shuteleva, lia (Bashkir State Pedagogical University named after M.Akmulla, RF,Ufa) shutelevai@gmail.com*

*Leonova, Tatiana (Bashkir State Pedagogical University named after M.Akmulla, RF,Ufa) leonotan@mail.ru*

*Kraeva, Ludmila (Orenburg Pedagogical University, RF) kraeva\_ludmila@mail.ru*

*Golyeva, Alexandra (Institute of Geography, Russian Academy of Science, Moscow, RF) alexandragolyeva@rambler.ru*

The Late Bronze Age on the territory of Southern Transurals is connected with plenty of archeological cultures and population groups: Srubnay and Andronovsky. Interaction of these population groups constitutes special mixed material culture having stable common features of independent Srubnay and Andronovsky cultures, as well as stable local features. These population groups brought to the region method to produce bronze. The biggest mines of the region are Kargaly mines (Chernykh, 2007). New methods to produce ceramics were also discovered; they combined two traditions – Srubnay and Andronovsky.

Traditional concept of the Late Bronze Age, explaining cultural diversity of continuity of Abashevsky, Srubnay and Andronovsky cultures, came to formation of chronological scales in 1970 – 1980. Application of natural science methods (radiocarbon dating, paleopedology, tracology, osteologic analysis, bronze metallographic analysis, application of ceramics spectral, technical and process analysis methods, etc.) proved that these conclusions were not quite correct.

All these methods were applied to investigate archeological micro-district in Urshak river basin (Southern Transurals). Area of micro-district investigated is 23,4 km<sup>2</sup>, it includes group of 5 settlements (Muradymovsky settlement, Usmanovo I – IV settlements) and 4 burial mounds (Kazburun I – IV burial mounds). Collection of bronze articles, found out in this micro-district comes only from Muradymovsky settlement. In Muradymovsky settlement the traces of bronze-foundry production (stone foundry moulds fragments, slags), estimated place of bronze production as well as different bronze articles were identified. In Russian Academy of Science laboratory of natural science methods in archeology

they analyzed metallographic specimens of bronze-foundry production. Bones and stones still prevailed in materials of tools produced. Though trace analysis of rich anthropologic material found out in Muradymovsky settlement, identified traces of human bones working by metal ware. In 2008 – 2013 radiocarbon analyses of anthropologic materials were performed: AMS-dating of teeth buried in Muradymovsky settlement and Kazburun I burial mound, as well as AMS-dating of ceramics belonging to above mentioned settlements. The results can be grouped (Beta Analytic 1890 – 1750 BC). Osteologic analysis data proved unity of species composition of flock in all settlements. To define methods to produce ceramics belonging to Kazburun I mound and Usmanovsky III settlement, process and technical analysis of ceramic material was performed, that let identify presence of two similar traditions observed in materials of both monuments - Srubnay and Alakul.

In the process of investigations dates of settlements and mounds of the Late Bronze Age were obtained; the data let age chronological frameworks by 150-200 years. Bronze production centers were found out on the territory of the settlement. Independent cultural tradition in ceramics production was identified.

Investigations conducted let unite different cultural traditions in one period of the Late Bronze Age. Cultural traditions in use and production of bronze, resources were same on this territory. However the use of metal was not essential in economic and cultural type. Stone and bone industry prevailed in inhabitants' life.

ORAL

## 2. EARLY STATE FORMATION IN VIDARBHA DURING IRON AGE

*Sawant, Reshma (Deccan College, Pune, India) drreshma.sawant@gmail.com*

*Shete, Gurudas (Deccan College, Pune, India) shete.gurudas@gmail.com*

The present paper focuses on the 'Early State' formation process during the Iron Age, c. 8<sup>th</sup> century BCE to 4<sup>th</sup> century BCE, in the Vidarbha region which also coincides with the existence of Megalithic Culture. Iron Age sites in Vidarbha have revealed the existence of two ethnic groups, viz., A. people erecting megalithic structures for disposal of the dead, and B, people following a different mode of disposal of the dead. Important excavated

sites of group 'A' are - Junapani, Mahurjhari, Takalaghat-Khapa, Naikund, Bhagimohari, etc.; and of group 'B' are - Kaundinyapur, Paunar, Adam, etc.

On the basis of the study of archaeological evidence from published excavation reports, the following observations can be made with regard to the process of state formation during the said period:

### 1. *Significance of Craft Specialization*

There is significant evidence of technological progress and extensive use of metal craft and lapidary. Megalithic burials have yielded a number of iron objects, particularly agricultural tools and a variety of offensive and defensive weapons. The use of metals, especially iron, by Vidarbha Iron Age people suggests that the need for these was becoming quite enormous and the reason behind this may be related to military, agriculture, and increasing exchange.

### 2. *Proto-administrative Functionaries*

The sites of Adam and Pauni have furnished evidence of rampart as part of collective protective strategies which indicates social ranking: the ruler and the ruled. Such construction shows the capacity of an authority, to direct or to impose manpower to carry out public works, though not necessarily through specialized administration.

The presence of rampart and variety of iron weapons supports the existence of a warrior class which was probably necessary to defend their state from other tribes, *Janapadas*, and *Mahajanapadas*.

### 3. *Inter-regional and Long Distance Exchange and Inter and Intra-site Hierarchy*

The long distance exchange of useful goods or raw material are more likely to occur successfully when they can be arranged and administered by a leader (Service 1975: 292). The occurrence of iron implements, gold ornaments, beads of shells and semi-precious stone from common distant sources at various sites suggest widened exchange network as well as hierarchy of sites (producers, receiver, and middlemen).

The study suggests that this period witnessed manifestation of a process that transformed the society into a class differentiated one. In a nut shell, c. 8<sup>th</sup> to 4<sup>th</sup> centuries BCE, the region of Vidarbha experienced the formulation of 'Early State' which is demonstrated through, 1. large number of sites which give an idea about the demography of contemporary population; 2. archaeological evidence of craft and agriculture which definitely

point to enough surplus to play a role in exchange network; 3. existence of some sort of authority to prepare defensive measures and regulate trade; 4. elaborate burial practices which adequately reflect social stratification; and 5. lastly, wide spread and uniform megalithic burial practices indicating common ideology among the majority of population.

## ORAL

### 3. A CHANGING PATTERN OF SOCIO-CULTURAL SYSTEM FROM CHALCOLITHIC TO THE EARLY HISTORIC PERIOD IN WEST BENGAL? A STUDY BASED ON DIFFERENT TECHNOLOGIES AND INDUSTRIES.

*Basu, Durga (Dept. of Archaeology, Calcutta University) durgabasu57@gmail.com*

In recent Indian historical researches, a new interest among the scholars developed about the study of various ancient industries, considering their growth as an important socio-cultural phenomenon. In a given society multitudinal growths of industries and development of technology not only indicate economic development but also show a complex form of society. Moreover development of various industries helps us to understand a changing pattern of a simple village life to a sophisticated urban culture. The present paper aims to highlight the gradual transformation of the socio-cultural system from chalcolithic village culture to the Iron-age culture in West Bengal.

Since the present attempt is based on the study of technological development and various industries emerged during early historic phase (N.B.P. culture) in West Bengal, different excavated industrial materials will be discussed. A comparative study will be made of the materials discovered from both of these cultural phases, highlighting a transition from the chalcolithic to the Iron age or early historic period. The study will include typological, technological and stylistic differences of the materials.

In West Bengal, there are two clear cut cultural zones of Pre-historic chalcolithic settlements and the early Iron-age culture marked by N.B.P. period. From these two settlement areas one can trace the transformation of simple agricultural village life to an urban culture. A significant change has been noticed in the socio-cultural system during N.B.P. period in comparison to the previous chalcolithic phase. One can observe the change through the study of new technological development in agriculture and specialized industries like metal, ceramic, bead and



others. The base that was created in the chalcolithic stage received developmental impetus during early historic period.

The present effort will help us to understand the genesis of the changing patterns of socio-cultural system which was directly connected with various industries and technological development.

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ORAL

#### 4. IRON TECHNOLOGY IN NORTHERN INDIA: A RE-APPRAISAL OF EMERGING PATTERN

*Srivastav, Omprakash (Centre of Advanced, Department of History, Aligarh Muslim University, Aligarh, India) sramakrishna.pisipaty@gmail.com*

There are a large number of unresolved issues related to the beginning and growth of iron technology in India. There are misconceptions/ misplaced notions due to lack of right information on the subject. What is required is a critical evaluation of data and deeper inquiry of relatively unknown facts. To attain this goal the following strategy has been devised:

Literature survey for collection of data from different sources, viz. (a) archaeological (b) literary (c) ethnographical (d) archival.

Collection and analysis of ore, iron objects crucibles, slag, furnace remains for retrieving further information and reconstruction of metallurgical processes.

Survey and documentation of tribal regions for collection of in depth information on traditional iron working. The introduction of Iron Technology emerges in Northern India from the Proto-historical phase (1100-700 B.C.) from the PGW level. The excavated site i.e. Jakhera iron objects has been found from the early levels of PGW phase, which is known as Proto-PG level. The present paper deals with the study of various types of iron tools and implements recovered from the archaeological excavations. The area under study is rich in yielding the iron implements such as arrowheads, spearheads, knives, bangles, chisels, nails, bars/rods, ploughshares, diggers, sickles, etc The detailed study of iron implements have been undertaken to understand the changes in shape and size and their prolific use if any within a cultural period and one cultural to another. The above-mentioned iron implements may find support from the cotemporary texts, which do not provide a picture of wide famili-

arity with these metals for the purpose. There is a need to undertake a holistic approach to resolve the issues related to iron in India.

The main aim of the present study is to bring out a comprehensive history of iron technology in India using a multidisciplinary approach.

To study in detail the iron technology with a multidisciplinary approach using all possible sources.

To correlate the resource-zones and the related important cultural centers of ancient India.

To undertake ethnographic investigations in remote areas for the surviving remains of traditional iron working. To interpret and synthesize the data collected in the form of a book on ancient Indian iron technology covering all its aspects.

Conclusion: (1) Socio-economic Implication of Use of Iron through the Ages, (2) Technology adaptation and productivity, (3) Innovations in Iron and distribution through trade, (4) Cultural dynamics.

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ORAL

#### 5. EARLY IRON AGE HUMAN ACTIVITIES ON SOUTHERN PART OF INDIA: FROM RECENT ARCHAEOLOGICAL EXCAVATIONS.

*Pisipaty, S. Rama Krishna (Prof. & Geoarchaeologist Department of Sanskrit & Indian Culture Sri Chandra Sekharendra Saraswathi Viswa Maha Vidyalyaya) sramakrishna.pisipaty@gmail.com*

The influence of metal technological knowhow had also been appeared in the southern part of India from the beginning of the last millennium BCE. No doubt, it was a major breakthrough in the history of mankind. Because, it had a turn towards successive stages of modification from the barbaric mode to the sophisticated and comfortable way of living lifestyle with the master over utility of metals like copper/bronze and iron for different purposes. Besides being technological attainment, the use of these metals improved general living patterns and also governed economic processes during the Early Iron Age.

Construction of structures with big boulders (mega-liths) for after death rituals was another practice developed during this period which is not only providing their constructional technological skills but also the development

of socio-cultural trends which prevailed thousands of years, still in practice in many pockets. Further, another greatest technological achievement in blacksmiths' workshop was originate from the Indian subcontinent i.e. Carburization of iron also known as *Wootz Steel* (Corrosion-Resistant Iron). It was well developed indigenous technology by the end of the last millennium BCE in India.

Recent archaeological excavations and material related to the Early Iron Age technologies, settlement pattern, socio-cultural trends on the southern part of India are the subject matter for present paper.

The above discoveries and researches in the southern part of India revealed that by the end of the last millennium BCE, advanced iron technologies like carburization, commercial based production, etc. technological achievements appeared in the region. Besides, after death rituals and constructions with mega-lights were also developed in great extent.

# A3C The emergence of warrior societies and its economic, social and environmental consequences

Commission on The Metal Ages in Europe

(Organisers: Fernando Coimbra, Davide Delfino, Dragoş Gheorghiu)

Thursday 4th (9:00 to 13:00)  
A12 Meeting Room



2014 burgos  
1-7 sept.

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XVII World UISPP Congress  
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XVII Congreso Mundial de UISPP

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ORAL

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### 1. WARRIOR IDEOLOGY, BURIAL CUSTOMS AND GENDER ROLES IN EUROPEAN BRONZE AGE SOCIETIES (2500-800 BC)

*Brandherm, Dirk (Queen's University Belfast) d.brandherm@qub.ac.uk*

At several points in time between the mid 3rd and the early 1st millennium BC, abrupt changes can be observed in the expression of male and female identities through the funerary record of European Bronze Age societies. This paper explores to what extent such changes may be linked to a cyclical waxing and waning of warrior ideologies.

A number of case studies are scrutinized whose chronology ranges from the Beaker period to the Bronze Age/Iron Age transition in Central Europe, comparing male and female grave assemblages and frequency ratios in the funerary record.

Recurrent episodes of warrior ideologies rising over the course of the Bronze Age generally coincide with environmental and/or societal crises. These episodes tend to be relatively short and are usually followed by longer intervals of apparently more stable conditions, during which the focus in the expression of male identities shifts from the display of martial prowess to that of more peaceful means of peer polity interaction.

In a long-term perspective there is clear evidence for cyclical patterning in the impact warrior ideologies had on the representation of male and female identities in the burial record.

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ORAL

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### 2. WAR PSYCHOLOGY IN EUROPEAN COPPER AND BRONZE AGE AND ITS MARKS IN FORTIFIED SETTLEMENTS

*Delfino, Davide (Universidade do Trás os Montes e Alto Douro/ Instituto Terra e Memória, Mação (Portugal), Quaternary Group of Geosciences of FCT) davidedelfino@libero.it*

What are the dynamics that led to the rise of the fortifications in the human settlements from the Recent Prehistory? It is possible to answer this question with a psychological and archeological approach.

On the one hand the psychology of combat, which for a general foundation can also be applied to prehistoric humans, explains some of the dynamics of impression / reaction typical of the human being subjected to danger or death. Five psychological steps identified in a combat psychology study by Dave Grossman, can be applied at pre and protohistoric warrior (and not only) to understand human behavior and its consequences in creating physical protection to the villages. On the other hand the analysis of archaeological data into and nearby settlements, fortified or not fortified, which witness fight scenes, explains the dynamics of the necessity to protect the settlements from the Neolithic (Rubané culture) to the Bronze Age ( Aegean world)

In such cases, the most recent (Bronze Age) build structures considerable such as fortifications, does not imply a real use in real fights, but more probably a deterrence function, maintaining ties with the principles of the psychology of combat: in many cases are more fighting evidence nearby protective structures in Neolithic that do not in Bronze Age.

Which clearly cannot speak of war in the modern sense to the prehistoric age, however it is clear a temporary bellicosity level of fighting since Neolithic. According to L. Keeley, primitive fights are no less bloody of modern warfare. These gradually produced the necessity to protect the settlements with architectures that became, over time, probably many more architectures to psychological deterrence, which fortifications who suffered fighting.

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ORAL

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### 3. THE GROUP OF CUIRASSES FOUND IN THE DANUBE REGION IN THE LATE BRONZE AGE

*Jankovits, Katalin (Pázmány P.K. Universität) msuch.gutierrez@uam.es*

In the Danube north from Budapest, near Pilismarót in Hungary, one cuirass has been found. The breast and back plates of the cuirass were built of bronze plates. The complete cuirass is a unique item and it belongs to the group of cuirasses found in the danube region (Caka, Ducové, Cierna nad Tisou, Nadap, Pázmándfalu). In the Danube region the cuirasses show an influence of the Aegean. In the period of the Late Tumulus culture (Bz D, Bz D-Ha A1), in the Caka culture, different rich warrior tombs were discovered in Hungary and in Slovakia.

These Tombs and the corselets in the Danube region demonstrate the importance of the militar aristocracy in the Late Bronze Age. An intact armour was found in grave 12 of Dendra in the Aegean, which was composed of a high, separate neck guard, interlocked plates and a coat-of-chain built of two parts underneath. Two fragmentary cuirasses of the same type are known from the settlement of Thebes. They are dated from the LH II-III A2/B1 period. The shape of the cuirass from the Danube and its high neck guard are similar to the miniature bronze cuirass, worn as a pendant, from the hoard find of Brandgraben (Steiermark) dated from Bz D-Ha A1 and the bipartite cuirass found in the Seine at Saint-Germain-du-Plain. On this cuirass from the Danube, flat rivets hold the two plates together on both sides. Similar, although conical rivets were used in the cuirasses from Cierna nad Tisou and Saint-Germain-du-Plain. A motive of semicircular, punched dots can be seen on the bottom of the black plate of the cuirass from the Danube. This and the solution of the shoulder strap on the right shoulder show similarity to the cuirass from Saint-Germain-du-Plain. The finely punched dot row ("Gleich-Buckel-System") and the plastic rib are characteristic decorations of the cuirasses of the Danube region. The cuirass from the Danube can not exactly be dated in lac of accompanying finds, nevertheless the listed characteristic suggest that it came from the Bz D-Ha A1 period.

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#### 4. SYMBOLS FOR PROTECTION IN WAR AMONG EUROPEAN SOCIETIES (1000 BC - 1000AD)

*Coimbra, Fernando (Universidade do Trás os Montes e Alto Douro/ Instituto Terra e Memória, Mação (Portugal) coimbra.rockart@yahoo.com*

The emergence of warrior societies in Europe is interconnected with the spread of several symbols, which are used by the warriors to affirm their role and their importance in society. In spite of other meanings that some of these symbols could have had in earlier times, a new social value - protection in war - can be observed with the rise of warrior societies.

In this paper the author analyses motives like the swastika, the triskel and the pentagram, which appear associated with warriors and their weapons in a very diverse range of iconography and artefacts, such as rock art, pottery, funerary tombstones, helmets, shields, fibulae, spears, axes and swords, among other examples. In a methodological way, these motives are studied accord-

ing a context - their association with warriors or with war. Previous or later contexts of the same symbols are also considered but only with the aim of understanding them better regarding the context of warrior societies. The analyses of the mentioned context allows understanding that those motives take advantage of a previous known symbolism and get reinforcement in meaning and diffusion in protohistoric times, among several European cultures through time and space.

The value of protection in war of the studied symbols can result from earlier examples with already a strong meaning in society, when they appear in a religious or in a sacred context, being associated with deities, appearing in funerary cults of different peoples and chronologies.

ORAL

#### 5. SINGULARITIES OF THE BRONZE AGE FUNERARY PHENOMENA IN THE MIDDLE TAGUS AREA.

*Cruz, Ana (Instituto Politécnico de Tomar) anacruz@ipt.pt*  
*Graça, Ana (Instituto Politécnico de Tomar) anagrace@ipt.pt*

Although this section chronology is bound by the Bronze Age and cultural contacts between Atlantic and Mediterranean, we think that is important to establish a diachronic funerary pattern in order to clarify the ideological changes, reflected in the Holocene communities' concepts, social, economic and political set.

The funerary-symbolic phenomena in Portuguese Bronze Age on the area of the Middle Tagus Valley, includes burials in karstic cavities contexts, reusing megalithic monuments and *tumuli*.

From this point, starts the contextualization of these data in the environment of the increasingly complex societies connected by the encounter between sea and ocean.

So, we studied the Portuguese middle Tagus area funerary archaeography and its inclusion in a wider universe, through bibliographic data research.

Our data from archaeography were gathered in excavations and archaeometric studies.

The bibliographic research starts in the Mediterranean world of the Sumerian, the emergence of the pharaohs, the Minoan civilization or the long distance trades carried by the Phoenicians in Mediterranean Sea. Also the

settlement of the Iberian cultures developed after “Los Millares substitution for “El Argar” until Tartessos.

After we carried on with the Atlantic Bronze Age influences through migrations or long distance trades based on different kinds of bronze artefacts or amber commerce.

The outcomes must target two contexts:

The first is the Portuguese regional context of the Middle Tagus.

The second is the trans-regional context composed by the Mediterranean and the Atlantic realities.

Concerning these two wider contexts we state that our study area, although it might be put geographically in both; has its own singularities (even within the Portuguese territory funerary contexts), with micro regional roots.

Towards the archaeological record uniqueness we assume an indigenous approach.

Although perceiving that these communities must have had knowledge of the wider exchange networks presence, it is not possible to ignore the archaeography, where the data point towards a very unique ideology, in which the technological novelties are not crucial to the symbolic and funerary behavior

Thus, we are in the process of creating an explanatory model that we have called mutualistic cosmogony.

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ORAL

## 6. WARFARE IN VALCAMONICA ROCK ART NEW EMERGING DATA FROM PASPARDO AREA

*Sigari, Dario (Cooperativa Archeologica Le Orme dell'Uomo)  
dariothebig@anche.no*

Warrior engravings represent nearly 25% of the entire Iron Age carvings corpus in Valcamonica rock art (Zanetta, 2009). They appeared in Valcamonica rock art tradition in the last centuries of the Bronze Age (XII-IX century BC), becoming the most common figures in the I millennium (Anati, 1982).

Armed anthropomorphs are depicted: standing alone with raised arms; duelling, sometimes there is a third standing and supervising figure, which can be complete or not; riding horses; hunting (Fossati, 2005).

Most of the scenes involving warriors are supposed to be representation of duels. Whilst there are few scenes which are thought to be war and violent activities depictions: see rock 34 in Luine, rock 4 in In Valle, rock 1 and 50 in Naquane (Fossati, 1991; Bevan, 2005; Sigari, 2011). The site of In Valle, in Paspardo, has been systematically studied between 2008 and 2011, 30 years after the first systematic study, taken in the eighties (Abreu & Fossati, 1988; Fossati, 2007; Sigari, 2011). The big rock of In Valle, labelled as rock 4 has been divided into nearly 20 panels to better study the engraving and the rock itself.

Sector C is the northern part, under the upper channel. Its figurative complex is very simple and highly readable. Eight fighting warriors named C05, C06, C07, C09, C10, C11, C12, C13 are the main subject of this panel.

The scene, into which they are grouped, is highly dynamic thanks to the different position the warriors stand. The uncommon number of involved subjects, their position, the different weapons they handle, the analysis of the overlappings has questioned whether the scene is a common duel scene or not. Is it an animated scene like a comic strip? Or does it portray a fight involving more people? Might it be a war scene?

Archeological and rock art data from Valcamonica, comparative rock art and archaeo-anthropological data from the rest of the world do not exclude the idea of a war representation, thus indicating the first example of a battle depiction in cammunian rock art repertory.

However this interpretation does not explain why representing a battle and what it would mean for the ancient population.

Certainly Valcamonica engravings belong to a new social context, which differs from other warfare rock art scenes, such as the Spanish or the Saharian ones. The whole rock art complex suggests the emergence of a new social class, the warrior class. Their power involves different aspects of social and cultural life. In this sense, once more, it cannot be avoided the possibility of a real fight representation on rock 4 in In Valle.

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ORAL

## 7. THE BRONZE AGE BATTLEFIELD IN THE TOLLENS VALLEY, MECKLENBURG-WESTERN POMERANIA, NORTHEAST GERMANY ? COMBAT MARKS ON HUMAN BONES AS EVIDENCE OF EARLY WARRIOR SOCIETIES IN NORTHERN MIDDLE EUROPE?

*Brinker, Ute (State Authority for Culture and Protection of Monuments, Mecklenburg-Vorpommern) ute.brinker@im-ail.de*

*Schramm, Annemarie (State Authority for Culture and Protection of Monuments, Mecklenburg-Vorpommern) annemie\_schramm@web.de*

*Orschiedt, Jörg (Freie Universität Berlin, Institut für Prähistorische Archäologie) jorschiedt@zedat.fu-berlin.de*

*Flohr, Stefan (Thuringian State Office for the Preservation of Historical Monuments and Archaeology, Weimar) flohrs@uni-hildesheim.de*

*Jantzen, Detlef (State Authority for Culture and Protection of Monuments, Mecklenburg-Vorpommern) d.jantzen@kulturerbe-mv.de*

The discovery of numerous human skeletal remains, partly with traces of violence, as well as horse bones and weapon finds, dating to about 1250 BC, brought the Tollense valley into the focus of interdisciplinary research. The remarkable finds are currently interpreted as the remains of a Bronze Age group conflict on a previously unexpected scale.

So far, c. 9300 well-preserved commingled human bones of more than 124 individuals, mostly young males, have been recovered. Several exhibit clear traces of violence, e.g. strong impression fractures on skulls, or long bones with embedded arrowheads. Fine cut marks and notches, in particular on ribs, have also been identified.

In order to examine whether these minor traces could be caused by arrowheads or stabbing weapons, experiments were conducted with replicas of Bronze Age arrowheads and daggers on half-carcasses (pigs). Different types of injuries caused by these experiments were compared with the human material, using macroscopical examination as well as microscopical and radiological analysis.

About one third of the experimental shots caused lesions on ribs. Different types of injuries were identified, e.g. notches of varying angles and depth, or tangential impacts that broke off bone fragments, depending on the point of impact. Fine cut marks were only caused by daggers. The injuries patterns produced by these experiments are very common in the Tollense bone assemblage. In addition to traces of blunt and sharp force, the

use of bows and arrows, daggers, lances and wooden clubs are evident. This indicates considerable interpersonal violence.

The osteological analysis combined with archaeological experiments highlights the scenario of conflict with use of distance and close-combat weapons. The range of weaponry and numbers of victims indicates a high intensity of Bronze Age group conflict not of local but of supra-regional significance. This can be interpreted as evidence of early warrior societies in Northern Middle Europe.

ORAL

## 8. METALWORK'S MODEL AND SCRAPS BRONZE CIRCULATION BETWEEN MEDITERRANEAN AND ATLANTIC IN MIDDLE TAGUS IN FINAL BRONZE AGE

*Delfino, Davide (Universidade do Trás os Montes e Alto Douro/ Instituto Terra e Memória, Mação (Portugal), Quaternary Group of Geosciences of FCT) davidedelfino@libero.it*  
*Graça, Ana (Instituto Politécnico de Tomar) anagrace@ipt.pt*

The area of the Middle Tagus River, is now considered as one of the regions during the Late and Final Bronze Age saw both the arrival of bronze metallurgy in Mid-Southern Portugal, both the intersection of different metallurgical models related at three metallurgical circles: Continentals, Atlantics and Mediterranean's. The region is strategically located along a "water ways" of Tagus, Zêzere and Ocreza rivers and between the Beira region, rich in copper resources and Atlantic coast.

Contexts with few but significant finds of bronze artefacts in the municipalities of Mação and Abrantes, reveal two aspects: the widespread business of collecting bronze scraps to be recycled; the clear circulation of models related at the three circles metallurgical thanks, probably, to the navigation of the Tagus and to accessibility of the valleys of the Zêzere and Ocreza. Denotes particular interest, in these two dynamics, the bronzes workshop of Castelo Velho do Caratão hilltop settlement, the hoard of Porto do Concelho, the small open village of Quinta da Pedreira and the Castelo de Abrantes hilltop settlement area.

Two facts stand out: the metallurgical activities, especially scrap recycling, it is not only the prerogative of walled hilltop settlements, but is also present in small open village; also most of the concentration of storage of finished objects and scrap bronze is in an area surrounded

by walled hilltop settlements, or near these.

The view that emerges is that there may exist artifacts or scrap bronze collector's centers in the walled hilltop settlements, some of them close to the river waterways, with a redistribution in small open villages perhaps single-family. Following this model of circulation, it can be concluded that different metallurgical models circulate in the region through the river waterways, with a circulation system managed by local elites in hilltop walled settlements.

ORAL

## 9. THE EMERGENCE OF WAR IN HUMAN SOCIETIES.

*Ruzza, Stefano (Assistant Professor of Conflict, Security and Statebuilding Department of Cultures, Politics and Society University of Turin) stefano.ruzza@unito.it*

*Berruti, Gabriele Luigi Francesco (PhD Student of International Doctorate in Quaternary and Prehistory, Department of Geology, University of Trás-os-Montes e Alto Douro; Associazione Culturale "3P") gabrielefberruti@gmail.com*

The transformation of agricultural societies in warrior societies is a crucial moment in human history, and its study represents a challenge for both anthropological archaeology and social sciences. These new societies created their own myths and patterns of social behaviour, introducing a new human practice - war - and a new human actor: the warrior. The proposed paper focuses on the emergence of the practice of war in Bronze Age societies by adopting a multi-disciplinary approach, mostly grounded in - but not limited to - archaeology and political science.

Bronze Age strongholds, colonies and open mines (above many other possible examples) are visible traces, well documented by their archaeological remains, of the deep and pervasive social, economic and technological changes related to war. This latter is indeed one of the most peculiar human behaviours. But how did the concept and practice of war emerged in Bronze Age societies? Why did war become - according to archaeological finds - one of the most important propulsive forces behind these societies? These broad and far-fetching questions are dealt through three inherent sub-questions, i.e.: What is war?

Why war is waged?

How war is prepared and waged?

These three "core" questions are addressed through a multidisciplinary approach, including theories and em-

pirical findings from political philosophy, archaeology, history, ethology and political science.

The proposed argument merges material and socio-cultural analysis, in order to open new venues to the understanding about the emergence of war as a human practice, the relationship between war and society, and their mutual influence.

By integrating different disciplines and methods, the paper aims to open new grounds and allow for fresh hypothesis about birth, development and impact of war on human society.

ORAL

## 10. REPRÉSENTATION DE LA GUERRE À L'ÂGE DU BRONZE D'ITALIE SEPTENTRIONALE ENTRE XVII<sup>E</sup> ET XIII<sup>E</sup> SIÈCLE: ARMES DANS LE MOBILIER FUNÉRAIRE, LES HABITATS ET LES DÉPÔTS

*Cupitò, Michele (Dipartimento dei Beni Culturali - Università di Padova) michele.cupito@unipd.it*

*Rubat Borel, Francesco (Soprintendenza per i Beni Archeologici del Piemonte e MAE) francesco.rubatborel@beniculturali.it*

Thanks to recent research and new studies on the main contexts of northern Italy it is possible to identify the development of the ways of combat and of representation of warriors through time on a regional scale, in correspondence to the different cultural *facies*.

In XVI-XV centuries there is a strong regionalisation in grave goods, settlement and hoards (swords in the East and panoply made of dagger, axe and spear in the West), whereas later, between the XIV and XIII centuries, there is widespread diffusion of swords (used in combat or to represent warriors).

The main contexts will be analysed: in the East, where the complex "palafitticolo-terramaricola" facies develops, we will consider the examples of the Olmo di Nogara necropolis and the Pila del Brancon hoard; in the West, where contacts with central-western Europe are stronger, the examples of the Viverone settlement and the Cascina Ranza and Oggiono-Ello hoards.

We will discuss the manners of combat, and their change through the centuries, the ways of representation of warriors in the different areas of northern Italy, considering the different socio-political organizations and the



nearby territories.

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ORAL

### 11. BRONZE AGE SETTLEMENTS AND DWELLINGS IN GALICIA. SEEKING CONNECTIONS WITH EUROPE.

*Díaz Rodríguez, Mikel (Universidad de Santiago de Compostela) mikel.diaz.rodriguez@hotmail.com*

*Prieto Martínez, M. Pilar (Universidad de Santiago de Compostela) mpilarprietom@hotmail.com*

Settlements from the second half of the second millennium BC and the first few centuries of the first millennium BC are relatively unknown in Galicia. The best-studied sites are metallic deposits and burials, while less attention has been paid to the settlements, a problem that is further aggravated by having practically no datings. However, in recent years a number of studies have been published that deal with the record from these types of sites. Based on the data that is now available, we believe it is possible to offer a preliminary summary of the basic features of certain elements from these settlements, such as studies concerned with how their domestic space was organised, or regarding their emplacement. A great deal of work still has to be done on the internal organisation of these settlements, as only very small areas have been excavated, but our aim is to offer a general overview of the current situation.

Our empirical base is quite small (11 sites), although we do have radiocarbon datings for most of them, and it is possible to clearly define the typical structures found in the settlements. The province of Pontevedra contains the majority of these sites (7), which are Carballeira do Espírito Santo (Silleda), Mesa de Montes (Cangas), Monte Buxel (Pazos de Borbén), Monte dos Remedios (Moaña), Os Pericos (Ribeira), Setepías (Cambados) and Chan das Pozas (Campolameiro). In the region's other three provinces we have a considerably smaller number, with two sites in A Coruña: A Lagoa (Toques) and Punta de Muros (Arteixo); one in Lugo, the petroglyph of Pena Fita (Lugo) and another in the province of Ourense, the settlement of O Fuxiño (Piñor).

Based on the existing data, we have found clear similarities with other European regions, both in the Atlantic and Mediterranean areas, especially with regard to the layout of the dwellings in the settlements. As a result, in addition to identifying similarities between the metalurgy and pottery, we can demonstrate a connection be-

tween Galicia and other regions through studying these settlements.

Our aim is to identify and offer an initial definition of the features that make it possible to identify connections between Galicia and other parts of Europe, and from there to try and understand a number of possibly European influences not only on the organisation of the dwellings, but also the families in this part of the north-west Iberian Peninsula.

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ORAL

### 12. NEW DEVELOPMENTS IN GALICIAN POTTERY FROM THE SECOND HALF OF THE SECOND MILLENNIUM BC. FROM THE REGIONAL TO THE EXTRA-REGIONAL: WIDE HORIZONTAL RIM VESSELS AND STAMPING

*Nonat, Laure (L'Université de Pau et Pays de l'Adour - Univ. Santiago de Compostela) laurenonat@hotmail.com*

*Prieto Martínez, M. Pilar (Universidad de Santiago de Compostela) mpilarprietom@hotmail.com*

*Vázquez Liz, Pablo (Universidad de Santiago de Compostela) pvliz@hotmail.com*

In Galicia (NW Spain) there are few sites dating from the second half of the second millennium BC, and these have not been investigated in any detail, with the attention mainly focused on metallic material culture. The pottery is usually considered as being very uniform in nature and lacking decoration. However, recent studies have shown that this idea of homogeneity and a lack of decoration for pottery from this stage of the Bronze Age is untrue. This said it is possible to identify an important legacy from the undecorated pottery that accompanied Bell Beaker pottery, as well as some new shapes indicating important new developments in prehistoric pottery know-how, not only in Galicia but also in the north of Portugal. In this paper we will focus on a specific type of pottery, known as Wide Horizontal Rim (*WHRv*) pottery, which is mainly decorated and exclusively found in the NW Iberian Peninsula, as it makes it possible to support and even update a theme that has been firmly rooted in the specialised literature for many years, based on the type of relationships that unite, or otherwise disunite, the east and west of Western Europe.

Effectively, some of the vessels belonging to this type of pottery contain a type of decoration that is unique in the NW Iberian Peninsula for two main reasons: (1) the use of a new technique, stamping, which appears for the

first time in this region. Until recently, in Galicia stamping was presumed to be a technique that belonged to the Second Iron Age; and (2) in the use of new motifs, which recur in Late Prehistory: concentric circles, in clearly defined patterns.

The combination of these new developments is especially noteworthy because, on the one hand, these developments seem to coincide at the same time in cultures in France and Eastern Europe, and on the other hand, because they clearly reveal the active involvement of Galicia within the mesh of networks of circulation in Europe, which can clearly be seen from the Neolithic onwards.

In summary, in our paper, by exploring pottery studies in general and WHR pottery in particular, we aim to show the possible relationships Galicia had as a key territory with the European continent and its Atlantic areas.

# A3e Objects of the dead, offerings from the living: interpreting finds in funerary contexts

Commission on The Metal Ages in Europe  
(Organisers: Rebecca Peake, Valérie Delattre)

Thursday 4th (14:00 to 19:30)  
A13 Meeting Room



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ORAL

## 1. FUNERAL OUTFITS AS ELEMENTS OF SOCIAL DIFFERENTIATION DURING THE THIRD MILLENNIUM ANE IN SETTLEMENT OF VALENCINA DE LA CONCEPCIÓN (SEVILLA)

*Pajuelo Pando, Ana (Universidad de Sevilla) anapajuelo@gmail.com*

*López Aldana, Pedro Manuel (Universidad de Sevilla) aldanaostrogodo@gmail.com*

Possession of certain components and products beyond death involves the perpetuation of social inequality generated in the society of the living.

In social formations of the III millennium BC this circumstance is manifested forms clear, both funerary buildings, a complex and monumental showing a significant investment of labor, and other minor and formal simplicity; when reuse of structures, a priori, no purpose-built this functionality funeral.

This marked difference between burial containers is often betrayed in artefactual component in the form of offerings, regardless of the population composition that house.

We analyze in this paper these social practices at the site of the Copper Age Valencina de la Concepción, relating the structures, types of products, partnerships thereof, the possible spatial relationships buried, materials premiums and the specialization of its articles.

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ORAL

## 2. OFFERING OR WASTE? THE FUNERARY ENSEMBLE OF LALLANA CAVE.

*Vega Maeso, Cristina (Universidad de Cantabria) cvega-maeso@gmail.com*

*González Morales, Manuel R. (Universidad de Cantabria) moralesm@unican.es*

La Llana Cave is located in Andrín (Llanes, Asturias). Into this cave, a superficial deposit, atop of a Mesolithic shell midden, included the remains of several ceramic vessels, three bevel-cut bones, a polished tooth, and a small metal piece reminding a Palmela point. All of them seem to represent waste of different kinds of technological procedures. However, there is no evidence of in situ domestic activity. By contrast, in a small niche, few meters

away to the lower galleries of the cave, an almost complete human skeleton was also disposed on the surface. All these elements can be parts of a single set, whose association needs to be explained.

To achieve this goal, we followed this methodological path: first, we have carried out a typological study of archaeological remains to determine their general characteristics, and to establish their relative dating and possible contemporaneity; second, the human bones were dated by AMS to check if its chronology was similar to the rest of the materials; finally, a micro spatial study of all these elements was performed in order to understand the possible process of dispersal.

Radiometric and typological methods provide similar dates. This coincidence could indicate a possible association or a relationship between the different elements of the archaeological record. This idea is reinforced by the lack of evidence about any other activity except the burial. In consequence, these residues were unlikely to be the result of a different action within the cave.

The available data suggest that la Llana didn't have a domestic use at the time when the archaeological ensemble was deposited. The set of residues seems an offering that, somehow, may be related to the human remains.

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ORAL

## 3. THE TRIPARTITE FUNERARY CONTEXT OF ALTO RIBATEJO (PORTUGAL)

*Cruz, Ana (Instituto Politécnico de Tomar) anacruz@ipt.pt*  
*Graça, Ana (Instituto Politécnico de Tomar) anagrace@ipt.pt*  
*Berruti, Gabriele (Universidade de Trás-os-Montes e Alto Douro) ilgabbro79@gmail.com*

Funerary context of Alto Ribatejo datable to the recent Prehistory derives from the regional entity itself which is also tripartite both in hydrographic terms (Nabão, Zêzere and Tagus rivers) and in geological terms (Limestone Massif, Hesperian Massif and Quaternary Terraces).

The lithological and geomorphological diversity contributed to the variability of tripartite funerary *modus operandi*: karstic environments in small cavities, megalithic monuments and *tumuli*. All these contexts exhibit "votive offerings" that accompany a vast period ranging from Early Neolithic to Late Bronze Age.

In what concerns the interpretation of the operational chains of behaviour of the living towards the inevitability

of death, we observe an archaeographical and physical approach to death that can be recorded, interpreted and theorised by the data obtained through excavation contexts, artefact typologies and bone radiocarbon dating.

There are considerable differences in the treatment of (positive and negative) structures, i.e. bodies and grave goods. There are pro-individualisation postures of death (Cave of Nossa Senhora das Lapas, Cave of Cadaval, *tumulus* 1 of Souto) and pro-socialising postures of death (Dolmen 1 of Val da Laje and Cave of Morgado Superior). There are graves in the cave where human bones and grave goods appear completely de-contextualised, piled up, not for taphonomic reasons but due to direct interventions of the living who re-use a cavity in a systematic manner. This suggests a first phase of the individual burial of the corpse followed shortly thereafter (once the first corpse is decomposed) by another giving rise to a secondary deposition (cave of Morgado Superior, cave of Cadaval and Dolmen 1 of Val da Laje). There is also a socialisation of death which is evidenced in the stratigraphic sequences of bones (*Gruta dos Ossos*). Strong evidences of burial and cremation are also found.

But in fact and once the operational chains of the “architectures of death” (stone architectures and architectures of the deceased and their grave goods) are understood, the real challenge lies in trying to find a metaphysical and dialectical explanation of the cognitive and mythological context which we comfortably call “culture”.

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ORAL

#### **4. A SPECIAL BODY: EXPOSURE RITUALS OF A SEATED CADAVER FROM THE COPPER AGE (III<sup>RD</sup> MILLENNIUM CAL BC) CEMETERY OF HUMANEJOS (PARLA, MADRID, SPAIN)**

*Garrido Pena, Rafael (Universidad Autónoma de Madrid) rafael.garrido@uam.es*

*Flores Fernández, Raúl (Professional Archaeologist) raulfloresfernandez@gmail.com*

*González Martín, Armando (Universidad Autónoma de Madrid) armando.gonzalez@uam.es*

*Herrero Corral, Ana Mercedes (Universidad Complutense de Madrid) anaherre@uam.es*

*Gutiérrez Sanz, Carmen (Universidad Autónoma de Madrid) carmen.gutierrez@uam.es*

Recent rescue excavations have discovered a huge Copper Age site near Parla (Madrid), with nearly 2000 nega-

tive structures, both domestic and burial ones. Amongst the graves excavated in this site there is a very special one where the body was found seated inside a pit, probably supported by a sort of wood structure that maintained straight the back of the corpse, until the burial pit was finally filled up with sediment and deliberately closed. Thus it seems that this body was exposed during a certain time inside this tomb, but when the skull and upper part of the skeleton loosed the soft tissues and several bones fell down, it was finally interred. No grave goods were found inside the grave but a small flint arrowhead that was recovered beside the skull. But was it really a grave offering? What is the meaning of the presence of this item inside this special tomb? Has it something to do with the death of this individual?

The complete bioanthropological study is presented, together with the use-wear analysis of the flint arrowhead that give us clues to interpret this complex find.

Moreover such a singular treatment of this individual demands a social and ritual explanation, and this could be done in the context of exposure rituals of corpses, which is a very interesting feature of burial symbolism, with known examples in the ethnographic literature. This sort of practices is always related with certain beliefs about the afterlife world and the way to achieve the final rest for the deceased members of the group.

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ORAL

#### **5. CONTEXTUALIZATION OF FUNERARY EVIDENCE FROM THE CAVE SANT'ANGELO IV, NORTHEASTERN CALABRIA, ITALY**

*Ippolito, Francesca (Groningen Institute of Archaeology) f.ippolito@rug.nl*

The cave of Sant'Angelo IV or Grotta dell'Antenato is part of the Sant'Angelo karst system located N-W of Cassano allo Jonio, Calabria, Italy. It consists of a series of caves frequented from the Neolithic to the Bronze Age. Among them, the cave of Sant'Angelo IV shows the first evidence of settlement at the end of the Middle Eneolithic and during the period between the end of the Eneolithic and the beginning of the Middle Bronze Age in Northeastern Calabria or Sibaritide.

The research was based on the analysis of pottery, bone remains and radiocarbon dating.

Pottery and skeletal remains from this cave indicate the presence of at least three tombs dating to three different

periods and showing ritual practices already attested at contemporary funerary contexts in other Italian regions. Moreover, a peculiar find was found in this cave, representing the cultural aspect of Rodi'-Tindari-Vallelunga (RTV), attested for the first time in the study-area. Furthermore, the presence of finds similar to ceramics found at sites located along the Northern Adriatic coasts suggests long range cultural interactions which took place between the Eneolithic and the beginning of the Middle Bronze Age, otherwise poorly documented in the Sibaritide so far.

Considering the lack of evidence for the period between the Neolithic and the second phase of the Middle Bronze Age in the Sibaritide, the finds from Sant'Angelo IV constitute a starting point to fill in the settlement record for this area. The funerary function of the cave-site will be analyzed considering the surrounding context, by taking into account both the data provided by the nearby cave-sites and the open-air settlement evidence, in order to interpret the communities' perception of the funerary and daily use of their territory.

ORAL

## 6. EGYPTIAN AFTERLIFE. PREDYNASTIC AND EARLY DYNASTIC GRAVE GOODS-A VIEW FROM TELL EL-FARKHA.

*Rosinska-Balik, Karolina (Institute of Archaeology, Jagiellonian University in Krakow, Poland) k.rosinska.balik@gmail.com*

*Debowska-Ludwin, Joanna (Institute of Archaeology, Jagiellonian University in Krakow, Poland) joanna.debowska-ludwin@uj.edu.pl*

The Afterlife for Ancient Egyptians certainly played a great role in their beliefs. The care with which their prepared their deceased for the infinite existence has been observed in many aspects: preparation of the body itself, construction of sophisticated tombs, all the rituals concerning the celebration of inhumation process, the wide range of grave goods in which deceased was equipped. All this aspects seem to be present from the beginning of Egyptian state. Research on Predynastic and Early Dynastic periods teaches us that this tradition is at least partially present even before the Egyptian unification.

The Tell el-Farkha cemeteries reveal up to date over 120 graves with very diverse structures, grave offerings and even various body arrangements. There were observed different sets of Afterlife equipment for a departed. This

sets differ not only in kind and amount of the goods, not only they were differentiated by sex of the dead person but also took different place in the tomb structure.

In the presentation we would like to discuss all kinds of goods such as: pottery, stone vessels, tools, jewellery, other small luxury items and extraordinary artifacts. We would also like to make an attempt to find any patterns in equipment concerning sex and/or age of the deceased and propose some interpretation based on selected examples.

ORAL

## 7. LA DÉPOSITION D'OBJETS FUNÉRAIRES DANS LES TOMBES DU BRONZE FINAL EN FLANDRE.

*De Mulder, Guy (Ghent University) guy.demulder@ugent.be*

Les tombelles du Bronze ancien et Bronze moyen sont mal conservées en Flandre ce qui limite notre connaissance sur la déposition funéraire d'objets dans cette période. Dans les quelques monuments intacts, qui ont été fouillés, des offrandes funéraires ne sont pas reconnus.

La pratique de déposition d'objets funéraires se manifeste pour le premier temps au Bronze final. Néanmoins cette pratique reste limité au environ 50% des personnes incinérés et déposés dans une tombe selon les dates archéologiques disponibles. Les communautés du Bronze final montrent une absence de normes strictes au niveau des gestes funéraires. L'apparence de la tombe suggère des rites funéraires sobre et une sorte d'égalité dans la mort. La construction de la tombe est simple. Les ossements, si oui ou non dans une urne, sont déposés dans une fosse creusée dans le sous-sol. Le traitement des objets funéraires est très diverse. Ils peuvent être passée dans le feu du bûcher; d'autres sont ajoutés au ossements incinérés au moment de la déposition de la tombe. Des combinaisons d'objets brûlés et intacts ne sont pas rares dans les nécropoles. Les artefacts brûlés peuvent être déformé ou représenté par quelques tessons. Aussi la position des objets dans la tombe est caractérisée par cette variabilité. La majorité est déposée dans l'urne, mais des exemples des tasses au dessus ou à coté de l'urne sont aussi connus.

Parmi les objets choisis pour accompagner le défunt sur le bûcher et dans la tombe figure surtout la céramique; plus spécifique des éléments de service à boire comme des gobelets et des tasses. Les métaux sont rares et sont représentés par des objets de parure en bronze. Des fragments d'os animalier dans une tombe sont plutôt

une exception.

La transition vers le premier âge du fer montre une communauté aux deux visages concernant la déposition d'offrandes funéraires. D'une partie, les gestes funéraires restent globalement simples dans la majorité des nécropoles, de l'autre côté les tombelles de Court-Saint-Etienne illustrent les changements dans les rites funéraires. Ces tombelles sont équipées d'un mobilier riche avec des armes, des éléments de harnachement de cheval et le service à boire comme dans les autres régions de l'Europe.

ORAL

## 8. THE LATE BRONZE AGE BUTTONS FROM HAN-SUR-LESSE (BELGIUM): A NEGLECTED MATERIAL

*Duriau, Alexandre (Université libre de Bruxelles) alexandre.duriau@ulb.ac.be*

In the village of Han-sur-Lesse (Namur, Belgium) the river Lesse, an affluent of the Meuse, goes underground through the limestone hills of Boine. Over a period of thousands of years its course has created a network of caves. Among these, the *Grotte de Han* is one of the main tourist attractions in Belgium. As early as 1902, it was subjected to archeological explorations led by E. de Pierpont. These digs' findings were numerous and varied but have not been conserved. The set of items included in the present study comes from the bed of the river Lesse, precisely from the *Trou de Han* which is the point at which it surfaces once more. Since 1963, systematic underwater digs led by the *Centre de Recherches Archéologiques Fluviales* (Centre for Archeological River Digs) directed by M. Jasinski have brought to light thousands of objects. The oldest date back to the end of the Neolithic period. However, the main period of origin is the Late Bronze Age. The number and variety of metallic objects is unique in Belgium: among them are axes, spear points, pins, bracelets, knives and gold jewellery. The layout of the site and the presence of exceptional objects have led E. Warmenbol to interpret this site as a 'Gateway to the Underworld' (*bouche des enfers*). The deposits of intact or intentionally broken objects could thus be linked to the world of the dead.

This study has been carried out on a particular class of objects: bronze buttons from the *Trou de Han*. Compared to weapons, tools and gold jewellery, bronze buttons may appear uninteresting. However, their number ranks them among the most common metallic objects found

on the site. In effect, almost 120 buttons have been found since 1963. The typological study of this material, far from monotonous, permitted us to identify several different types of buttons based on formal criteria such as the method of fixing to clothes - loop (*bélière*) or bar (*traverse*) - and shape or decoration of the visible face of the button (*cabochon*). The study then used comparisons with other better-dated buttons in order to situate them chronologically. We focused on buttons from an area including the whole of Belgium, Luxemburg, the east of France, the west of Switzerland, the west and south west of Germany. By taking into account the context and environment of these finds we were able to better determine the different uses of the buttons from Han (decoration for horses' tack or clothing, etc.).

POSTER

POSTER

## 1. THE SUN IN CELTIBERIAN ICONOGRAPHY AND ITS COSMOGONICAL INTERPRETATION

*Burillo-Cuadrado, M<sup>a</sup> Pilar (Universidad de Zaragoza) mpilar.burillo@gmail.com*

The few texts on Celtiberian religious belief mean it has to be studied from the iconography and the few structural remains that have been preserved. Unlike those of other cultures, these focus mainly on a single motif, the Sun.

We have been able to determine the existence of three different iconographic syntaxes intended to tell the same story, the solar myth. The oldest images are found on bronze plates, staffs and fibulae. The sun is depicted realistically in two ways, as radiant or non-radiant concentric circles, associated with the figure of a horse. On monochrome pottery, the sun is depicted as a left-facing or right-facing swastika, is associated with the horse and an anthropomorphic figure with an equine head, which usually takes the form of a protome of a horse throughout the Celtiberian world. However, neither the swastika nor the protome of a horse appears on the polychrome pottery of Numancia, on which the sun is depicted realistically.

On the basis of structuralist and phenomenological theoretical approaches, and a 3D analysis of the pottery, it has been possible to carry out a cosmogonical interpretation of Celtiberian iconography.

The sun appears as the highest deity. In order to explain its diurnal motion, radiant circles or right-facing swastikas are used, and circles with no rays and left-facing swastikas for its nocturnal return. The horse figures carry the sun and are in themselves identified with the solar deity. The sun would return through an aquatic sphere situated in the upper Cosmos.

To this should be added the discovery of a sanctuary in the Celtiberian city of Segada. It is built as a great platform, and indicates the dominant direction of the setting sun at prominent points on the horizon at the equinoxes and the summer solstice.

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## POSTER

### 2. COMPLEJIDAD FUNERARIA EN LA PUNA MERIDIONAL DE ARGENTINA DURANTE EL HOLOCENO TEMPRANO (CA.8400-8000 AP)

*Martínez, Jorge G. (Instituto Superior de Estudios Sociales-CONICET/Instituto de Arqueología y Museo. Universidad Nacional de Tucumán. Argentina) jormartin1969@yahoo.com.ar*

Presentamos en este trabajo la información proveniente del hallazgo de dos estructuras funerarias detectadas en el interior del alero rocoso Peñas de las Trampas 1.1. el cual se ubica a 3582 msnm en la localidad de Antofagasta de la Sierra, en la Puna meridional de Argentina. Las condiciones climáticas de gran sequedad propias de ambientes de Puna, jugaron un rol fundamental en la preservación de todo tipo de restos orgánicos hasta el presente. Estos contextos fueron datados entre ca.8400-8000 años AP. Se trata en ambos casos de estructuras de cavado revestidas con gramíneas, en cuyo interior fue hallado un gran número de elementos culturales, los cuales constituyen, con algunas diferencias, depósitos intencionales. Dentro de estas estructuras, fueron recuperados restos óseos humanos correspondientes a seis individuos, tres en cada estructura. Estos fueron hallados en asociación a numerosos restos de tecno-facturas variadas de gran complejidad artesanal, incluyendo cueros gamuzados (cosidos y pintados de color rojo), numerosas cuentas de collar confeccionadas con valvas de moluscos y semillas, fragmentos de malla de red teñidos de rojo y pintados en negro, adornos hechos con plumas entretejidas, y finos cordeles de fibra vegetal.

Además del análisis espacial de la disposición de todos los elementos materiales de las dos estructuras, se hizo un detallado análisis de las materias primas y de la con-

fección técnica de los distintos objetos y artefactos que fueron registrados en asociación primaria con los restos óseos humanos.

Todos estos restos de origen orgánico si bien se encuentran en muy buenas condiciones de preservación, se presentan altamente fragmentados. En base a los análisis realizados, pudo establecerse que más del 90 % de los elementos mencionados fueron manufacturados con materias primas alóctonas, i.e. fuera del ambiente natural de la Puna. Las cuentas de semillas vegetales y fibras que componen los cordeles vegetales, provienen de fibras de palmeras ubicadas en pisos ecológicos distantes a más de 200 km (llanuras de este). Las valvas de moluscos provienen de la costa del Océano Pacífico, cuya distancia mínima es de 350 km. Dado que se trata de un tipo singular de hallazgo, se crea la imposibilidad de comparar con otros contextos sincrónicos, y por lo tanto una limitación al abordar la dimensión simbólica o el significado como ofrenda o ajuar suntuario de todos estos elementos asociados a los enterratorios.

Nuestro análisis lleva a diferenciar las evidencias de este sitio dentro del noroeste de Argentina, con respecto a que no se corresponden con el patrón funerario generalizado "arcaico" propuesto por Standen y Santoro (1994) para sitios tempranos del norte de Chile, lo cual genera un plus de variabilidad muy interesante para seguir explorando. Los numerosos elementos funerarios procedentes de ambientes ecológicamente diferenciados, lleva a plantear un modelo de gran interacción entre diferentes grupos humanos que habitan efectivamente dichos espacios y que las prácticas funerarias estarían reflejando tempranas relaciones sociales de alianzas y/o parentesco dentro de estas sociedades altamente nómades.



# A3f 50 Years of Prähistorische Bronzefunde

Commission special on Prähistorische Bronzefunde  
(Organisers: U.L. Dietz)

Monday 1st (14:00 to 19:30)  
B03 Meeting Room



2014 burgos  
1-7 sept.

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Union International  
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XVII World UISPP Congress  
XVII<sup>e</sup> Congrès Mondial de l'UISPP  
XVII Congreso Mundial de UISPP

ORAL CONTRIBUTIONS

ORAL

### 1. 50 YEARS OF "PRÄHISTORISCHE BRONZEFUNDE"

*Dietz, Ute Luise ("Prähistorische Bronzefunde", Akademie der Wissenschaften und der Literatur, Mainz / Goethe-Universität Frankfurt a.M.) dietz@em.uni-frankfurt.de*

The international editing project "Prähistorische Bronzefunde" (PBF) is now working for nearly 50 years. Up to now, 175 volumes have been published, documenting about 140,000 copper and bronze objects from the Copper, Bronze and Early Iron Ages.

In addition to a short overview on PBF's long history, especially on the situation during the time of the Iron Curtain, there will be a presentation of the project's reception. There will also be an outlook on the chances and perspectives of a digital edition.

ORAL

### 2. TWO NEW BRONZE HOARDS FOUND ATTĂRTĂRIA (ALBA COUNTY), ROMANIA

*Bors, Corina (National History Museum of Romania (MNIR), Bucharest) corina.bors73@gmail.com*

Considering the topic of the UISPP2014 session entitled "50 years of Prähistorische Bronzefunde", but also the features of two newly discovered bronze hoards, the paper will bring into attention new evidence in regard to the phenomenon of bronze deposition during the 9<sup>th</sup> – 8<sup>th</sup> c. BC within the Carpathian basin. In 2012, within the framework of a large scale rescue excavation national program undertaken along the Mureş river valley (southern Transylvania), occasioned by the construction of a future motorway, was made a very important archaeological discovery: two bronze hoards. The hoards were discovered on the southern limit of a very large prehistoric site, located on the left bank of the middle Mureş valley, at Tărtăria (Alba county), preliminary dated during the 8<sup>th</sup> c. BC (the middle Hallstatt period, the Basarabi type pottery style). The context and structure of the two deposits are of particular importance, since it is the first time when such hoards belonging to the so-called "Bălvăneşti - Vinţ" series (referring to the terminology used for nowadays Romania's territory) are discovered during an archaeological excavation. The two bronze hoards were discovered within a ditch, marking the southern limit of the

site. The structure of the deposits is complex and varied, containing weapons, tools, jewelry and harness objects. The first hoard comprises more than 300 objects, being the largest ever found corresponding to the 9<sup>th</sup> – 8<sup>th</sup> c. BC period in the Carpathian basin, while the second consists of 50 objects. In both cases, the metal objects were placed in ceramic vessels. The majority of the objects are made of bronze, yet there are also weapons and tools made of iron, along with others made of animal bones (teeths). The preliminary analysis of certain objects indicate wider connections to the north Pontic areas, as well as to the south-western Balkan ones, providing new data to discuss upon the long-distance exchanges and contacts during the first centuries at the beginning of the first millennium BC in the Carpathian basin.

ORAL

### 3. THE RÍA DE HUELVA AND THE DEPOSITION OF PAIRED OBJECTS IN THE EUROPEAN BRONZE AGE

*Brandherm, Dirk (Queen's University Belfast) d.brandherm@qub.ac.uk*

The phenomenon of structured paired-object deposition has long been recognized as a significant feature of later prehistoric ritual practice. It is particularly well attested for, but by no means limited to the deposition of Bronze Age metalwork. Interpretations aiming at an explanation for this phenomenon tend to focus on the motif of the 'divine twins' and its significance for Bronze Age cosmologies, but given the wide range of different forms in which this practice manifests and its long development over time, this is perhaps insufficient to explain its complexity.

Building on earlier work by the author, this paper will provide a brief overview of diachronic trends in the practice of multi-piece sword deposition from the Middle through the Late Bronze Age, to then go on and explore related patterns in complex multi-piece assemblages, using the Ría de Huelva find as a prominent example in case.

As a result from this exercise, both the original interpretation of this assemblage as lost cargo and its alternative reading as a cumulative funerary or cenotaph deposit are rejected.

It has to be acknowledged that without comprehensive corpora such as the Prähistorische Bronzefunde, low-frequency or low-density patterns that only become dis-

cernible by adopting a diachronic wide-area approach, such patterning would almost certainly remain undetected.

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ORAL

#### 4. A PROPOS DES CORPUS D'OBJETS EN BRONZE D'ITALIE DU NORD: QUELQUES OBSERVATIONS.

*Cupitò, Michele (Dipartimento dei Beni Culturali - Università di Padova) michele.cupito@beniculturali.it*

*Rubat Borel, Francesco (Soprintendenza per i Beni Archeologici del Piemonte e MAE) francesco.rubatborel@beniculturali.it*

The increase of new data and the numerous reassessments of various categories of bronze artefacts make necessary the update of some existing *corpora* – in primis the most dated ones – for the Italian territory.

Moreover, it would also be necessary to plan and realize ex novo new *corpora* on categories that have not been analysed before, taking into consideration the context of provenance, the functional and metallographic analyses, the contacts and the production processes. Since this problem is shared by the other Countries, we would like to ask our foreign colleagues how they intend to deal with the issue: online open publications, committees, etc.

We will therefore synthetically present some works undertaken as part of the research of the two proponents, who already studied systematically new contexts or bronze artefacts categories (specifically swords, axes, pendants and arm rings) from Northern Italy. These could be a useful basis for the development of new studies updating and/or realizing new *PBF*.

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ORAL

#### 5. BRONZE SPEARHEADS BETWEEN CARPATHIAN BASIN AND APENNINE PENINSULA AT THE TRANSITION FROM BRONZE AGE TO IRON AGE

*Pabst, Sabine (Philipps-University Marburg) pabsts@staff.uni-marburg.de*

In the extensive area between the Carpathian basin and the Apennine peninsula several typologically related spearhead shapes occur during the late Bronze Age and early Iron Age. The region of origin of these types

of spearheads (especially the types with flame-shaped blade and with a profiled socket) is to be pinpointed by chronological and typo-genetic analyses in the environment of the Carpathian basin. New supra-regional investigations on the typology and chorology as well as on the find contexts and the equipment structure of the finds that contain spearheads in the different regions provide insight into particular directions of spreading and the underlying communication routes and social processes. In the lecture the initial results of two research projects will be presented, dealing with the recording of bronze spearheads in Hungary (within the series "Prähistorische Bronzefunde") on the one hand and with the cultural relations between the Carpathian basin and the Apennine peninsula at the transition from the Bronze Age to Iron Age on the other.

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POSTER

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POSTER

#### A NEW MIDDLE HALLSTATT SITE ON THE MUREȘ VALLEY: TĂRTĂRIA - PODU TĂRTĂRIEI VEST AND THE RELATED BRONZE HOARDS

*Bors, Corina (National History Museum of Romania (MNIR), Bucharest) corina.bors73@gmail.com*

*Irimus, Luciana (National History Museum of Romania (MNIR), Bucharest) luciana\_dr@yahoo.com*

*Rumega, Vlad (National History Museum of Romania (MNIR), Bucharest) vladrumega@gmail.com*

The preventive archaeological research campaign 2012 on the site Tărtăria – Podu Tărtăriei vest / Valea Rea (Tărtăria 1) was occasioned by the construction works of the A1 motorway, crossing the southern part of Transylvania from west to east. The site is located about 0.3km south to the Mureș river, north to the Tărtăria village, on a plateau situated on the upper left terrace of the valley. Throughout an open area archaeological excavation it was fully investigated an area of about 2ha, where 269 archaeological complexes (mostly from the middle Hallstatt period, namely the time of the Basarabi style pottery) were identified and excavated. From a functional point of view these were (most probably) semi-sunken dwellings, offering/votive pits (with pottery broken in situ), refuse pits, extraction pits, as well as remains of the "level of culture".

As regards the middle Hallstatt habitation, there are also a series of particular discoveries, namely two ditches marking the southern and eastern limits of the site, two hoards comprising more than 400 bronze and iron

objects (Ha B<sub>3</sub>-C / the so-called Bâlvănești - Vinț series), and a collective grave. It was uncovered a significant quantity of pottery characteristic for the Basarabi culture (more than 120 vessels restored up to now), as well as a great number of metal objects (weapons, tools and adornment object made of bronze and iron). Considering all the data recorded and the preliminary analysis of the very rich archaeological finds, the site from Tărtăria – Podu Tărtăriei vest / Valea Rea (Tărtăria 1) represents a very important prehistoric site dating from the middle Hallstatt period.

# A4a The revolution of the sixties in Prehistory and Protohistory

Commission on Historiography, Methods and Theory: Formalization, Quantification, Mathematics and Computerization

(Organisers: Colin Renfrew, François Djindjian & Alessandro Guidi in collaboration with Commission on History of Archaeology)

Thursday 4th  
9:00 to 13:30  
B03 Meeting Room



2014 burgos  
1-7 sept.

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XVII World UISPP Congress  
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XVII Congreso Mundial de UISPP

ORAL CONTRIBUTIONS

ORAL

## 1. THE SCIENTIFIC REVOLUTION OF THE SIXTIES IN PREHISTORY AND PROTOHISTORY

*Djindjian, François (Université de Paris 1 Panthéon Sorbonne & CNRS UMR7041 Arscan) francois.djindjian@wanadoo.fr*

### Abstract

The post second war period (1955-1975) has been a scientific revolution in the advance of Prehistory and Protohistory: advanced field techniques and archaeological data recording, new disciplines (Archaeometry, Geoarchaeology, palaeoenvironmental reconstitutions, quantitative and computational archaeology, etc.) involving major methodological and technical advances, which have diffused in the whole archaeological field. The present paper has the purpose to remember this golden age and to replace the scientific revolution in the general context of the progress of Sciences and of the early and new paradigms of the Archaeology of the period (« *Culture historical Archaeology* », Marxism, and « *New Archaeology* »).

### Résumé

L'après deuxième guerre mondiale (1955-1975) a été une révolution scientifique dans l'histoire de la préhistoire et protohistoire : amélioration des techniques de fouilles et d'enregistrement des données de terrain, émergence de nouvelles disciplines (archéométrie, géoarchéologie, reconstitutions paléoenvironnementales, archéologie quantitative et computationnelle, etc.) apportant des progrès méthodologiques et techniques majeurs, qui ont diffusé dans le domaine archéologique tout entier. La présente communication a pour but de se remémorer cet âge d'or et de le replacer cette révolution scientifique dans le contexte général de l'avancement des Sciences et des paradigmes anciens et nouveaux de l'Archéologie de cette période (« *Culture Historical Archaeology* », Marxisme et « *New Archaeology* »).

ORAL

## 2. MARXISM IN THE EUROPEAN ARCHAEOLOGY OF THE SIXTIES: THE CASE-STUDIES OF ITALY AND FRANCE

*Guidi, Alessandro (Università Roma Tre) alessandro.guidi@uniroma3.it*

As many scholars noted, Marxist theory (as Childe defined it, "not a set of dogmas... but a method of interpretation and a set of values" [Childe 1952, 25]) was widely incorporated in post-war European archaeology, probably as a result of a different political climate that favoured the diffusion of Marxist thought and, from another side, of the prevailing legacy of the most influential cultural and artistic *avant-garde* to the left-wing parties.

The paper explores the evolution of these theoretical trends in the two countries in which Socialist and Communist parties were stronger: Italy and France, especially in the Sixties and in the early Seventies, a period in which on the other side of the Atlantic and in England the sudden burst of New Archaeology caused a deep crisis of traditionalist approaches.

As a matter of fact Marxist archaeology had more or less the same impact in Western Europe, with a true fight of the new generation against the academic establishment.

This is not surprising, given "the materialism inherent in most Marxist traditions in Europe, reminiscent of the strongly American processual archaeology, coupled with the evolutionary views of the New Archaeology which themselves had Marxist affiliations" (Hodder 1991, 15); a point of view shared by Renfrew, who dedicated same paragraphs of his archaeological handbook to the comparison between Marxism and Processual theory (Renfrew-Bahn 2012).

These trends were particularly strong in Classical and Medieval Archaeology; the paper will also examine, in the same period, the first attempts (not by chance of Marxist archaeologists!) to import processual theory in Italy (overall in prehistoric and near eastern archaeology).

ORAL

## 3. PREHISTORY AND PROTOHISTORY IN THE SOVIET UNION DURING THE SIXTIES

*Iakovleva, Lioudmila - (Institute of Archaeology NAS Ukraine (Kiev) and CNRS UMR 7041 Arscan) l.iakovleva@wanadoo.fr*

### Abstract

Archaeology in the Soviet Union, after the last world war, has known an exceptional growth, made possible by the centralized organization of the Academy of Sciences, an important number of specialized archaeologists and very many field operations. However, the intervention of

Joseph Stalin, himself, in 1950, in Pravda, to condemn, as non-Marxist, the theory of the stadial evolution of N. Marr, official doctrine of archaeology since 1919, has upset the archaeological community, which then has lost any theoretical framework. Soviet archaeologists then refocused on archaeological excavations and the publication of their results following a standard description framework leaving little place for interpretations. The most significant methodological contributions of this period are the development of open air excavations techniques (following Efimienko), the invention of usewear studies (Semenov) and the importance given to geoarchaeology (Velichko, Ivanova), archaeozoology (Pidoplichko) and palaeoenvironmental studies (Dolukhanov). The theoretical framework of archaeology, in its formal approach, is treated by Klejn in St. Petersburg and Gening in Kiev.

#### Résumé

L'archéologie en Union soviétique, après la seconde guerre mondiale, a connu un essor exceptionnel, rendu possible par une organisation centralisée par l'Académie des Sciences, un effectif important d'archéologues spécialistes et de très nombreuses opérations de fouilles sur le terrain. Cependant, l'intervention de Joseph Staline, lui-même, en 1950, dans la Pravda, pour condamner, comme non marxiste, la théorie de l'évolution stadiale de N. Marr, doctrine officielle de l'archéologie depuis 1919, a bouleversé la communauté archéologique, qui s'est retrouvé sans cadre théorique.

Les archéologues soviétiques se sont alors recentrés sur les campagnes de fouilles archéologiques et la publication de leurs résultats suivant un canevas descriptif normalisé laissant peu de place aux interprétations. L'apport méthodologique le plus significatif de cette période est le développement des techniques de fouilles de plein air (à la suite d'Efimienko), l'invention des études tracéologiques (Semenov) et l'importance donnée aux études géoarchéologiques (Velichko, Ivanova), archéozoologiques (Pidoplichko) et paléoenvironnementales (Dolukhanov). Le cadre théorique de l'archéologie, dans son approche formelle, est traité par Klejn à Saint-Pétersbourg et par Gening à Kiev.

#### ORAL

### 4. THE CONTRIBUTION OF THE POLISH PREHISTORIANS TO THE RENEWING OF THE LITHIC STUDIES

*Burdukiewicz, Jan Michal (University of Wroclaw, Insitute of Archaeology) janmibur@gmail.com*

Polish prehistorians paid great attention into lithic studies since beginning of 20<sup>th</sup> century. The founders of lithic studies in Poland were Stefan Krukowski and Ludwik Sawicki, who introduced technological and spatial analysis of lithic assemblages in opposite to widespread use of typological type fossils in other countries. Their approach was broadly extended in sixties of by R. Schild, B. Ginter, J.K. Kozłowski and other Polish prehistorians as general approach, called firstly Dynamic Technological Classification and later The Dynamic Technological Analysis. The best examples of such approach with inspiration of D. Clarke were later published in the book "Unconventional Archaeology", edited by R. Schild (1980).

Polish comprehensive approach is focused on complete processing of lithic artifacts, divided into successive sequences (or groups) from acquisition of raw material, core reduction, processing of blanks to tool shaping and repairing, later their up including all wastes dropping and archaeological site formation. All archaeological data were analyzed in broad geologic and ecologic setting concerning settlement period as well as postdepositional circumstances.

The important assumption was careful excavation of the isolated archaeological assemblages with recording their spatial position, detailed morphological and technological classification. Such assemblages were analyzed by distinctiveness of raw material, morphological, technological and metric attributes. Taxonomic analysis after that was made by appropriate statistical methods. Dynamic Technological Analysis was usually supplemented by an analysis of the spatial organization of stone processing, refitting network as well as macro- and micro-wear of usage or hafting. All-inclusive settlement units, distances of raw material acquisition and circulation were afterward used in formulation of economic and social concepts of hunter-gatherer societies and their temporal changeability.

The Dynamic Technological Analysis approach is fairly similar to the method of chaîne opératoire developed in France, which was applied to the stone assemblages much later. However, chaîne opératoire method bases also on sequence analysis of lithic artifact processing, starting from extraction of raw material, through the stages of core and blank processing, retouch of tools up to use the tools and their abandonment.

Although Dynamic Technological Analysis and chaîne opératoire methods are quite similar, it is possible to show significant differences. The chaîne opératoire is more as acquiring and handling and focused on a "bio-

graphical description" of certain groups of artifacts instead of whole assemblage.

Dynamic Technological Analysis is focused on quantitative and statistical methods, used in the analysis of the sequences and identifying the similarities and differences between the entire lithic assemblages. The quantification and statistical analysis of the lithic assemblages can objectively recognize some trends and attributes of every group of artifacts in the resource management and application of technological treatments. Currently, computer databases allow to collect much broader number artifact attributes and a more detailed analysis of the archaeological assemblages.

Dynamic Technological Analysis shows differences between domestic and workshop facies as well as technological trends, taxonomic units and settlement patterns of prehistoric societies. This resulted in the original method of highlighting and comparing lithic artifact assemblages, which is one of the most important aspects of the study of the Stone Age in Poland.

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ORAL

## 5. PORTUGUESE ARCHAEOLOGY IN THE 60IES OF THE 20TH CENTURY: REVOLUTION OR TRANSITION?

*Martins, Ana Cristina (Tropical Research Institute / Uniarq-Centre for Archaeology, University of Lisbon) ana.c.martins@zonmail.pt*

Of transition, par excellence, the years between the end of World War II and the 70 are crucial for understanding the change in the archaeological activity in general, and in Portugal, in particular, largely in the wake of the *New Archaeology* (1958). The reasons for this phenomenon were many, underlying the growing role played by university in archaeological training; the rising of archaeological internationalization; the new excavation methods; the mentors of a new generation of archaeologists; the presence of foreign experts among us, likewise the German Archaeological Institute (1971).

This period, mediated between the late '50s and early '70s, is fundamental to understand, deepest and largely, national archeology, when a significant part of our leading archaeological institutions persisted in a historical-culturalist and structure-functionalist speech, while young scholars eager for *New Archaeology*, receiving and disseminating it between colleagues and different national institutions.

Studying coeval Portuguese archaeology means to comprehend more broadly archaeology in Portugal within the general framework of European Archaeology, filling still scarcely known pages of a history inextricable of the History, Philosophy and Sociology of Science and Technology.

To discuss about the ways and the many forms of reception, circulation and dissemination of *New Archaeology* in Portugal, we will practice an historical approach. In doing so, we will use mainly both written and iconographic primary sources from public and private archives, namely the documentation in the custody of the Portuguese Association of Archaeologists and the National Museum of Archaeologists, together with several secondary sources published by Portuguese archaeologists between the end of the 50ies and the beginning of the 70ies.

Evaluating the many forms of reception, circulation and dissemination of *New Archaeology* in Portugal, we will be able to understand if the 60ies were of revolution or of transition, when comparing to coeval examples, naming protagonists, institutions, outcomes and outputs.

The links between particularities of Portuguese archaeology and the many forms of reception, circulation and dissemination of *New Archaeology* in the country, provide undeniable contributes to the historicization of the discipline. In this framework, we hold that a study on the History of Archaeology cannot fail to consider the significant role of the many international scientific relations about this particular issue.

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ORAL

## 5. MARXISM IN THE EUROPEAN ARCHAEOLOGY OF THE SIXTIES: THE CASE-STUDIES OF ITALY AND FRANCE

*Guidi, Alessandro (Università Roma Tre) alessandro.guidi@uniroma3.it*

As many scholars noted, Marxist theory (as Childe defined it, "not a set of dogmas...but a method of interpretation and a set of values" [Childe 1952, 25]) was widely incorporated in post-war European archaeology, probably as a result of a different political climate that favoured the diffusion of Marxist thought and, from another side, of the prevailing legacy of the most influential cultural and artistic *avant-garde* to the left-wing parties.

The paper explores the evolution of these theoretical trends in the two countries in which Socialist and Com-



unist parties were stronger: Italy and France, especially in the Sixties and in the early Seventies, a period in which on the other side of the Atlantic and in England the sudden burst of New Archaeology caused a deep crisis of traditionalist approaches.

As a matter of fact Marxist archaeology had more or less the same impact in Western Europe, with a true fight of the new generation against the academic establishment.

This is not surprising, given “the materialism inherent in most Marxist traditions in Europe, reminiscent of the strongly American processual archaeology, coupled with the evolutionary views of the New Archaeology which themselves had Marxist affiliations” (Hodder 1991, 15); a point of view shared by Renfrew, who dedicated some paragraphs of his archaeological handbook to the comparison between Marxism and Processual theory (Renfrew-Bahn 2012).

These trends were particularly strong in Classical and Medieval Archaeology; the paper will also examine, in the same period, the first attempts (not by chance of Marxist archaeologists!) to import processual theory in Italy (overall in prehistoric and near eastern archaeology).

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ORAL

## 6. HISTORICIZING THE 14C REVOLUTION

*Delley, Géraldine (Université de Neuchâtel, Institut d'archéologie) geraldine.delley@unine.ch*

Since the middle of the 1970's, disciplinary histories have established that the 14C dating method has revolutionized the comprehension of time in prehistory. This paper proposes a critical analysis of the implementation and reception of this innovative tool in the field of the Swiss lake-dwelling research. Focusing on the institutionalisation and the integration of the method in the daily practice of prehistoric research, this contribution aims at shedding light on a paradoxical situation. Between 1950 and 1980 the 14C dating method was recognized as an important methodological innovation by the archaeological community whereas, during this same period, the results thereby obtained remained poorly exploited. The analysis is based on published and unpublished sources (correspondence, reports, interviews) produced in the framework of wetland archaeology research in Switzerland between 1950 and 1980.

The analysis reveals that the relatively quick institutionalization of the method in Switzerland was independent from the recognition of the heuristic potential of the 14C method. Different elements explain this situation. On the one hand, the modernity of the method, coupled with the influent discourse of the politics of sciences regarding collaborations between different fields of research (humanities, natural and exact sciences), contributed to a quick recognition of the innovation amongst archaeologists. On the other hand, however, other circumstances – among which the epistemological origins of the actors of the research and the competition, within the field of archaeology, of different means of measuring prehistoric time and conceiving dates (archaeological chronologies and dendrochronology) – explain the weak interest archaeologists manifested for the new chronologies produced by the 14C method.

The contextualized historical analysis of the development of the 14C dating method reveals an absence of correlation between the development of such a methodological tool, its institutionalisation and the epistemological logics of the actors. Finally, this contribution tackles the critical issue of the long process necessary for the transformation of a technical tool into a method.

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ORAL

## 7. LECTURE DE L'ART MOBILIER À TRAVERS LES TRAVAUX DE LÉON PALES SUR LES PIERRES GRAVÉES DE LA MARCHE (VIENNE)

*Welté, Anne-Catherine - (Université de Franche-Comté, Besançon) acwp@netcourrier.com*

1955-1975 : deux décennies d'une grande importance dans l'histoire de la préhistoire au cours desquelles s'opère une véritable mutation dans les conceptions de travail, avec l'année-charnière 1958, qui voit la publication d'une part d'un des derniers grands ouvrages de l'abbé H. Breuil : *Les Cavernes du Volp : Trois-Frères, Tuc d'Audoubert à Montesquieu-Avantès, Ariège* (réalisé avec le Comte H. Bégouën), suivi l'année d'après par *les Hommes de la pierre ancienne* (réalisé également en collaboration avec R. Lantier), et d'autre part de trois articles d'André Leroi-Gourhan dans le Bulletin de la Société préhistorique française, intitulés : *La fonction des signes dans les sanctuaires paléolithique, le symbolisme des grands signes dans l'art pariétal paléolithique* et *la Répartition et groupement des animaux dans l'art pariétal paléolithique*. L'abbé H. Breuil fût la figure emblématique du « premier » XXème siècle marqué par la découverte de la ma-

jeunesse et la mobilisation permanente. L'objectivité des faits, dûment mesurés, devrait permettre de remplacer les passions et subjectivités qui facilitent les divisions. Les sciences humaines doivent donc être quantifiées pour éliminer leur gangue philosophique. Ainsi émerge un « second » XX<sup>ème</sup> siècle où l'analyse mécaniste du fonctionnement de la pensée semble s'imposer dans tous les domaines de l'activité humaine. De nouveaux procédés (analyses mécanographiques, statistiques) doivent permettre d'éloigner le hasard dans le raisonnement et de rationaliser le vivant.

Comment se situe le travail de L. Pales à La Marche dans ce mouvement des idées ? L. Pales (1905-1988) a suivi l'enseignement du comte H. Bégouën (1863-1956), et a été initié au déchiffrement des parois gravées du « sanctuaire » de la grotte des Trois-frères par l'abbé H. Breuil (1877-1961). Médecin-colonel, il quitte l'armée en 1957 et se consacre quasi exclusivement à la recherche en anthropologie et en préhistoire. Dès 1951-1952, l'abbé lui avait montré les pierres gravées de La Marche et avait exprimé le souhait de lui en confier l'étude. Il accepta cette tâche, « dont nul n'avait imaginé l'ampleur et la difficulté... » (1969, 26). Quel protocole d'analyse ce chercheur a-t-il mis en œuvre pour étudier cet ensemble de 1512 pierres (décompte de 1965) considéré par lui-même comme incomplet ?

#### ORAL

### 8. THRACIAN ARCHAEOLOGY IN BULGARIA. REVOLUTION IN THE INVESTIGATIONS AND IN THE KNOWLEDGE ABOUT THE THRACIANS.

*Gergova, Diana (National Institute of Archaeology with Museum-Bulgarian Academy of Science, Sofia Institute of Archaeology, University of Rzeszow, Rzeszow, Poland) dianagergova@gmail.com*

Thracology - one of the new disciplines that emerged in the end of the 60ies and the beginning of the 70ies of the 20<sup>th</sup> century, as an integral part of the Paleo-Balkan and Indo-European studies institutionally was supported by the found in 1972 Institute of Thracology and by the Department of Thracian archaeology at the Institute of Archaeology with Museum at the Bulgarian Academy of science. The development of this interdisciplinary

discipline was very much dependent on the archaeological investigations - the only one that could offer the acquisition of new and objective archaeological sources for the understanding of the culture of the Thracians.

Since 1972 to 1989 these investigations were financially supported by the state and had been provided often in collaboration with foreign institutes, universities and specialists from Poland, Tchechoslovakia, East and West Germany, France, Great Britain, The Netherlands, Japan, etc. This period could be really called the Golden Age of Thracian archaeology.

New methodological and technical advances were introduced for these most exhaustive investigations. The Golden Age of Thracian archaeology was characterized by the introduction of the most advanced approaches in field survey and the creation of the National Information system "Archaeological map of Bulgaria" that allowed for the first time to have an objective picture also of the Thracian settlement system and its development during the different periods (end of the Chalkolithic - to the Roman conquest). Unknown categories of sites had been registered and excavated like Thracian sanctuaries and cult places of different types, megalithic monuments, rock tombs and niches, political centers, etc. Special attention had been paid to the investigations of the Thracian burial rites and the excavations of the monumental tumuli with tombs, as well as to the study of the urbanogenic processes and cities in Thrace. Investigations of the Greek colonies and emporia change dramatically the notion about the Thracian-Greek relations in the process of the colonization. This period was characterized by the intensive interdisciplinary field and laboratory studies and contributions in their archaeological applications (areal photogrammetry, geophysical prospecting, geoarchaeological, paleoseismical and archaeoastronomical studies, archaeometric investigations, etc.)

After 1989 in the time of economic and social changes the scientific research as well as some of the institutions were deprived from any regular state financial support and left to private sponsors that in fact did not exist. Systematic long term investigations of some important sites continued on a smaller scale mainly thanks to the international collaboration of the teams. The greater part of the field investigations were connecting with the preventive archaeology. The financial sources from the infrastructural projects lead to the discovery of even more new categories of sites.

Thracian archaeology had contributed both to the better reading of the ancient written sources, as well as to

the much more objective understanding of different aspects of the civilization of the Thracians, their relations with the contemporary ancient people and contribution to the formation of the culture of Ancient Europe.

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ORAL

### 9. NEW ARCHAEOLOGY AT COCINA SITE. MAKING NEW SCIENCE WITH OLD DATA.

*Díez Castillo, Agustín (Universitat de València) adiez@uv.es*  
*García Puchol, Oreto (Universitat de València) oreto.garcia@uv.es*

*Cabanilles, Joaquim Juan (Museu de Prehistoria de València -S.I.P.-) joaquim.juan@dival.es*

*Pardo Gordó, Salvador (Universitat de València) pargor@uv.es*

*McLure, Sarah (Department of Anthropology, The Pennsylvania State University) sbm19@psu.edu*

In the Iberian Peninsula the impact of the New Archaeology in the late 1960s and early 1970s was reflected in several theoretical issues but also in the way things were recorded on the field. The New Archaeology did change the way archaeological fieldwork was done forever. Archaeologists lived the illusion of finally being able to read history books without destroying their sheets. In the 1970s more and more sites were being recorded rigorously by a increasing number of youth scholars, among them the fieldwork of Prof. Javier Fortea at the mesolithic key site of Cocina could be an example.> Unfortunately, in Cocina's case, the more than rigorous fieldwork never was fully published in the form of a monograph volume, even when the impact of the few Fortea's paper changed the way the Iberian Prehistory looked at the Mesolithic and the neolithization process forever (Fortea 1973, ...). Methodologically speaking is also a prime example of the way archaeological findings should be recorded in any excavation. Prof. J. Fortea and his collaborators mounted, at the time, a fixed structure to take aerials of each of the archaeological sheets they were reading, anticipating times to come were orthorectification can be better accomplished, but at the same time they recorded in paper the 3d provenance every artefact or biofacts, along with a little description of each piece. Those paper inventories were accompanied of carefully drawings were the findings were recorded according to a color code depending of their nature (flint, bone, seed, bead, ...). Planar coordinates (x, y) were referred to each square meter unit while the depth of the finding (z) was always referred to the same zero level.> Thanks to the careful fieldwork of Prof. J. Fortea and colleagues

we have been, first of all, able to gather all the findings in a relational database with spatial capabilities (postgis) and, secondly, to represent all of them in 3D with the aid of R -packages rgl, alphashape3d, akima, spatstat, foreign, VectStatGraphs3d, VectStatGraphs2d-, among others we have able to define zones of special interest due to three dimensional density of the findings. Even if a 3D representation of a forty year old excavation is good enough, what has been more crucial for us is the ability to reinterpret the stratigraphical sequence proposed then by Fortea, reinforcing in some points his interpretation but also challenging some of them. In conclusion, we have had a unique occasion to add value to several months of rigorous fieldwork giving sense to all the work made in 1970s by our colleagues. Our results, aside of helping us to have anew look to the neolithization process in the area, served to support rigorous fieldwork recording even in the lack of technologies. Now it is possible to record millions of points in a few seconds with laser scanners like Faro but the work done in the earliest 1970s by Prof. J. Fortea have shown the importance of a good record to will allow others to go back to the data later on time.

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ORAL

### 10. THE NEW ARCHAEOLOGY AND THE ARCHAEOLOGY OF AUSTRALIA.

*Murray, Tim (Faculty of Humanities and Social Sciences, La Trobe University, Melbourne, Australia) T.Murray@latrobe.edu.au*

In 1980 Murray and White (Tim Murray and J.P. White Cambridge in the Bush? World Archaeology 13(2): 255-263), found in the new archaeology of the 1960s the seedbed of approaches and methods that underwrote the development of prehistoric archaeology of the continent of Australia. The great themes of the new archaeology approach to hunter-gatherer archaeology laid out first by Binford and others, and subsequently by British archaeologists such as Eric Higgs and Mike Jarman, were highly influential, but then so too were what would now be described as positivist approaches to theory building and methodology flowing from the work of Binford and David Clarke. Thirty three years have elapsed since that first assessment and Australian prehistoric archaeology is much changed both in focus and approach. It is thus an excellent time to reflect on the inheritance of so much path-breaking research in the 1960s and 1970s, particularly the socio-political context within which prehistoric archaeology is practiced in Australia.

POSTER

**11. BEYOND THE THEORY: ?NEW ARCHAEOLOGY?  
IN MESOLITHIC STUDIES IN CANTABRIAN SPAIN**

*Cubas, Miriam (Instituto Internacional de Investigaciones Prehistóricas de Cantabria-Sociedad de Ciencias Aranzadi) mcubas@aranzadi-zientziak.org*

*Fano, Miguel Ángel (Universidad de La Rioja) miguel-angel.fano@unirioja.es*

One century ago, in 1914, research on the Mesolithic in the Cantabrian region started with the archaeological excavation of the site of El Penical by Count Vega del Sella. This marked the beginning of the research line whose theoretical approach has been modified from the historical-cultural paradigm consolidated in the first moment to the different approaches followed today.

The historical-cultural paradigm dominated the theoretical framework almost entirely until the 1960s and its principal aim was the establishment of the prehistoric chrono-cultural sequence in the region. Although the influence of this paradigm is still current today, the impact of New Archaeology could be observed from the 1960s onwards in Mesolithic as well as in Palaeolithic studies. In the case of the Mesolithic, this theoretical influence is significant through the research on the *Asturian* culture carried out by American and British archaeologists.

In this paper, we review the literature on Mesolithic studies in the Cantabrian region and the influence of New Archaeology in the development of this research.

The influence of the new paradigm involved the introduction of systematic surveying, excavations and sampling programs. In addition, the processual perspective involved the introduction of new study techniques, such as radiocarbon dating, sedimentology, and the use of statistics for the analysis of archaeological remains. Indeed, this approach implied the interpretation of the *Asturian* as a cultural adaptation. The concept of the culture as an adaptive system produced an interest in environmental reconstruction, subsistence and settlement patterns. This has led to the development of synchronic approaches, focused on one historical moment, without considering the dynamics of cultural transformations. Indeed, the study of the Neolithisation process is scarcely considered in processual archaeologists' research.

As a result, the influence of New Archaeology succeeded in overcoming the chronological problem related

to the chronology of the *Asturian*. Despite its impact in the western part of the Cantabrian region, processualism was not very influential in Mesolithic studies in the Basque Country. The effect of New Archeology has continued until today, through the importance of studies related to the economy, settlement patterns, etc., although this theoretical approach is a "re-formulation" of general systems theory. However, in the last decades of the 20<sup>th</sup> century we can observe studies within a diachronic perspective, focusing on research into the Mesolithic as a way to understand the Neolithisation process.

# A4b The scientific value of 3D archaeology

Commission on Historiography, Methods and Theory: Formalization, Quantification, Mathematics and Computerization

(Organisers: Hans Kamermans, Chiara Piccoli, Roberto Scopigno)

Tuesday 2nd (9:00 to 13:30 15:00 to 19:30)  
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ORAL

### 1. 3DI – ENHANCING THE RECORD, EXTENDING THE RETURNS, 3D IMAGING FROM FREE RANGE PHOTOGRAPHY AND ITS APPLICATION DURING EXCAVATION

*Powlesland, Dominic (Field Archaeologist in Residence, McDonald Institute of Archaeological Research, University of Cambridge Visiting/Honorary Professor, Universities of Leeds, York, Huddersfield and Vienna) d.powlesland@btinternet.com*

Changes in digital photography, games computing hardware and software developments over the last decade, have transformed the potential application of digital photography during excavation. Most particularly when applied to photogrammetry using Structure from Motion software for documenting structures and even landscapes as well as excavations in progress. Experiments undertaken by the Landscape Research Centre in Yorkshire over the last six years have revealed the potential benefits of using 3Di for recording excavations, in plan and in section, but unfortunately also provide an opportunity for field archaeologists to disengage with the recording process and diminish the returns from excavation. Like so many aspects of computing when applied in the field we can either enhance our potential to interpret the archaeology that we encounter, or use it to simply speed up our throughput and hide poor practice and limited observation. In many ways 3Di provides an opportunity for us to achieve the nirvana of archaeological recording, a record that is so detailed that we can truly re-examine excavations through their archived data. To do this, however, we need to apply the same levels of rigor and observation that we should to any part of the excavation and recording process and remember that new technology does not replace the eyes, touch and on site drawings but provides an opportunity to expand the record in a format that serves both the excavator and the public at large in a way that has never been possible before.

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ORAL

### 2. THE SCIENTIFIC ARCHAEOLOGICAL VALUE OF MANUAL 3D MODELING

*Lanjouw, Tijm (Leiden University) t.j.r.lanjouw@arch.leidenuniv.nl*

3D is hot now, but in 1985 it was even hotter. But there was no LIDAR, no high density point clouds, no ad-

vanced photogrammetric software, there was only manual modelling of 3D geometry using code. It was the subject of prestigious million-dollar projects dressed to impress. The immediate response of the 'sceptic archaeologist' was of course to question its actual scientific value. Some considered 3D modelers no more than sophisticated illustration tools while others embraced the new technology with enthusiasm, reciting its scientific merits ever since the early 90s. But it seemed hard to shed the stigma of 'pretty picture generators'. Then came the technology that allowed for high resolution 3D models. It really opened up new worlds and made new discoveries possible on all possible spatial scales. But what about the oldest of techniques, that of manual modelling: did it do the same? How has the technology been applied to the scientific good over the last 30 years? Are we maybe just talking about pretty pictures with some, albeit limited scientific value? Or did it change the game more than we think? Instead of presenting yet another 3D model, in this paper I will be looking back at how manual 3D modelling was used and perceived in the past and ask whether our thinking about it has made any progress.

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ORAL

### 3. MULTI-SCALE APPROACHES USING INTEGRATED SOLUTIONS FOR 3D ANALYSIS OF PREHISTORIC SITES

*Muth, Xavier (Helimap System SA) xavier.muth@gmail.com*  
*Castel, Jean-Christophe (Muséum Histoire Naturelle de Genève) Jean-Christophe.Castel@ville-ge.ch*  
*Camus, Hubert (Prothée) camus.hubert@laposte.net*  
*Vallet, Julien (Helimap System SA) julien.vallet@helimap.ch*

Over the last decades, remote sensing technologies have become more and more powerful, and thus omnipresent even in civil applications. The data recorded are more reliable, extensive and accurate. In many applications, these technologies have become quickly essential. Here, we show what kind of information these new techniques can bring, what insight can be gained in prehistoric sciences, and why these new data sets are pertinent. Focusing on photogrammetry and LiDAR technologies, we evaluate their potential for the understanding of prehistoric sites and their surroundings.

The study area covers a couple of kilometers around Pech Merle Cave (Quercy, South West of France). It takes part in the scientific research on regional human settlement and fauna occupation during the upper paleolithic. The presented data acquisition presented focuses di-

rectly on two sites: Petit Cloup Barrat, a seasonal shelter which has been occupied at least during a large period from 24.000 to 16.000 BP, and Igue du Gral, a natural trap which gives a unique rich and large sequence of fauna bones between 30.000 and 10.000 BP.

However, as both sites are located in a karstic area (Parc Régional des Causses du Quercy), its understanding is very dependent on the karst comprehension itself.

An aerial survey, that covers both sites and more largely the Pech Merle area was conducted in July 2013. The Helimap System was used for this acquisition. It is composed of several sensors for high accuracy positioning (GPS antenna and Inertial Measurement Unit), a high-resolution camera and a LiDAR system for the simultaneous recording of images and 3D points clouds. For these ~500 ha covered by a flight at 300 m over the ground, the absolute positioning accuracy of the data is better than 5cm and the density of the obtained points cloud reaches 30 pts/m<sup>2</sup>. Additional tests have been done on cliffs area with an oblique configuration and thermal imagery. Moreover, both Petit Cloup Barrat and Igue du Gral sites have been digitized by photogrammetry and integrated into the global LiDAR model.

The obtained LiDAR data enables a very precise landscape analysis. The topography under vegetation is revealed. For this karstic region especially, the survey is even more relevant. The paleokarst visible on the surface can be clearly identified. Thanks to the high density of the points cloud, every hole on the surface wider than half a meter can be easily detected. Moreover, the integration of the cave models under the ground model provided by the LiDAR acquisition enables an easier analysis of the karst in concordance with the clues at the ground surface. The 3D reconstruction of the cave is also very useful to better understand the cave filling and thus, the spatial distribution of the bones.

Many other applications can be developed with photogrammetry at the site scale. These tools are essential not only for conservative purposes, but also for other applications such as, for example, the digitizing of geological section and the assessment of excavated volume.

ORAL

#### 4. THE USE OF 3D GIS IN ARCHAEOLOGICAL RESEARCH.

*Klinkenberg, Victor (Leiden University) m.v.klinkenberg@arch.leiduniv.nl*

Geographic Information Systems (GIS) have been an important tool for archaeologists for decades now. A promising recent development is the introduction of the third dimension in GIS. Many software developers have announced to have introduced a fully functional "3D GIS". However, although in these programs it is possible to display and transform spatial features in three dimensional space, formal methods of spatial analysis have not made the leap to 3D. Therefore, these 3D GIS cannot be seen simply as a 3D version of the conventional 2D GIS. I have used the 3D element of modern GIS software for several archaeological research projects. From these, it appears that the use of the third dimension in GIS analyses presents both clear opportunities and limitations which I will discuss in this paper. I will argue that the current use of the third dimension in GIS is an important step forward, albeit one of many steps on a path still ahead.

ORAL

#### 5. TOWARDS 3D GIS

*van Leusen, Martijn (Groningen Institute of Archaeology) p.m.van.leusen@rug.nl*

In December 2012 a joint session of the Dutch, German and Flanders chapters of CAA (Computer Applications and Quantitative Methods in Archaeology) considered the theme of 'Z-the third dimension'. In several papers and an extensive plenary discussion those present considered the feasibility and desirability of extending current 2.5D GIS capabilities into three spatial dimensions. This paper will present the main aspects of these discussions.

ORAL

#### 6. 3D TECHNOLOGY IN PECULIAR SITE: THE LOWER GALLERY OF LA GARMA CAVE (OMOÑO, CANTABRIA, SPAIN)

*Maximiano, Alfredo (IIIPC. University of Cantabria) maximianoam@unican.es*

*Arias, Pablo (IIIPC; University of Cantabria) pablo.arias@uni-can.es*

*Ontañón, Roberto (Museo de Prehistoria y Arqueología de Cantabria; IIIPC. University of Cantabria) ontanon\_r@cantabria.es*

*Bárcia, Camilo (IIIPC. University of Cantabria) camilobarciagarcia@gmail.com*

Currently, the application of computational resources (Geomatics) is a widespread praxis as mediation to archaeological problems (i.e. recording, analysis and visualization of results).

In this communication we introduce a case study where a confluence of many computational resources in data capture (e.g. Total Station, Laser Scanners, Photogrammetry), analysis (Geostatistics, Rock art, Refitting, Taxonomy of archaeofaunal and Lithic...) and visual results (simulations, virtual scenes ...) are the best and only possible way to improve the quality of research based on the creation of 3D products.

The cave of *La Garma* is a Paleolithic site where original access to the cavity was collapsed sometime in the XV millennium BP. This isolation cut off from the outside and there is not any type of sedimentary process and any natural taphonomic events and/or concomitant anthropogenic activities linked with formation process dynamic. Therefore, it preserved *in situ* exceptional occupation floors (aprox 100.000 items, and 6 recognizable structures) (Ontañón 2003; Arias *et al.* 2011) and variety of rock art (paintings and engravings).

This so singular case involves the convergence between scientific research and diffusion of large and complex archaeological record (which have remained in their same places in the *Lower Gallery*) with the guarantee of preservation and dissemination of the prehistoric heritage to the lay public.

This situation makes indispensable the use of leading technology in 3D, nonintrusive data capture and analysis of archaeological evidences with the minimal impact over this exclusive archaeological heritage (It was included in the World Heritage List since 2008), and these practices are the reference vector from the first archaeological interventions that have been performing since the moment of its discovery (the late 90's of the XX century). In this communication we introduce several initiatives launched for the digital processing of all archaeological evidence, synthetically: Laser scanner technology was used for volumetric modeling of the cave; High resolution Photogrammetry for maximum details in occupations

floors; 3D Scanning artifacts *in situ* (lithic, archaeofaunal...); Non-intrusive method like: GPR, XRF; use of GIS platform like management geo-database and analytical tool (Maximiano *et al.* 2013)

All these activities allow us to work outside the archaeological site, from a digital and virtual environment (in our Lab) with different types of 3D models which we interact with thousands of entities compiled from the site (e.g. debitage, lithic objects, archaeofaunal, pigment, structures, fireplace, rock art...) At the same time, we are generating high quality metadata and a digital environment where we can replicate/simulate all sectors of the cave, analyze (Bárcia 2013) and interacting (Arias *et al.*; in press) with sets/collections of entities/objects without impairing to the archaeological heritage in the cave. As a result, preservation and minimal impact on these unique contexts is ensured keeping them unchanged for future generations and for improvements in research methodology that enables address problems with the current *state of technology* are not addressed.

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ORAL

**7. NEW DEPICTIONS FOR ANCIENT CARVINGS. RESULTS OF THE MRM PILOT PROJECT AT THE ROCK ART SITE MONTE FARO, VALENÇA, PORTUGAL.**

*Pires, Hugo (Centro de Investigação em Ciências Geo-Espaciais (Univ. Porto) miqhapaqnan@gmail.com*

*Bacelar Alves, Lara (Centro de Estudos em Arqueologia, Artes e Ciências do Património (Univ. Coimbra) larabacelar@sapo.pt*

*Martínez Rubio, José (Laboratório de Fotogrametria Arquitectónica (Univ. Valladolid) jmrbuio@ega.uva.es*

*Elorza Arana, Artzai (Laboratório de Fotogrametria Arquitectónica (Univ. Valladolid) artzai.elorza@gmail.com*

*Gonçalves Seco, Luis (Centro de Investigação em Ciências Geo-Espaciais (Univ. Porto), Instituto de Ciências del Patrimonio, Consejo Superior de Investigaciones Científicas, Instituto Universitario da Maia) lgseco@gmail.com*

*Fonte, João (Centro de Investigação em Ciências Geo-Espaciais (Univ. Porto), Instituto de Ciências del Patrimonio, Consejo Superior de Investigaciones Científicas) joaofonte@gmail.com*

High-definition 3D digital models of objects, sites or landscapes are increasingly been made available to researchers and general public. Entire countries are being surveyed with airborne Laser scanning systems, extensive 3D digital artefacts collections are being built by museums, entire archaeological excavations are being



record in 3D. In brief, a lot of focus and effort is being put into 3D scanning for archaeological research. But are we benefiting from all the information that this data can deliver?

The most common approach for 3D scanning data visualisation has been to produce a mimesis of the way we see things in reality. Although allowing a good perception of shape and morphological detail in most cases, this technique is limited by the same constraints that archaeologists face in the real world sites: faded or damaged testimonies of anthropic activities are often very hard and tricky to perceive and interpret.

A recently developed technique, called Morphological Residual Model, tries to overcome this problem by transforming high resolution 3D scanning data sets into contrasted depictions of surface morphology, unveiling astonishing details of engravings that are not perceived by human vision even in controlled lighting conditions. To overcome some of the difficulties that 3D visualization presents for most archaeologists, a tool for visualizing MRM results within the Reflectance Transformation Imaging viewer (RTI) environment is currently being developed.

These techniques are currently being tested in the context of a research project on the open air rock art site of Monte Faro, in the region of Valença (north-western Portugal). As fieldwork developed, the assemblage extended from the four sites published in the 1980s and 1990s to over one hundred carved rocks. The large majority of sites exhibit cup-marks, cup-and-ring motifs and animal figures typical of the Iberian Atlantic Art tradition, either found in isolation or in complex arrangements.

The results achieved so far emphasize the ability of the MRM approach not only to reveal faded carvings but also as an innovative and effective way of depicting morphology.

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#### ORAL

### 8. USING DIGITAL PHOTOGRAMMETRY TO PRODUCE 3D MODELS AT PREHISTORIC DITCHED ENCLOSURES: PERDIGÕES AS A CASE STUDY.

Caro, Jose L. (University of Malaga) [jlcaro@uma.es](mailto:jlcaro@uma.es)  
Márquez-Romero, Jose E. (University of Malaga) [jemarquez@uma.es](mailto:jemarquez@uma.es)  
Jimenez-Jaimez, Victor (University of Southampton) [V.J.Jimenez-Jaimez@soton.ac.uk](mailto:V.J.Jimenez-Jaimez@soton.ac.uk)

The Perdigões archaeological complex (Reguengos de Monsaraz, Portugal) is a prehistoric site near the Guadiana river, comprising at least 12 ditched enclosures, several hundred pits, an area with megalithic tombs and a set of standing stones (*cromeleque*). It is located in one of the richest archaeological landscapes of Iberia, with notable examples of Prehistoric monumental architecture such as menhirs and portal tombs (*antas*). A team from the University of Malaga (Spain) has been carrying out fieldwork in collaboration with the Portuguese entity ERA Arqueologia at the site since 2008. This includes geophysical (2008-2009) and microtopographical (2011) surveys of the whole site, as well as both open-area excavations (2012-2013) and trenches (2009-2010, 2013) in the area surrounding Gate 1.

Digital photogrammetry is an inexpensive computerised method that enables the creation of three-dimensional models from photographs using image pattern recognition. The technique can be employed during the process of excavation to better record the archaeological evidence, to generate 3D models of the stratigraphical units and to digitalise singular findings. It is also useful activities aiming to spread knowledge and awareness about the site. In this paper we will describe the basics of the method and its workflows, and three specific applications at Perdigões. Later, we will compare digital photogrammetry with alternative solutions for the digitalisation of cultural heritage, such as LIDAR and total station scanners with LASER.

Digital photogrammetry has been utilised in three separate aspects of research at Perdigões:

- Generating DTM (digital terrain models) of large excavation areas like that laid out by us around Perdigoes' Gate 1 (about 1000m<sup>2</sup>).
- Producing 3D models of different excavation trenches made on the site, e.g. a trench over Ditch 1.
- Creating models of outstanding findings, like small idols. This task is particularly difficult because of the small size of the objects.

Each of these purposes requires specific modelling techniques and workflows, namely equipment, software programs and techniques like photography, polygons, mesh and texture, all of which will be presented in this paper. Digital photogrammetry allowed the generation of a comprehensive model of the large excavation area around Gate 1 of Perdigões that would have been more difficult and expensive using other methods like LIDAR. This excavation recording has been used to obtain paleo-reconstructions of the site. Furthermore, digital photogrammetry has enabled the creation of partial 3D

models of the archaeological evidence, which can be later used in the process of analysis and knowledge dissemination.

Digital photogrammetry can help archaeologists in many ways, from digitalisation of archaeological contexts and structures in large areas to small artefacts. The resulting models are realistic in terms of looks and textures and can be used in a variety of activities, from recording to interpretation to public access.

ORAL

### 9. 3D MODELING BY DIGITAL PHOTOGRAMMETRY APPLIED TO THE PALAEO-LITHIC MAMMOTH BONE DWELLING SITE OF GONTSY (UKRAINE)

*Iakovleva, Lioudmila - (1. Institut d'Archéologie NAS Ukraine & UMR 7041 Arscan) [liakovleva@wanadoo.fr](mailto:liakovleva@wanadoo.fr)*

*Djindjian, François - (2. Université de Paris 1 Panthéon Sorbonne & UMR 7041 Arscan) [francois.djindjian@wanadoo.fr](mailto:francois.djindjian@wanadoo.fr)*

*Egels, Yves - (Institut Géographique National) [yves.egels@free.fr](mailto:yves.egels@free.fr)*

#### Résumé

La technique de photogrammétrie numérique a été utilisée pour obtenir une modélisation 3D de l'habitat paléolithique à cabanes en os de mammoths de Gontsy (Ukraine). La zone de l'habitat étudiée contient trois cabanes en os de mammoths, des fosses, des zones d'activités et des foyers. Les difficultés qu'il a fallu surmonter sont l'insuffisance de contraste (couleur du loess), la faible discrimination des objets (répétitivité des ossements de mammoths) et l'existence de nombreuses zones aveugles (superposition des ossements).

#### Abstract

The digital photogrammetry technique was used to obtain a 3D modeling of a palaeolithic settlement with mammoth bone huts in Gontsy (Ukraine). The processed settlement area contains three mammoth bone huts, pits, working areas and hearths. The difficulties that had to be overcome are the lack of contrast (color of the loess), the small discrimination of artefacts (repeatability of the mammoth bones) and the existence of many blind areas (overlay of the bones).

ORAL

### 10. ARCHAEOLOGY AND COASTAL EROSION: MONITORING CHANGE THROUGH 3D DIGITAL TECHNIQUES

*López-Romero, Elías (Department of Archaeology, Durham University, South Road, Durham DH1 3LE, UK) [elias.lopez-romero@durham.ac.uk](mailto:elias.lopez-romero@durham.ac.uk)*

*Mañana-Borrazás, Patricia (Institute of Heritage Sciences (Incipit) Spanish National Research Council (CSIC), San Roque 2, 15704 Santiago de Compostela, Spain) [patricia.manana-borrazas@incipit.csic.es](mailto:patricia.manana-borrazas@incipit.csic.es)*

*Güimil-Fariña, Alejandro (Independent researcher) [alejandro.guimil.farina@gmail.com](mailto:alejandro.guimil.farina@gmail.com)*

*Daire, Marie-Yvane (Laboratoire Archéosciences UMR 6566 CReAAH/Centre de Recherche en Archéologie, Archéosciences, Histoire, Bâtiment 24?25 Campus de Beaulieu, 263 Avenue du général Leclerc, Rennes, France) [marie-yvane.daire@univ-rennes1.fr](mailto:marie-yvane.daire@univ-rennes1.fr)*

At present, sea-level rise is one visible effect of climate change, and human activity is also threatening much coastal and island territory on a global scale. The vulnerability of coastal heritage is increasingly coming into focus, particularly in areas such as the European Atlantic façade, where the combined results of sea-level rise, coastal environment dynamics and human activity are significantly altering the coastline. In this context, one of the aims of the eSCOPES Project (*Evolving spaces: coastal landscapes of the Neolithic in the European Land's Ends*, Marie Curie-IEF) is to provide cost-effective tools for monitoring at-risk coastal archaeological sites.

The project uses close-range photogrammetric techniques ('Structure from Motion') to record, 3D model and monitor changes in the architecture of selected megalithic monuments in three areas of the European Atlantic façade: the isle of Coalen (Côtes-d'Armor, Brittany, France), the Pénestin peninsula (Morbihan, Brittany, France) and the isle of Guidoiro Areoso (Ría de Arousa, Galicia, Spain). The sites have been chosen taken into account their location in different environmental settings, their different structural characteristics and their high vulnerability.

In addition to the photogrammetric record, a 3D laser scanning has recently been performed in Guidoiro Areoso in order to provide a series of comparative reference models.

The project is still ongoing. Two fieldwork campaigns have so far taken place (September 2013 and February-

March 2014). As a result, we have obtained more than 1200 photographs for each site so far. Several palaeosols and structures associated with, or in close proximity to, the megalithic monuments have also been documented. A third and last fieldwork campaign will take place in September 2014. Some preliminary 3D models have already been obtained and are being object of in-depth analysis.

The use of close-range photogrammetry appears as a cost-effective way to efficiently apprehend coastal archaeological site erosion.

The comparison of the 3D models for each site (surface loss, quantitative analysis) will provide a three-dimensional quantitative and a visual estimate of the erosion rate for the archaeological sites, constituting a powerful tool for decision-making processes to inform best practice in managing coastal heritage.

Additionally, the detailed three-dimensional record of the selected case studies will also allow safeguard the potential for architectural analysis of the sites even in the event of severe damage or destruction.

## ORAL

### 11. IMAGE BASED MODELING AND LITHIC ARTIFACTS

*Chu, Wei (University of Cologne) wchu@uni-koeln.de*  
*De Reu, Jeroen (Ghent University) Jeroen.DeReu@UGent.be*

In recent decades, archaeology has been increasingly concerned with creating narratives of cultural behavior through the lens of stone tool residues. Macroscopic stone tool systematics, however, have remained largely unchanged since the early part of this century as researchers continue to rely on visual typologies, basic classificatory forms, and simple orthogonal measurements to draw conclusions. Though three-dimensional (3D) analysis has become *de rigueur* in other areas of archaeology including site excavation, fossil reconstruction, and heritage management, its application to the stone artifact record has remained limited in spite of clear analytic potential. Despite the ambition of some modern archaeologists to apply 3D recording techniques to new archaeological finds or to the reassessment of key sites and assemblages, the capital and time required as well as the complexity of 3D registration methods (i.e. laser scanning, structured light scanning, and computer tomography) have severely limited its broad application.

Recently, however, image-based 3D modeling, a technique for recovering 3D shapes and appearances of objects from 2D images, has demonstrated itself as a low-cost alternative to traditional methods. It requires little more than a digital camera and low-cost or open source software packages. Our results show that image-based 3D reconstruction can be an accurate cost-effect alternative to range based methods. Overall, this suggests that image-based 3D reconstruction can be highly useful in the analyses of lithic material from a wide range of geographical and chronological contexts.

## POSTER SESSION

## POSTER

### 12. GEOMETRIC DOCUMENTATION AND DIFFUSION OF THE ROCK-ART IN THE MOUNTAIN RANGE OF ALBARRACÍN (SPAIN): ARAM PROJECT.

*Angas, Jorge (3D Scanner Patrimonio e Industria, Spin-off University of Zaragoza. Group "Primeros Pobladores del Valle del Ebro" Area of Prehistory, Dpt. Sciences of Antiquity. University of Zaragoza) j.angas@3dscanner.es*  
*Bea, Manuel (PostDoc Researcher "Torres Quevedo", 3D Scanner Patrimonio e Industria, Spin-off University of Zaragoza & MINECO. Group "Primeros Pobladores del Valle del Ebro" Area of Prehistory, Dpt. Sciences of Antiquity. University of Zaragoza) manubea@unizar.es*

Rock-art is one of the fields works that brings the most difficulties in its documentation, both geometric and graphic. The main difficulty is the importance of the objective register of each painted or engraved motif, as well as its relationship with the geometry of the place and substrate where they were created. This point is very important, because the reliable reproduction of the graphic and metric character allows us to research and explain the semiotics of each rock-art group.

In recent years, there have been important results that have enabled the improvement of the quality of graphic documentation of the decorated sites, with very notable progress in 3D documentation of rock-art. This improvement of data acquisition allows the perfect presentation and also a "real" perception of the represented works. Nevertheless, there is not yet a methodological standardization that we can use to document, to research, to spread and to preserve rock-art. On the other hand, the proliferation of new technologies and methodologies for document and spreading of Cultural Heritage in general has been quite relevant, and rock-art in particular, as

a constant in the last few years, evolving in time with the available technology.

In the latest three years, we have applied our own documentation methodology on 15 rock-art shelters from Albarracín, Bezas and Tormón. We developed a register system that combines the data acquired by 3D scanning technology (structured white light, time-of-flight, phase shift), photogrammetry, high-resolution spherical images both terrestrial and aerial and, finally, their organization by metadata.

The principal result of this research has been to contribute in a different concept for the registration, analysis and appreciation of rock-art allowing us a more exhaustive exploitation of the graphic and metric documentation. Additionally, it contributes to the gradual change towards the tri-dimensional graphic representation by using new digital supports.

A large part of the obtained information has been processed in order to create new products to improve the impact of the spreading by using a web platform. So, the documentation generated has been transformed and uploaded to the *RAMA Project: Rock-Art and Multimedia Accessibility* web page (<http://proyectoaram.tecnitop.com/>). The owners of this website want to open a digital platform where a large number of documented rock-art sites (Palaeolithic, Levantine and Schematic) as a nexus between different cultural areas in the Iberian Peninsula, can be exposed.

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POSTER

### 13. FROM PENCIL TO 3D VIRTUAL MODEL. THE BREWERY FROM TELL EL-FARKHA, EGYPT.

*Rosinska-Balik, Karolina (Institute of Archaeology, Jagiellonian University in Krakow, Poland) k.rosinska.balik@gmail.com*

*Debowska-Ludwin, Joanna (Institute of Archaeology, Jagiellonian University in Krakow, Poland) joanna.debowska-ludwin@uj.edu.pl*

Methods and techniques of field work documentation are constantly being improved. In the era of visual media, it has become necessary to upgrade traditional drawings and records of structures unearthed during archaeological prospection. Documentation process of excavated sites has always been crucial especially when a considered feature, accordingly to specific destructive character of archaeological examination, is accessible to

researchers for limited time. Parallel to graphic and visual improvement go possibilities of data interpretation. The new way of view produces not only eye-catching images but it could be a great resource for further consideration, testing hypotheses or research result presentation. In my paper I would like to present development in documentation techniques implemented during over 15 years of excavation at the Tell el-Farkha site in Egypt. This Pre- and Early Dynastic site gives great opportunities since different types of features are registered on it starting from domestic structures at a settlement area, through industrial installations and ending on graves. I would like to focus on some specific structures discovered over the time – breweries. Several examples of these devices were recorded at the site and during the passing years they were documented in various styles. The goal of my paper is to present them all with all their pros and cons

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POSTER

### 14. 3D MODEL OF THE SITE STRATIGRAPHY AS A RESEARCH TOOL

*Urbanowski, Mikołaj (Szczecin University, Institute of History, Archaeological Department) m.urbanowski@univ.szczecin.pl*

Since the beginning of the scientific archaeology the excavation is regarded to be an unidirectional research tool. Although this general opinion is still true, the capabilities of a 3D stratigraphic documentation significantly limit the necessary data loss and allow to virtually re-excavate the site as many times as it will be necessary.

The excavation of Late Middle Palaeolithic site in Stajnia Cave, Poland (N 50° 36'58,28", E 19° 29'04,24"), where conducted by the author so that it was possible to create a kind of photographic tomography of the site, which was cut into numerous plans and sections. Such methodology slowed the excavation, although it didn't disturb precise attribution of the finds to the stratigraphic unit, as well as to measure their 3D position within the site. All the partial photos were combined into a mosaic full-scale pictures, which were subsequently converted into a textures for the 3D model of the site stratigraphy. The model was enriched with the result of the 3D scanning of the site, which allowed to complete the model of the cave and its infillings.

The effects of the usage of such research tool fully rewards the time and effort which was invested during

the excavation. The possibility of visualisation of the subtle interfaces between the layers, which from definition are three-dimensional, thus difficult to trace in two-dimensional traditional documentation, allowed to make a very precise stratigraphic interpretation. For the sites like Stajnia, where the stratigraphy is heavily distorted by the cryoturbation, such tool is invaluable. After creating meshes from all the layers, it is also possible to create artificial cuts of the sediments in places of the site where it was not possible during the excavation. After several years of usage of system of documentation and visualisation it became a must-have-solution for the whole research team involved in research in Stajnia

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POSTER

**15. QUICK 3D RECORD: A LOW-COST METHOD OF DOCUMENTATION AND ANALYSIS OF SCATTERED ARCHITECTURES IN THE EMCHAHE PROJECT**

*Mañana-Borrazás, Patricia (Institute of Heritage Sciences, Spanish National Research Council) patricia.manana-borrazas@incipit.csic.es*

*Blanco-Rotea, Rebeca - (Technological Research Institute, Santiago de Compostela University) rebeca.blanco.rotea@gmail.com*

*Sánchez-Pardo, José Carlos (Santiago de Compostela University) josecarlos.sanchez@usc.es*

This work makes part of the Marie Curie CIG *EMCHAHE project: Early Medieval Churches: History, Archaeology and Heritage* (2013-2017), lead by José Carlos Sánchez-Pardo at the University of Santiago de Compostela (Spain). The research area of this project is the archaeology and history of the early medieval rural churches and their value for cultural management in Galicia (Northwest Spain). The project has two major goals. First, to generate new archaeological/historical knowledge on the social dynamics in such a peripheral area of Europe during the period of transformations that goes from the end of the Roman World until the peak of the feudal system (5th-11th centuries) by means of the study of the remaining evidences of the religious buildings of this period. Second, to learn how to re-direct all this knowledge towards a proper and effective management and communication of the important and rather unknown heritage value of the remains of these buildings: architectural, archaeological (unearth or visible), artistic, documentary or even toponymic. Both objectives are interrelated since only an adequate historical knowledge allows a correct heritage management.

EMCHAHE is a project with several methodological challenges that we must face with limited resources. One of these challenges is the territorial scale, which involves the analysis of a large number of sites scattered through three rural areas of Galicia. This dispersion increases the problems and the cost of the access and the study of each church. Another one is the difficulty of identifying and analysing evidence of early medieval phases in the churches due to the frequent existence of several reforms and reconstructions. Therefore, it is necessary to apply a church documentation method as agile in field as accurate enough, which allows recording the graphic and geometric information necessary for a detailed study (stratigraphic analysis of the walls, identification of architectural elements, etc.) with the lowest cost.

The poster will summarize the workflow and results of this quick and low-cost record of scattered churches proposal. Close-range photogrammetry is a low-cost technique that allows a correct, accurate and detailed record of each church, basis for visualizing, analyzing and representing the architectonic features and the creation of 3D models and reconstructions. After several months of fieldwork and post-processing, we have developed an specific and well-adapted work system for this project. This has allowed us to document a high number of churches and to speed up the work in relation to other methodologies.

The project is still ongoing, but we have some methodological conclusions. The most important, we are now able to create a digital copy of the building using photogrammetry and make the field documentation agile and accurate. This digital copy can be used later to make decisions or recover information without returning to the place. It can be also used as basis for heritage outreach, the presentation of the results and reconstruction hypothesis that include not only the 2D stratigraphy but the volumes of the ancient buildings that have survived in the interior of the current churches.

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POSTER

**16. WHAT CAN WE FIND ON A MANDIBLE? 3D IMAGING OF AN EPIGRAVETTIAN ART OBJECT FROM GROTTA PAGLICCI (FOGGIA, SOUTHERN ITALY).**

*Moretti, Erika (Department of Physical Sciences, Earth and Environment - R.U. Prehistory and Anthropology - Università di Siena) erykamor4@gmail.com*

*Arrighi, Simona (Department of Physical Sciences, Earth and Environment - R.U. Prehistory and Anthropology - Uni-*

*versità di Siena) s.arrighi@hotmail.com*

*Boschin, Francesco (Department of Physical Sciences, Earth and Environment - R.U. Prehistory and Anthropology - Università di Siena) fboschin@hotmail.com*

*Crezzini, Jacopo (Department of Physical Sciences, Earth and Environment - R.U. Prehistory and Anthropology - Università di Siena) crezzini@unisi.it*

*Ronchitelli, Annamaria (Department of Physical Sciences, Earth and Environment - R.U. Prehistory and Anthropology - Università di Siena) annamaria.ronchitelli@unisi.it*

In this work we tested the application of 3D microscopy to technological analysis of artistic engravings on Palaeolithic mobiliary art objects. The aim of this research is to understand the technical and artistic procedures followed by prehistoric artists. Here we analysed an unpublished right mandible of *Bos primigenius* (auroch), coming from the portable art assemblage of Paglicci Cave (Foggia, Southern Italy). This site shows an artistic production of exceptional importance that offers an essential record about Paleolithic mobiliary art in Italy (from Gravettian to Final Epigravettian). The studied mandible, coming from Evolved Epigravettian layers, displays an engraved motif of difficult interpretation.

Before studying the archaeological piece we produced an experimental programme in order to compare archaeological data with those obtained through replication under controlled parameters. We produced a set of experimental engravings on bone using burins and not retouched blanks. The experimental and archaeological engravings were analysed by means of a Hirox 3D Digital Microscope KH-7700. Cross sections from the median part of each groove have been observed and metrical parameters have been collected (depth, breadth at the floor and breadth at the top of the groove). In order to describe the shape of each cross section the ratio between the breadth at the top and the breadth at the floor, as well as the ratio between the breadth at the top and the depth of cut marks have been calculated.

Results of the analysis revealed that the overall contours of the figure was engraved first, while engraved lines inside were added afterwards. The experimental data pointed out that the morphometric analysis reveal no discriminating characters between the engravings produced by burins and those produced by not retouched blanks; on the other hand the micromorphological analysis showed a clearer context, where we can characterize the engravings produced by the two kinds of tool. The analysis of archaeological piece revealed a high homogeneity of the micromorphological and micromorphometrical data, feature which suggests the use of a single

tool in the realization of the figure, probably a burin. In addition to it the morphometric data collected on the mobiliary art object were compared with those collected on a sample of cut marks from the same site. Significant differences were found between the two samples: in particular the cut marks cross-sections are V-shaped, whilst the art object is characterised by U-shaped engravings. As regards the micro-morphological data, this research seems to give good indications for the detection of parameters that allow us to recognize the kinds of tool used for engraving. The application of 3D microscopy reveals new perspectives for the identification of techniques and gesture of prehistoric artists. Finally, the differences found between the art object and the cut marks are of great interest for developing protocols able to separate between butchering marks and engravings of dubious origin.

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POSTER

**17. DOCUMENTATION AND ANALYSIS OF THE ARCHAEOLOGICAL HUMAN FOOTPRINTS OF GALERÍAS DE LAS HUELLAS SITE (OJO GUAREÑA KARSTIC COMPLEX, BURGOS) FROM 3D LASER SCANNER AND GIS TECHNIQUES**

*Ruiz García, Francisco (Grupo Espeleológico Edelweiss. Excm. Diputación Provincial, 09071-Burgos) karstdeburgos@gmail.com*

*Ortega Martínez, Ana Isabel (Grupo Espeleológico Edelweiss. Excm. Diputación Provincial, 09071-Burgos) anaisabel.ortega60@gmail.com*

*Martín Merino, Miguel Ángel (Grupo Espeleológico Edelweiss. Excm. Diputación Provincial, 09071-Burgos) mamartinmerino@gmail.com*

*Benito, Calvo Alfonso (Centro Nacional de Investigación sobre la Evolución Humana (CENIEH, Paseo Sierra de Atapuerca s/n, 09002-Burgos, CENIEH) alfonso.benito@cenieh.es*

*Karampaglidis, Theodoros (Centro Nacional de Investigación sobre la Evolución Humana (CENIEH, Paseo Sierra de Atapuerca s/n, 09002-Burgos, CENIEH) theodoros.karampaglidis@cenieh.es*

*Campana, Isidoro (Centro Nacional de Investigación sobre la Evolución Humana (CENIEH, Paseo Sierra de Atapuerca s/n, 09002-Burgos, CENIEH) isidoro.campana@cenieh.es*

Ojo Guareña Karstic Complex is one of the biggest interconnected cave systems in Spain of 110 km long. It contains an impressive archaeological record of human activities from Upper Pleistocene, and it was listed in 1970 as Spanish Cultural Heritage. The diversity and variety of passages and sites include living areas cave vestibules,

rock art, human bones, grave goods or archaeological objects inside passages. Among these sites, the human footprints site of the "Sala y Galerías de las Huellas" is one of the most singular and vulnerable archaeological sites of Ojo Guareña karst.

The Sala and Galerías de las Huellas form a network of passages located inside the slope of Circo San Bernabe, at 1250 m westward from Cueva Palomera entrance. In 1969, an important set of well-preserved human bare footprints were found, preserved in the soft clay sediments of the floor. Due to difficulty of combining the documentation and preservation of these footprints, the study of this site has not been possible until the advance of new non-invasive remote sensing techniques.

In this work, we show the preliminary works carried out since 2012, focused on the accurate three-dimensional reconstruction of the human footprints site, using non-destructive 3D laser scanner methods and GIS techniques. The latter allow us to analyze the tracks and the characteristics of the human group who explored this cavity during the Prehistory. These works have been carried out combining 3D laser scanner technology with GIS methodologies, obtaining a model of the cavity floor, where the footprints and their internal morphology can be observed in detail. Currently we have identified more than 900 prehistoric human footprints and at least 16 distinct tracks, which could belong to around 8 individuals.

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#### ORAL

### 18. 3D NUMERICAL SIMULATION OF A FIRE IN A SIMPLIFIED GALLERY OF THE CHAUVET-PONT-D'ARC CAVE

*Lacanette, Delphine (I2M UMR 5295) lacanette@enscbp.fr  
Ferrier, Catherine (PACEA UMR 5199) c.ferrier@pacea.u-bordeaux1.fr*

*Mindeguia, Jean-Christophe (I2M UMR 5295) jean-christophe.mindeguia@u-bordeaux.fr*

*Debard, Evelyne (Université Lyon 1 - Département des Sciences de la Terre) evelyne.debard@univ-lyon1.fr*

*Kervazo, Bertrand (CNP Périgueux - PACEA UMR 5199) bertrand.kervazo@culture.gouv.fr*

The Chauvet-Pont-d'Arc cave located in the South-East of France shelters numerous fire marks on its walls (flakes, rubefaction, soot deposits). Hearths have been rearranged, and it is difficult to find the position of the fireplaces corresponding to the marks on the walls. Yet this information would be important to give interpre-

tations of the function of the fires and to check which behaviours were possible near the fires. Unfortunately it is impossible to reproduce the fires in this environment. We propose to use 3D numerical simulation of a fire burning in a volume like the Megaceros gallery of Chauvet-Pont-d'Arc to check whether it was possible or not to stay near the fire.

We use a Computational Fluid Dynamics code to simulate the combustion and the smoke transport. Fire Dynamics Simulation (FDS) is an open source code developed by the National Institute of Standards and Technology (NIST) in the United States. The methodology has been validated on an experimental fire in an underground quarry (LaScArBx IThEM program). The numerical data for the temperature on the wall of the fire, and for the carbon monoxide rates at the entrance of the quarry were compared to the experimental ones with a good agreement. The observations contributed also to the validation, as the smoke transport was video recorded during the experiment and matched with the simulations.

Temperatures at the wall near the fire exceed 300°C, i.e. the temperature of rubefaction of the limestone. This red colour is actually observed in the cave in these areas. Besides, simulation shows that smokes loaded with soots are concentrated in the upper parts of the domain. Observations by geoarchaeologists in the cave have located the soot deposits in the upper parts of the Mégacéros gallery.

Moreover, the highest concentrations of the toxic gases are also found numerically at the vaults of the gallery. The Fractional Effective Dose (FED) is a parameter commonly used in toxicology. It evaluates the exposure time available to escape from a place in fire or to survive post exposure. It provides valuable data of the possible behaviours of people in the environment of a fire.

The numerical results, corroborated with the observations in the Chauvet-Pont-d'Arc cave, showed that it was possible to stay near a fire, in the lower parts of the gallery.

3D numerical simulations have shown it was possible for Palaeolithic men and women to put additional wood to the fire during the burning, and to circulate around it, provided they have stayed in the lower parts of the galleries. The upper parts concentrate the heat and the toxic gases.

These first simulations on a simplified geometry have given valuable qualitative results. In order to go further

with quantitative ones and to get more precise information, we will integrate the precise geometry of the cave, based on its 3D numerical modelling. Furthermore, we will try several positions for the hearths, in order to identify which original position led to which mark on the walls.



# A4C Underwater Archaeology

Commission on Historiography, Methods and Theory: Formalization, Quantification, Mathematics and Computerization

(Organisers: Alexandra Figueiredo, Flavio Calippo, Deisi Eloy Farias)

Monday 1st (14:00 to 19:30)  
B07 Meeting Room



2014 burgos  
1-7 sept.

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Union International  
de Sciences Préhistoriques  
et Protohistoriques



XVII World UISPP Congress  
XVIIe Congrès Mondial de l'UISPP  
XVII Congreso Mundial de UISPP

ORAL

**1. UNDERWATER RESEARCH OF THE MIDDLE PALEOLITHIC IN DALMATIA, CROATIA**

*Karavanić, Ivor (University of Zagreb, Faculty of Humanities and Social Sciences, Department of Archaeology) ikaravan@ffzg.hr*

*Zubčić, Krunoslav (Croatian Conservation Institute) kruno.zubcic@gmail.com*

In recent years, work on Middle Paleolithic sites in Dalmatia (south Croatia) has intensified. It focuses on several cave sites, an open air, and an underwater site, as well as on land and underwater survey of particular parts of the region. This research is funded by Croatian Science Foundation, Ministry of Culture of Republic of Croatia and the University of Zagreb.

Kaštel Štafilić - Resnik is Middle Paleolithic underwater site at the depth of about 4m. Small scale underwater excavation and systematic collection of surface finds at this site using a grid have been ongoing since 2008. In 2014 underwater survey of some parts of Dugi island was also carried out. The methodology and preliminary results of underwater research of the Middle Paleolithic in Dalmatia will be presented on a poster.

The site of Kaštel Štafilić - Resnik represents elements (lithics) from one or several open-air habitation sites from the time when the sea level was considerably lower than today. Stone tools, pseudo-tools and numerous naturally broken pieces of local chert were found. All artifacts belong to the Mousterian industry, and there are also indications of the Levallois technique. Although the finds are disturbed (due to the action of waves and other factors) it seems that their accumulation is mainly not a result of displacement from another locality that was far away from the present site. However, only some of the finds may have arrived to their present position through erosion from another place.

It is vitally important to continue with this research in order to get a more complete picture of the area occupied by the Paleolithic people and their mobility patterns. We hope that this will allow a comparison of the land sites with those now under water, a reconstruction of formation processes of underwater sites, and further improve methodology of research of such sites.

ORAL

**2. TWENTY METRES DEEP! THE MESOLITHIC PERIOD AT THE SITE YANGTZE HARBOUR IN THE ROTTERDAM MAASVLAKTE, THE NETHERLANDS. EARLY HOLOCENE LANDSCAPE DEVELOPMENT AND HABITATION.**

*Sier, Maaïke Maria (City of Rotterdam Archaeological Service (BOOR) mm.sier@Rotterdam.nl*

*Cohen, Kim (Universiteit Utrecht & Deltares) k.cohen@geo.uu.nl*

*Kooistra, Laura (Biax Consult, Biologische Archeologie en Landschapsreconstructie) kooistra@biax.nl*

*Kubiak-Martens, (Biax Consult, Biologische Archeologie en Landschapsreconstructie) Lucy.kubiak@biax.nl*

*Moree, Jurrien (City of Rotterdam Archaeological Service (BOOR) jm.moree@Rotterdam.nl*

*Niekus, Marcel (ADC-Archeoprojecten) marcelniekus@gmail.com*

*Hans Peeters (Rijksuniversiteit Groningen) J.H.M.Peeters@rug.nl*

*Schiltmans, Dimitri (City of Rotterdam Archaeological Service (BOOR) dea.schiltmans@Rotterdam.nl*

*Verbaas, Annemieke (Stichting LAB) averbaas@stichtinglab.com*

*Verbruggen, Frederike (Biax Consult, Biologische Archeologie en Landschapsreconstructie) verbruggen@biax.nl*

*Vos, Peter (Deltares), Jorn Zeiler - abone@planet.nl (Archeobone) Peter.Vos@deltares.nl*

In November 2011 archaeologists of City of Rotterdam Archaeological Service (BOOR) conducted underwater research in the Yangtze harbour, Rotterdam Maasvlakte, The Netherlands. The research was commissioned by the Port of Rotterdam Authority as a result of the expansion of the Rotterdam harbour area and was supervised by the Cultural Heritage Agency of the Netherlands.

The results of geological, botanical, zoological and archaeological analyses of the retrieved material generated new information on the occupation of a relatively high river dune by Mesolithic hunter-gatherers, and on the development history of the surrounding landscape ca. 9,000 years ago.

Rather than using diving techniques the underwater investigations were carried out from a board of a vessel using a wire-operated, horizontal closing grab. Three small trenches (total area ca. 375m<sup>2</sup>) were excavated in layers in a fairly controlled manner. This kind of underwater excavations cannot achieve the same level of precision as is possible on land, but the many soil core samples

taken in the project's preliminary phase allowed detailed descriptions of the geomorphological stratigraphy. The excavation resulted in 316 bulk bags of soil. This soil was sieved on land, using sieves with mesh sizes of 10 and 2mm, after which archaeologists and volunteers carefully sorted the residues, documenting a total of ca. 46,000 finds. 68 soil sub-samples were taken from the bulk bags for archaeobotanical analysis.

Remains of Mesolithic occupation were discovered at all three grab locations, from depths ranging between 18 and 20m below modern MSL. The finds span the age range from ca. 8400 to 6500 BC, when the site transformed from dryland (an inland dune) to wetland (drowned delta subsurface). At the foot of the inland dune, the conditions allowed for excellent preservation of organic material, such as bone, charcoal and plant food remains, as well as stone and flint artefacts. As a consequence, the site has offered a major contribution to our knowledge of subsistence economy during the Early and Middle Mesolithic in temperate Europe. Furthermore, much detailed information on local environmental conditions and landscape development was to be revealed.

The landscape ecotones around the site yielded abundant food resources on and around the river dune. Under the influence of rising sea levels the Rhine/Meuse river valley gradually transformed into the mouth area of those rivers. At 6500 BC, the site was finally transgressed: drowned in an estuary and swallowed up by the sea.

The Rotterdam Yangtze Harbour research project demonstrates the preservation of Mesolithic sites along the river Rhine, at depths in nowadays coastal and offshore areas. Furthermore, it demonstrates the feasibility of archaeological investigation of such submerged sites, even at depths between 18 to 20m beneath sea, lake and harbour floors. Never before had such a submerged Mesolithic site been excavated at such a great depth. The scientific report (in English) will appear in the autumn of 2014, providing a full description of all finds as well their landscape context.

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#### ORAL

### 3. THE DWELLINGS SITES OF MARANHÃO, BRAZIL

Guida Navarro, Alexandre (Universidade Federal do Maranhão, Brasil (UFMA) [altardesacrificios@yahoo.com.br](mailto:altardesacrificios@yahoo.com.br))

We are developing the project "The People of the Waters: the *estearias* of north-central portion of the Baixada

Maranhense". The *estearias* were dwellings sites which were built with wooden pillars that served as support for higher buildings. They are located in the lowlands of a micro-region near the island of São Luís, Maranhão, and they comprise an area of approximately 20 000 km<sup>2</sup> within the Legal Amazon, being a region with over 500 thousand inhabitants (IBGE census 2006). It is a very poor area with the lowest life indices not only of the State of Maranhão, but Brazil as a whole, whose population lives from subsistence traditional agriculture, fisheries, small livestock and vegetable extraction, especially the *baçaú* coconut. The main cities in this area are Penalva, Viana and Santa Helena. The *estearias* are located along the many lakes that are characterized by the formation of a compound water system of rivers, floodplains and lakes of varying sizes that are defined by the seasonality of weather.

To create the archaeological letter we are conducting a systematic study of the geographical area comprised by *estearias* of the north-central portion of Baixada Maranhense. We are realizing intensive survey in the region with the aim of recording and cataloging the sites with GPS and GIS (Geographical Information System). After cataloged the sites, we will create a database to understand the process of occupation of the lakes and its expansion in the surrounding area.

To create the archaeological letter we are conducting a systematic study of the geographical area comprised by *estearias* of the north-central portion of Baixada Maranhense. We are realizing intensive survey in the region with the aim of recording and cataloging the sites with GPS and GIS (Geographical Information System). After cataloged the sites, we will create a database to understand the process of occupation of the lakes and its expansion in the surrounding area.

The investigation of the processes of human occupation in allied *estearias* analysis of cultural material will build a cultural landscape of these populations, their relationship with the aquatic landscape and the built environment and the dispersal area:

- 1 . Who were the prehistoric societies that inhabited the lake regions?
- 2 . Why people chose the lacustrine environment to live?
- 3 . What the exact area of the land occupation?
- 4 . Did exist long distance trade?
- 5 . When did collapse these people and why?

ORAL

**4. THE CASE-STUDY OF VILLAGGIO DELLE MACINE:  
A REFLECTED IMAGE OF THE PAST**

*Angle, Micaela (Soprintendenza per i Beni Archeologici del Lazio) micaela.angle@beniculturali.it*

*Achino, Katia Francesca (Universitat Autònoma de Barcelona) katiаfrancesca@libero.it*

*Cerino, Pamela (Università degli Studi di Tor Vergata) pame-la.cerino@gmail.com*

The site of Villaggio delle Macine, dated to the Latest Early Bronze Age - Early Middle Bronze Age (XIX-XVI BC), is an exceptional case of pile-dwelling for the central Tyrrhenian Italian area, for its available datasets and estimated width (about one hectare). It was recovered across the shore of the volcanic Albano Lake in 1984 and subsequently investigated, firstly through underwater analysis and subsequently through surveys and limited excavations. A drastic progressive lake's water drop due to climatic factors and uncontrolled water-takings led to the emersion of the site. This condition favoured the archaeological research, although the change of anaerobic state caused some preservation issues for both organic items and stratigraphy.

At Villaggio delle Macine many different features have been found, such as piles, pottery, bronze artefacts (axes, daggers, swords and instruments), lithic industry (lithic cores, flakes and *débitage*), bones (also bone industry, such as deer bones carved to obtain axe handles and awls), ambers and glassy faïence, seeds and fruits, clay fishing weights and a large amount of millstones and grindstones (from which the site's toponym derives). In order to understand the natural and cultural formation processes of the settlement preliminary geological, palaeoecological and archaeological researches were carried out; furthermore, taphonomy and post-depositional processes which deformed the archaeological record are currently under study, through an ongoing analysis of the site's abandonment plan. Because of the high variability showed by material consequences of social past actions, a multidisciplinary approach seems essential to reconstruct the most likely prehistoric/Bronze Age scenario.

The aforementioned markers allow to underline the different specialised activities carried out in some functional areas; the studies of game remains, fruits and seeds discovered in the settlement show that the site had a subsistence economy, based not only on summer-autumn agricultural productions (cereals and leguminous

cultivation) but also on collection activities (semi-domestic and wild fruits), hunting (in particular deer and roe), breeding and fishing. Furthermore, the material results of some handcraft activities have been identified, such as crop blending and milling, the treatment of game, as well as food consumption, preservation and cooking; finally, some sectors are hypothetically defined as ateliers, due to the presence of all *chaîne opératoire's* stages of lithic industry.

These interesting preliminary results show the potential of the site, although its study is still in progress. Hence, through a multidisciplinary approach, which integrates and combines all the aforementioned markers, a more precise idea of the role that the villag itself used to have will be developed. The preservation of organic items such as poles can give an additional contribution to the analysis, for example through the application of dendrochronological techniques, which have recently started to be undertaken. Furthermore, through the ongoing study of the site's abandonment plan, we should proceed to observe the material effects of the biasing factors (post-depositional processes and taphonomy) which affect and deform the distribution and density of the archaeological record.

ORAL

**5. WET SITES ARQUEOLOGY: THE CASE OF BACELINHO CAVE (ALVAIÁZERE)**

*Figueiredo, Alexandra (Instituto Politécnico de Tomar, Laboratory of Archaeology and Conservation of Underwater Heritage, Geociencias Center, Portugal) alexfiga@ipt.pt*

*Monteiro, Cláudio (Universidade de Trás-os-Montes e Alto Douro, Portugal) claudio.monteiro.cr@gmail.com*

*Farias, Deisi (Universidade do Sul de Santa Catarina, Brasil) deisiarqueologia@gmail.com*

*Tognoli, Anderson (Laboratory of Archaeology and Conservation of Underwater Heritage, Geociencias Center, Portugal) ar.tognoli@gmail.com*

The Bacelinho Cave is a mine cavity with traces of the classic era exploration, located in Alvaiázere, Central Portugal.

Its high humidity and extension, over 500m<sup>2</sup>, led to the closure of a set traces of the actions of soldiers and slaves who worked in the exploration of ore.

Among the recovered objects stand out some important artefacts, like Roman weapons, including two swords in iron and other elements of attack.

The working methods in their exhumation, and humidity due to the state of the archaeological site where they were discovered, and the conservation techniques employed in its, form part of the disciplinary scope of Underwater Archaeology. In this sense this article is intended to serve as a reminder of the importance of experience and knowledge of the behavior of objects in wet or underwater sites in all cave excavations, often neglected by the authorities and teams that have only terrestrial expert in their composition, usually caused by the association of this discipline to the river or sea nautical archeology.

In this sense the concept of underwater archaeology have to be rewritten given to the wet sites also an prominent place, because of the set of traces that can be lost without this expertises. Also it seems to discuss the importance of this discipline in all graduated courses conducting the future archaeologists to a knowledge that even if they are not linked to nautical archeology or diving, may need to employ in a multiplicity of sites where high humidity sign.

So with this paper and starting with the case of Bacelinho Cave we propose to discuss the problematic of the methodology and the thecnics applied to the archaeology wet cave places.

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ORAL

## 6. THE HISTORICAL PORT: THE GENESES OF PORT ACTIVITY IN SOUTHERN BRAZIL

*Márcia Fernandes, Rosa Neu (Universidade do Sul do Brasil)  
marcia.neu@unisul.br*

Até o século XVIII toda iniciativa de ocupação do sul do Brasil era planejada com objetivo de consolidar a expansão do território colonial. Após a independência houve a intensificação de ações empreendedoras coloniais de iniciativa privada, principalmente no Sul do Brasil. Nesse sentido, os portos foram fundamentais para a ocupação e a formação do território. No entanto, alguns Portos que possuíam grande movimentação de cargas e pessoas, no século XVIII e XIX, perderam sua competitividade, principalmente pela evolução no tamanho dos navios. Esse fato trouxe graves consequências para a população dessas cidades. A presente pesquisa focou nos Portos históricos do Sul do Brasil: Antonina - Estado do Paraná, Laguna, - Estado de Santa Catarina e Pelotas - Estado do Rio Grande.

A metodologia de pesquisa empregada foi pesquisa documental, na qual agregou-se materiais ou documen-

tos primários (sem tratamento analítico) e nas fontes secundárias de primeira e segunda mão dos próprios arquivos dos portos históricos.

Os resultados apontam para cidades portuárias empobrecidas, mas com um passado muito rico. Foram entrepostos comerciais importantes e desempenharam um papel relevante para a historia do Brasil. Atualmente todos os três portos apresentam dificuldade para manter a regularidade na movimentação portuárias, fato que se reflete na economia regional.

Estes portos apresentam atualmente pequena movimentação de carga, mas poderiam representar grandes possibilidades de redução de custos de transportes. Podem funcionar como portos específicos, como pontos centrais no interior e serem alternativas na flexibilidade com relação ao serviço marítimo num contexto global, pois alguns portos alcançam o status de porto concentrador (hub port), enquanto que outros cumprem serviços de alimentação (feeder port).

Os portos são geradores de crescimento local, mas requerem investimentos constantes capazes de atraírem outras atividades econômicas e ampliem a capacidade produtiva de uma região. Em suma, os portos de Antonina, Pelotas, Laguna e Porto Alegre têm grande significado para as economias locais. São áreas que representam grande campo de pesquisa para arqueologia subaquática, principalmente pela intensa movimentação que apresentaram durante a formação do território brasileiros e por armazenarem, no fundo do seu leito, resquícios do rico e recente passado.

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ORAL

## 7. ARCHAEOLOGICAL CHART OF SHIPWRECKS SITES OF BAÍA DE TODOS OS SANTOS, SALVADOR - BAHIA - BRAZIL

*Gusmão, Daniel Martins (UFS) dmgusmao@yahoo.com.br  
Rambelli, Gilson (UFS) gilson.rambelli@gmail.com*

The Baía de Todos os Santos ( BTS ), located in State of Bahia, Brazil, considered the second largest bay in the world, with a surface of 1,233 km<sup>2</sup>. It was the scene of the Greats Voyages, in 16th century and remains the important scene of maritime historical events until today. Memorable shipwrecks of different flags that happened in these waters, approximately two hundred forty records of shipwrecks were cataloged, of way systematic by the Brazilian Maritime Authority. What makes BTS a

place of great archaeological potential for research in aquatic environment

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Memorable shipwrecks of different flags that happened in these waters, approximately two hundred forty records of shipwrecks were cataloged, of way systematic by the Brazilian Maritime Authority. What makes BTS a place of great archaeological potential for research in aquatic environment.

Over time various types of instruments have been created to support the navigation, especially when related the management and protection of coasta , marine and river area . Portulanos, sea ??routes, nautical charts, in this case, are historical documents of first order, to know and interpret the landscape of the past and the heritage elements associated with them.

To this, this research will analyze the Nautical Charts seeking to give a view this archaeological potential existing in the Baía de Todos os Santos. Culminating in instrument management and protection of submerged archaeological sites, like the remnants of shipwrecks such as the remains of Scottish clipper Black Adder, wrecked in 1905.

In the last years many nations have adopted by the UNESCO General Conference in 2001 for the Protection of the Underwater Cultural Heritage as a normative instrument that favors the in situ conservation as a first measure to be taken. Stimulating international cooperation in study of "traces of human existence having a cultural character, historical or archaeological, that are partially or completely, periodically or continuously, for at least 100 years." This way, the results obtained in development this research will encourage the adoption by Brazil, according to the UNESCO Convention.

Based on the assumptions of the International Hydrographic Organization (IHO) that conduct the production of nautical charts for over eighty member countries and has as a main objective ensure that all the seas, oceans and inland waters of the world were studied and mapped . The considerations of this research still in evolution, are based in studies of formation processes of archaeological shipwreck sites, that according with your historical valuation by society left to be defined as "hull

shipwrecked". Is conceptualized a new proposal to IHO the are "Historic wrecks", places that should be protected from interventions unauthorized indicated in nautical charts through a specific symbology contributing to the management and protection of underwater cultural heritage.

ORAL

## 8. UNDERWATER ARCHEOLOGICAL CHART OF SERGIPE: PROTECTION AND MANAGEMENT OF CULTURAL HERITAGE IN UNDERWATER SERGIPE

*Trindade dos Anjos, Larissa Ramos (UFS) larissaanjos\_2@hotmail.com*

*Rambelli, Gilson (UFS) gilson.rambelli@gmail.com*

During the 16th century the brazilian territory was scene of greed of many European nations. Countries seeking to expand and legitimize themselves economically. Sergipe, located in northeast of country, belongs to the Brazilian coast. It has countless shipwrecks unknown by its own people. Shipwrecks dating from period of the greats voyages, as the Nau Gabriel Soares in 1591.

This project is part of Archaeology Laboratory of Aquatic Environments, Universidade Federal of Sergipe. Your principal objects is create an archaeological chart with the highest number of shipwrecks recorded through written and printed sources. Thinking about the possibility of future works in underwater archeology, and allows a management program on this heritage already registered.

From the year 1807 to 1969 were recorded about 150 shipwrecks in coast of Sergipe. This new material will be added, with more 59 shipwrecks, being reported from manuscripts issued by the Brazilian Maritime Authority and filed on Public Archives of State of Sergipe, shipwrecked between the years 1839-1919.

The Brazilian Maritime Authority had the duty of monitor all existing maritime traffic in territory of Sergipe, not only sea but also rivers. The commercial navigation was given by the cabotage system, browser always had the coast in your view field. These accidents were usually reported by Brazilian Maritime Authority and sent to the President or Secretary of Province.

During the 19th century the economy of Sergipe began to be noted for its sugar production. The best way to carry the products would be by the rivers navigable in the

state. In the same way that this river helped, also brought problems. The ships just could enter in the rivers in high tide, to avoid accidents in the sandbanks. Accidents such as groundings and shipwrecks happened often doing different victims.

Inventoried some shipwrecks lost throughout the Sergipe coast, we could extract some data as the year of shipwrecks, the ship name, its origin and place where happens the shipwreck. Has possible observed some reasons that caused the wreck, mostly caused by anthropogenic and natural factors. Through the reading of manuscripts, it's possible analyzed the daily life of "seaman" and how developed the navigation on the coast of Sergipe.

Underwater Archaeological Chart is important to ensure the management and preservation of underwater cultural heritage in Sergipe, and in this particular case, the remains of shipwrecks. Shares of heritage education also take part this project as a way of social awareness for that these archaeological sites don't suffer depredations, damaging archaeological researches that can happen in the future.

The importance of archaeologist learn about dive and specialize in scientific diving using as an archaeology tool, make part of objectives this project. Because Underwater Archaeology is assignment archaeologist diver!

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## ORAL

### 9. FLUVIAL GEOARCHAEOLOGY AND UNDERWATER ARCHAEOLOGY IN LAGO RICO ARCHAEOLOGICAL SITE, CENTRAL PLATEAU OF BRAZIL

*Theodoro da Silva, Rosiclér (Pontifícia Universidade Católica de Goiás, Brasil) silva.rosicler@gmail.com*

*Rubin de Rubin, Julio Cezar (Pontifícia Universidade Católica de Goiás, Brasil) rubin@pucgoias.edu.br*

*dos Santos Correa, Daniel (Pontifícia Universidade Católica de Goiás, Brasil) daniel.archeology@hotmail.com*

*da Silva, Sérgio Meire (Pontifícia Universidade Católica de Goiás, Brasil) sergia\_ms@hotmail.com*

*Batista Barbosa, Jordana (Pontifícia Universidade Católica de Goiás, Brasil) jordana.batista@hotmail.com*

The first results of the archaeological research being developed at the interfluvium of the Peixe and Araguaia rivers in the Central Plateau of Brazil, indicate the need and potentiality of applying fluvial geoarchaeology and underwater archeology to address a number of issues related

to the Lago Rico ceramic site.

The site located on the left bank of the Peixe river, in an area of approximately 120,000m<sup>2</sup>, surrounded by surface prospecting.

This site features cultural remains in a section of a low slope as well as two other areas. The first in the alluvial terrace (erosive margin), by a lagune formed October to March, in a seasonal river channel, and the second in the floodplain (depositional margin), close to the alluvial terrace, upstream of the first section, evidencing the erosive-depositional behavior of the river in the archaeological site area. Satellite images show intense migration of the Peixe river channel in the floodplain near the archaeological site.

The depositional segment, current floodplain, presents evidence of a different environmental context from the current one, more precisely an ancient erosive margin, allowing the hypothesis that part of the site may have been eroded transporting cultural remains downstream. To investigate these hypotheses, the use of underwater archeology is critical for firstly, the identification of cultural remains in the lagune area and the depositional margin, since these sites do not allow for traditional surface excavation even during the drought periods and secondly, obtaining information to aid in characterizing the behavior of the river channel and description of stratigraphic profiles, as the low turbidity of the water allows good visualization. Issues such as the characterization of the Lago Rico site, its occupation by prehistoric groups and the relationship between the area of the village and the dynamics of the Peixe river can best be addressed through fluvial geoarchaeology and underwater archeology, a new approach to the region

# A5a The Final Palaeolithic of Northern Eurasia

Commission on The Final Palaeolithic of Northern Eurasia  
(Organisers: B. V. Eriksen, E. Rensink, M. Street)

Monday 1st (14:00 to 19:30)  
A04 Meeting Room



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ORAL CONTRIBUTIONS

ORAL

## 1. STATUS AND PERSPECTIVES FOR THE FINAL PALAEO-LITHIC OF NORTHERN EURASIA

*Eriksen, Berit Valentin (Centre for Baltic and Scandinavian Archaeology) berit.eriksen@schloss-gottorf.de*

The purpose of this session is to discuss current and ongoing work with respect to the Final Palaeolithic of Northern Eurasia, to generate discussion of general interest, and to set the agenda for future research focus areas.

From a chronological perspective we are concerned with the emergence from an Upper Palaeolithic substrate of hunter-gatherers adapted to life in the more temperate conditions of the Late Glacial and Early Postglacial and their dispersal into previously unoccupied territories. To pursue this aim we invite archaeological and palaeo-environmental researchers dealing with the diversity of man and environment relationships during the Late Glacial and Earliest Postglacial, i.e. the period from approximately 15,000 to 8,000 BP. Given the magnitude of changes in climate, landscape, vegetation and fauna during this period, the Final Palaeolithic cultures of Northern Eurasia were characterized by a variety of adaptive responses, reflected in technologies, settlement patterns, subsistence practices, social organizations and even ideologies. Underlying this regional diversity of specific environmental and cultural changes were the fundamentals of climatic change in conditions that was relatively rapid and extreme and that clearly had major influence on contemporary hunter-gatherer land-use patterns. The general thematic focus of our session highlights all of these research questions.

ORAL

## 2. THE CHANGEABILITY OF LATE GLACIAL SETTLEMENT PATTERNS AND SUBSISTENCE IN NORTH EUROPEAN PLAIN

*Burdukiewicz, Jan Michal - (Institute of Archaeology, University of Wrocław) janmibur@gmail.com*

Late Glacial (15-10 ka BP) was a period of recolonisation of Northern Europe after LGM. The first human societies, who emerged in empty area of North European Plain, were Hamburgian hunter-gatherers originating in the Magdalenian milieu.

According to the recent research from the area of about 600,000 km<sup>2</sup> are known roughly 2000 settlement units representing three main archaeological technocomplexes: Shouldered Points (SPT – Hamburgian), Arched Backed Points (ABPT – Federmesser) and Tanged Points (TPT – Brommean, Ahrensburgian and Swiderian).

The basic spatio-temporal units are the sites, which represent settlement remains the most frequently by camp sites (lithic assemblages, rare habitation traces, fire places, etc.). Such units can be seen as homogenous and corresponding to a single stay of one basic social group (family and task groups). The heterogenous are sites representing several stays of one group in various periods, several stays of various groups with the similar technology and tool-kit or several groups with various equipments.

The detailed spatial analysis of artifacts, stratigraphy, refittings and technological features enabled the recognition of homogenous and heterogenous sites. However, the researchers did several mistakes and many times treated “mixed” as homogenous. Another possibility in the research of Late Glacial settlement patterns is an analysis of a long distance raw material procurement. Extended research of environmental data from Late Glacial gives an opportunity to show the ecological setting of first settlers of North European Plain.

The earliest settlers of North European Plain after LGM were hunter-gatherers of SPT, who arrived during the first warmer period (14,7-14 ka BP) in tundra conditions, following reindeer herds. They are represented by circa 200 settlement units, which were located mostly in the southern part of the area, usually agglomerated in small valleys with possibly good food supply of hunted reindeers and occasionally small game.

The further taxonomic unit ABPT with a much simplified lithic technology are represented by circa 300 settlement units, which existed during Allerød period (14-12,7 ka BP), when European Plain was already covered by a birch forest followed in second part by birch-pine forests, which were inhabited by forest animals, like deer, elk, etc. ABPT groups were more randomly dispersed.

Already in the second part of Allerød, after Laacher See volcano explosion, originated in Northern Germany and Denmark first unit of TPT, Brommean, which were followed during Younger Dryas (12.7-11.5 ka BP) by Ahrensburgian and Swiderian) existing even in Preboreal period. They existed in park tundra conditions hunting again on large reindeer herds and they are represented

by circa 1200 settlement units with a sophisticated long distance raw material circulation.

The three Late Glacial taxonomic units represent the really efficient adaptation systems during recolonisation of North European Plain. There are three main concepts of their origin: 1 – three waves of recolonisation or 2 – three systems of adaptation with demographic increasing of the same populations, 3 – mixture of two above mentioned concepts, however stimulated by strangers from the south.

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ORAL

### 3. STABLE ISOTOPE ANALYSIS OF THE HUMAN OF RHÜNDA (GERMANY): INTENSE EXPLOITATION OF AQUATIC RESOURCES IN THE EUROPEAN NORTHERN PLAINS DURING THE YOUNGER DRYAS

*Drucker, Dorothee G. (Department of Geosciences, Biogeologie, University of Tübingen, Germany) dorothee.drucker@ifg.uni-tuebingen.de*

*Rosendahl, Wilfried (Abteilung Weltkulturen und Umwelt, Reiss-Engelhorn-Museen, Mannheim, Germany) Wilfried.Rosendahl@mannheim.de*

*Van Neer, Wim (Laboratory of Biodiversity and Evolutionary Genomics, University of Leuven, Leuven, Belgium) wvanneer@naturalsciences.be*

*Görner, Irina (Vor- und Frühgeschichtliche Sammlung, Museumslandschaft Hessen Kassel, Kassel, Germany) i.goerner@museum-kassel.de*

*Bocherens, Hervé (Department of Geosciences, Biogeologie, University of Tübingen, Germany) herve.bocherens@uni-tuebingen.de*

The Younger Dryas or GS-1 (ca. 12.8-11.6 ka cal BP) is the last severe cold episode of the Lateglacial before the definitive global warming of the early Holocene. In the northern Plains of Europe, this period witnessed the return of reindeer herds that were actively hunted by the Ahrensburgian hunter-gatherers. Besides this typical Pleniglacial species, horse, large bovines, elk, hare, bird and fish were exploited. However, their remains are found in a lesser extent than those of reindeer in archaeological sites such as Stellmoor in northern Germany or Remouchamps in Belgium. One of the very few human remains dated to the Younger Dryas in northern Europe was found near Rhünda (Central Germany; Rosendahl, 2002).

An isotopic study was conducted on the skull of Rhünda to reconstruct the diet ( $^{13}\text{C}$  and  $^{15}\text{N}$  abundances in collagen) and environment ( $^{18}\text{O}$  abundances in phos-

phate) of the specimen. The interpretations were based on the comparison with the abundances of the same stable isotope measured on reindeer (*Rangifer tarandus*), horse (*Equus* sp.) and bison (*Bison bonasus*) from the Ahrensburgian sites of Stellmoor (North Germany) and Remouchamps (Belgium).

As in Stellmoor (Drucker et al., 2011), the return of the tundra-like conditions is clearly reflected in the relatively high collagen  $^{13}\text{C}$  and low phosphate  $^{18}\text{O}$  abundances of the reindeer of Remouchamps, which were due to higher availability of lichen in colder conditions than during the Lateglacial interstadial period. The low pedogenesis rate in such a cold context was reflected by the relative low  $^{15}\text{N}$  abundances in the collagen not only of reindeer but also horse and bison. The low  $^{18}\text{O}$  abundance of the human of Rhünda was consistent with a source of drinking water depleted in  $^{18}\text{O}$  during this period as testified by the results on the reindeer from Stellmoor. The abundances in collagen  $^{13}\text{C}$  and  $^{15}\text{N}$  of a secondary consumer (carnivore, omnivore) are typically enriched compared to the collagen of the animal providing the protein pool of the diet (e.g. Bocherens and Drucker, 2003). In the case of Rhünda, the reindeer did not appear as a significant contributor to the protein of the diet based on the abundances of  $^{13}\text{C}$ . Considering the abundances of  $^{15}\text{N}$ , none of the analysed herbivores could explain the high value of the human collagen. Thus, the consumption of freshwater resources, with higher  $^{15}\text{N}$  abundances than the terrestrial resources, must be considered to explain the isotopic signature of the human of Rhünda. Indeed, the isotopic values of late Paleolithic fish specimens from Belgium fit the expected range of collagen value of the prey of the human from Rhünda.

Such an intense consumption of aquatic prey could be a result of the low plant availability during the harsh conditions of the Younger Dryas as it is the case nowadays in high latitude hunter-gatherer populations (e.g. Cordain et al., 2000). A low biomass of animal herbivores should also be considered has a reason why some human groups exploited intensively the freshwater ecosystem for their subsistence in the northern plains of Europe.

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ORAL

### 4. SHOULD I STAY OR SHOULD I GO? ALTERNATIVE BEHAVIOURAL STRATEGIES OF LATE MAGDALENIAN HUNTERS AND GATHERERS CONFRONTED WITH CLIMATIC AND ENVIRONMENTAL CHANGES

*Grimm, Sonja B. (MONREPOS Archaeological Research Centre and Museum for Human Behavioural Evolution, RGZM) grimm@rgzm.de*

In north-western Europe, the Upper Palaeolithic Magdalenian way of life disappeared during the Lateglacial Interstadial. The exact dating remains a matter of debate and, probably, of regional differentiation. However, if regional differences had an impact on the process of behavioural change, a correlation of this disappearance with global climatic and environmental changes must be considered more critically.

Therefore, several archaeological assemblages from northern France, Belgium, Central Rhineland, the Netherlands, and northern Germany were correlated in a high-resolution chronostratigraphy which allowed the comparison with developments revealed by climatic and environmental archives. In a second step, observable differences and similarities of the archaeological assemblages were recorded to assess the normative behaviour of quasi-contemporary assemblages and to reveal changes of these norms over time.

At the beginning of the Lateglacial Interstadial, the limits of normative behaviour became wider but no significant change was observed. In these wider limits several different, modified versions of the typical Late Magdalenian behavioural norms appeared gradually. These modified versions spread northwards and, thus, expanded the Magdalenian settlement area. The norms in these northern expansions were more comparable to the Late Magdalenian than contemporary behavioural expressions in the previously inhabited regions. Perhaps, some more traditional Magdalenian hunters and gatherers followed the familiar biotope which gradually shifted northwards, whereas those hunters and gatherers remaining in the changing southern environments had to be more innovative in their survival strategies. During the continuous amelioration of the Lateglacial Interstadial, the northern environments also changed further towards light forests but the behavioural developments in these northern areas seemed independent from the southern strategies. However, after a cold return, a revolutionary behavioural shift occurred in the south. With the expansion of light temperate forests to the north, these newly established southern norms also spread into the north.

The environmental changes in the early Lateglacial Interstadial challenged the members of the Late Magdalenian society. Alternative behavioural strategies were chosen for different biotopes resulting in separate developments. With the experience of natural limits to the

gradual adaptive strategy in both areas and the appearance of more similar biotopes, behavioural strategies approached shared norms again.

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ORAL

### **5. BETWEEN THE MAGDALENIAN AND FEDERMESSE- ER GRUPPEN. THE ARCHAEOLOGICAL EVIDENCE FROM THE SOUTHERN NETHERLANDS**

*Rensink, Eelco - (Cultural Heritage Agency, Amersfoort) e.rensink@cultureelerfgoed.nl*

*Verpoorte, Alexander - (Leiden University) a.verpoorte@arch.leidenuniv.nl*

In the southern Netherlands, the Magdalenian represents the earliest human occupation after the Last Glacial Maximum. Taking into consideration the occurrence of Dutch Cretaceous flint in the settlements of Andernach and Gönnersdorf, the Dutch Magdalenian sites of Sweikhuizen, Mesch and Eysersheide can be indirectly dated to the final phase of the Pleniglacial, ca. 13.300-12.700 BP. What happened between this period and the first occupation of people of the (early) *Federmesser Gruppen*, from ca. 11.500 BP onwards, is largely unknown.

The paper examines the contribution of the Late Palaeolithic record of three geographical regions in the southern Netherlands to the investigation of this 'intermediate' period: the hilly loess area, the sandy coversand area and the Meuse valley area.

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ORAL

### **6. A LATE PALAEOLITHIC DOG FROM BONN- OBERKASSEL AND WOLF DOMESTICATION AS A HUMAN ADAPTIVE STRATEGY**

*Street, Martin (MONREPOS Archaeological Research Centre and Museum for Human Behavioural Evolution, RGZM) street@rgzm.de*

Two human skeletons discovered in 1914 during basalt quarrying at Oberkassel in the German Rhineland were recognized as being of Upper Palaeolithic age and swiftly published as part of a comprehensive monograph. Animal remains recovered with those of the humans were originally mentioned only in a cursory fashion but were presented in more detail in the 1980s, at which time cranial elements of a canid were identified as a domestic dog. A re-examination of the highly fragmented faunal

specimens in the 1990s revised previous identifications, assigning some postcranial material to this species, and provided a series of direct 14C dates for the complex of Oberkassel human and animal remains.

On the occasion of the centenary since the Oberkassel discovery a broad range of new analyses was initiated, among them studies of the dog remains which were examined using e.g. CT scanning for specific pathological-morphological features and sampled for their aDNA and for renewed 14C dating using state of the art methodology.

The results of new analyses of the late Palaeolithic Oberkassel canid confirm its status both morphologically and genetically as a specimen of domestic dog and provide new details relevant to current discussions of the status of small Upper Pleistocene canids and their identification as dogs. The context of recovery, in association with two human skeletons interpreted as a formal burial, highlight the particular status accorded to the animal. The dog from Bonn-Oberkassel provides some of the earliest convincing evidence for a far earlier domestication of the wolf than has been accepted until comparatively recently. In a broader context and against the background of claims for even earlier evidence for the keeping of wolves the domestication process can be argued to be a further behavioural adaptation specific to anatomically modern humans and not observed in earlier hominin populations.

## POSTERS

### POSTER

#### 7. THE EARLY MESOLITHIC OF THE NORTHERN EUROPEAN LOWLANDS

*Groß, Daniel (Centre for Baltic and Scandinavian Archaeology) daniel.gross@schloss-gottorf.de*

The poster presents results of a PhD thesis that deals with human-environment interactions in the early Holocene of the northern European lowlands. It is investigated if early Mesolithic traditions spread out into the area under consideration due to active colonization processes or to a successive widening of the people's habitat. Additionally, aspects like reliability and quality of excavations and sites are discussed.

The analysis compares several sites by published information. The methods used include environmental reconstructions which are derived from faunal remains and palynological samples such as functional interpre-

tations of the sites by artefact inventories. Multivariate statistics, factor analyses and cluster analyses as well as the calculation of different ratios are the tools used to approach the aforementioned research questions.

The early Mesolithic sites in the northern European lowlands show pronounced ties to their environment. As a result, the colonization of the area under consideration started after it was already reforested. Following this, it is appropriate to describe settlement in those areas as subsequent to environmental changes. This is also underlined by the very opportunistic, broad-spectrum subsistence strategy, which nonetheless relied on a familiar package of resources. Individual sites which show a more specialized exploitation of a single resource have to be seen as discrete phenomena which warrant further investigation. Furthermore it became obvious that investigations which compare different sites are dependent on the quality of the published information. In this respect there is still a lot to be done for archaeological research because most excavations are not entirely published yet. The focus of further investigations has to be the establishment of a more solid data base. To establish this, an elaborated publishing strategy is needed so that the results can be widely used. Standard guidelines would help in this respect. An evaluation of human-environment relationships is only possible if researchers can compare their results on a common ground and a supra regional scale. This is crucial to understand the transition from the Final Palaeolithic to the early mesolithic.

Since many pre-Neolithic sites are only known from surface collections it is often difficult to recognize palimpsests, especially in chronozones where artefacts are typologically indifferent, like in the Preboreal and Boreal. As a result, the functional interpretation becomes difficult as long as few sites with a reliable stratigraphy are known. Following this, the human-environment interaction is also difficult to interpret. As a consequence research may intensify surveys in areas that promise good preservation and stratigraphies. By applying such a more focused research strategy it might be possible to gain better insights into the relation of a site's character and its environment.

POSTER

## 8. THE MAGDALENIAN OF HOHLE FELS CAVE: CENTRAL EUROPE AT THE END OF THE PLENIGLACIAL

Taller, Andreas (University of Tübingen) [andreas.taller@uni-tuebingen.de](mailto:andreas.taller@uni-tuebingen.de)

Napierala, Hannes (University of Tübingen) [Hannes.Napierala@ifu.uni-tuebingen.de](mailto:Hannes.Napierala@ifu.uni-tuebingen.de)

Conard, Nicholas (University of Tübingen) [nicholas.conard@uni-tuebingen.de](mailto:nicholas.conard@uni-tuebingen.de)

The Palaeolithic cave site of Hohle Fels is situated in the Ach Valley in the Swabian Jura of Southwestern Germany. Its stratigraphy encompasses layers from the Middle Palaeolithic, as well as the Aurignacian, Gravettian and Magdalenian from the Upper Palaeolithic.

In the Magdalenian, Hohle Fels served as a base camp and was occupied mainly in the winter months. The occupation dates very close to the end of the Pleniglacial, around 12.500 BP, shortly before the onset of the late glacial interstadial cycle beginning with the Meiendorf-amelioration. This is in good accordance with most of the Magdalenian sites in southern Central Europe. The Central European Magdalenian seems to encompass very little time-depth (ca. 13.000-12.500 BP) since only very few Magdalenian sites in the region predate this time of comprehensive settlement. Virtually no Magdalenian sites date into the late glacial interstadial cycle itself. It seems therefore that the Magdalenian was in fact closely linked to the climatic and environmental conditions of the late Pleniglacial, as its abrupt end can be observed with the onset of the Meiendorf Interstadial.

The Magdalenian layers of Hohle Fels yielded close to 25.000 lithic artefacts, including 8.695 pieces larger than 1cm, 1.115 tools and 129 cores. Blank production was focused on blades and bladelets, which were made in a unidirectional manner on well prepared cores. Almost 50% of the tools are backed pieces, which shows their importance for the Magdalenian craftsmen. A functional analysis carried out on a sample of these pieces revealed that not all of them were used as inserts in composite projectile heads or projectile points. Although 19% of the backed elements show fractures diagnostic of an impact and therefore indeed served as projectile parts, some other pieces were used as cutting inserts in knives (for meat, hide or leather,) or for working plant fibres and wood. Some pointed pieces even performed perforating tasks. The cutting edge angles of the pieces mirror the intended use: the harder the material to be worked, the wider the cutting edge angle in order to obtain a more robust edge.

Next to the lithics, many artefacts of organic materials were found (harpoons, antler javelin heads, needles, awls) as well as jewellery (beads, perforated animal teeth, perforated molluscs). Other symbolic expressions are limestone rocks decorated with painted red double dotted lines.

The hunted fauna is dominated by horse, reindeer and hare. However, there are also several thousands of bones and scales of fish found in the Magdalenian layers. Species that were fished include *Salmo trutta*, *Salvelinus alpinus*, *Thymallus thymallus*, *Lota lota*, *Hucho hucho* and *Esox lucius*. The harpoons are most probably to be seen in connection to this result, as some of the fish species mentioned are quite big, e.g. *Esox Lucius* (ca. 20kg max.), but especially *Hucho hucho* as those can grow to a weight of approx. 30kg.

ORAL

## 9. DISCUSSING THE CULTURAL SIGNIFICANCE OF LITHIC PROJECTILE IMPLEMENTS ? A CASE STUDY OF HAMBURGIAN SHOULDERED AND TANGED POINTS

Weber, Mara-Julia (Centre for Baltic and Scandinavian Archaeology) [mara.weber@schloss-gottorf.de](mailto:mara.weber@schloss-gottorf.de)

Traditionally, archaeological entities in the Palaeolithic and Mesolithic have been defined and hence distinguished from one another on the basis of their projectile implements, mostly of lithic raw material. This has also been the case of the Late Upper and Late Palaeolithic archaeological record in North-West Europe, which has been subdivided into three big units characterised by shouldered, curve-backed and tanged points. These units have also been correlated with the three major Lateglacial biozones in this part of Europe. However, the western and northern zone of the distribution area of the Hamburgian represent an exception, since they witnessed the appearance of tanged points – of the Havelte type – in the course of the Hamburgian and preceding the curve-backed points.

In this paper, potential causes of this introduction of Havelte tanged points in the Hamburgian, characterised thus far by shouldered points known from the Magdalenian in general, will be examined. As a basis of this discussion, technological and functional aspects of the two point types will be compared, using examples from Schleswig-Holstein (northern Germany). In addition, the environmental conditions under which these points served as projectile implements will be taken into

account.

The similarities and differences between the Hamburgian shouldered and tanged points are of such a nature that a development from one type of the other is possible and that they could have been used in a comparable manner. With regard to the factors at the origin of the appearance of the Havelte points, changes in the hunting circumstances stand alongside with social expressions, whereas the absence of clear changes in other parts of the Hamburgian material culture seem to exclude cultural changes.

In conclusion, this example illustrates the difficulties archaeologists have in evaluating the significance of single elements of the hunting system for prehistoric groups. Moreover, ethnographic examples show the complexity of this topic.

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ORAL

#### **10. ARCHED- AND TANGED POINTS TECHNOCOMPLEXES IN NORTHERN CARPATHIANS. CURRENT STAGE OF RESEARCH**

*Valde-Nowak, Pawel (Institute of Archaeology, Jagiellonian University; Institute of Archaeology and Ethnology, Polish Academy of Sciences) p.valde-nowak@uj.edu.pl*

*Kraszewska, Anna (Institute of Archaeology, Jagiellonian University) ania.kraszewska@gazeta.pl*

*Stefański, Damian (Institute of Archaeology, Jagiellonian University; Paleolithic and Mesolithic Department, Archaeological Museum in Kraków) damian.stefanski@ma.krakow.pl*

The goal of this work is to review the present discussion and the perspectives of the Late Palaeolithic in the northern part of the Western Carpathians and in the Northern Subcarpathia region during the Allerød and the Younger Dryas oscillations. The area of Subcarpathia, especially dunes of the upper Vistula valley, has been explored many times since the second half of XX century (e.g. Kraków-BorekFałęcki, Kraków-Kobierzyn). It brought numerous collections proving dense Late Palaeolithic settlement around Kraków. Although the Tanged Point Technocomplex (TPT) prevailed, traces of Arched Point Technocomplex were also reported. Since the 80's, methodological researches in the northern part of The Western Carpathians have unexpectedly revealed rich remains of the Late Palaeolithic settlements. It mainly represents the APT settlement (SromowceNiżne, NowaBiała). The recent progress has been achieved as a result of extensive rescue excavations which brought a

number of methodically acquired lithic assemblages (e.g. Kraków-Kurdwanów, Kraków-Bieżanów, Mucharz). This issue has boosted a discussion on the Late Palaeolithic settlement in the region. The discussion is focused on the techno-typological aspect of a material culture, detailed analysis of raw material procurement, usage of land and spatial arrangements of assemblages. The numerous accumulations show a variety of cultural entities including the Tarnowian, Witowian, Swiderian and Brommean cultures. The investigated area represents two main raw material provinces: the north Subcarpathia with Jurassic flint and the northern part of the Western Carpathians – where radiolarites were mainly found however other rocks were present, as well. Both cases are characterized by local production only merely enhanced with imported materials. The settlement is almost completely represented by open air sites although caves are also present (Zalasrockshelter). The extent of the assemblages varies from rich settlement units yielding several thousands of artefacts to tiny spots of about dozens of lithics. Only in case of a few archaeological sites an environmental record was acquired. It hinders a construction of a reliable chronology and therefore some comparative studies over the adjacent area are necessary. The basic reports indicate the northern part of the Western Carpathians and the Northern Subcarpathia region as “contact zone”, proving a local character of them as well as a strong affection from the part of the North European Plain.

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ORAL

#### **11. A FAMILY HUNTING UNIT AT TROLLESGAVE, DENMARK: THE CONTRIBUTION OF LITHIC TECHNOLOGY AND MICROWEAR**

*Donahue, Randolph (University of Bradford) r.e.donahue@bradford.ac.uk*

*Fischer, Anders (Danish Agency for Culture) afiklb@privat.dk*

Microwear analysis, in combination with refitting and analysis of lithic reduction, is applied to reconstruct the function and social organisation at the Late Glacial site of Trollesgave, Denmark. Analyses of the flint knapping and the spatial distribution of its products reveal the traces of at least three individuals: expert, medium competent, and inexperienced. Based on the quality of craftsmanship and the aberrant habits of disposing their products of the latter two are inferred to be children. As with Bromme Culture sites in general, the assemblage consists of primarily three types of tools. There is a strong association between these types and their use: end scrapers for dry hide scraping; burins for working hard material,

primarily bone; and tanged points primarily for projectile tips. Nearly all divergence from this pattern can be referred to the activities of the children. The site appears to be occupied by a single family hunting (and fishing) unit.

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ORAL

## 12. INFLUENCE OF THE EXTREME INUNDATION EPOCH ON THE FINAL PALAEO-LITHIC CULTURES OF NORTHERN EURASIA

*Chepalyga, Andrey (Institute of Geography Russian Academy of Sciences) tchepalyga@mail.ru*  
*Pirogov, Andrey (Paleo.org Project) an.pirogov@gmail.com*

After the Late Glacial Maximum (LGM, 20-18 ka BP) during the Late Glacial Deglaciation (LGD, 16-10 ka) another very important event the Extreme Inundation Epoch (EIE, 16-14 ka) (Chepalyga, 2004) was discovered.

Four types of inundations in the different landscapes were found:

1. Marine transgressions filled Ponto-Caspian depressions and formed Cascade of Eurasian Basins. The territories covered by waters are: marine depressions (Caspian Sea marine depression, more than 1 mln. km<sup>2</sup>) as Epicenter of Cascade of Eurasian Basins (Chepalyga, 2005) from Aral Sea to Aegean Sea (more 1.5 mln. km<sup>2</sup>). General characteristics of marine-lake basins of CEB are: total aquatorium space — 1 mln 500 000 km<sup>2</sup>, including flooded space — more 1 mln km<sup>2</sup>, water volume — up to 700 000 km<sup>3</sup>, water system of CEB covered the space 3000 km from East to West and 2500 from North to South.

Cascade of Eurasian Basins is an inner system of basins which were connected by spillways: Aral-Sarykamysh basin — Uzboy spillway — Khvalynian basin — Manych-Kerch spillway — Neuwexinian basin — Bosphorus spillway — Sea of Marmara basin — Dardanelles spillway — The Mediterranean Sea.

2. River inundations (superfloods) in river valleys, when water discharge rose to 5-15 times more than recent. River valleys formed underfit channels with abnormal width to 3-5 km.

3. Slope inundations connected with permafrost melting and solifluction provoked by thermocast lakes activation.

4. Interfluvial flooding by permanent lakes similar to recent alases in Yakutia (paleoalases).

Total EIE events covered area reached 10 mln. sq km in the N-W Eurasia between the Atlantic Ocean and the Yenisei river.

Described processes of the EIE were catastrophic and greatly influenced on ancient peoples: waste inundations, migrations, losing the most fertile land, increased population density. Great alimentation deficit together with critical instability of environment provoked stress, famine and great human crisis. Extinction of great mammals and spread of large water space changed human diet to small mammals and birds and possible stimulated appearance of new type of hunting weapons — bow with arrow. Type of houses was changed to light dwelling like wigwam or teepee, according smaller family groups. These processes could stimulate of economy type change from wild non productive to productive economy: cattle breeding and agriculture.

The numerous water basins produced barriers for human communications from North to South on 2000 km. Manych-Kerch spillway (strait) between Caspian and Black Sea was an effective barrier for Late Palaeolithic culture exchange between East Europe and Middle East — 16-14 ka (Chepalyga et al, 2005). This isolation led to fragmentation of habitat area and form of separate languages and language families (Chepalyga, 2010).

So, main human evolution events (productive economy, civilization beginning, and first language diversification) were connected not only with climatic extremes (LGM), but much more with the inundation events of the EIE in North Eurasia.

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ORAL

## 13. TOWARDS AN ARCHAEOLOGY OF MIND IN THE FINAL PALAEO-LITHIC: LOOKING FOR NEW AVENUES TO UNDERSTAND CULTURAL BEHAVIOR AND MATERIAL CULTURE CHANGE IN THE PLEISTOCENE-HOLOCENE TRANSITION.

*De Bie, Marc (Flanders Heritage & Vrije Universiteit Brussel) marc.debie@wo.vlaanderen.be*

Archaeological debate on the Pleistocene-Holocene transition in Northern Eurasia has so far mainly focused on descriptive approaches of taxonomy, regional classification, techno-functional analysis and settlement organization. The interpretation and explanation of cultural behavior and (material) culture change has mostly been related to changing environmental conditions.

Many current topics of debate have been addressed for more than half a century now (spatio-temporal distribution, raw material, material culture, environmental change, ...) and mostly emphasize economic behavior of these hunters and gatherers. How did they survive (subsistence), what functional activities were they carrying out in order to survive (technology) and what made them occupy certain areas at certain moments in time (environmental constraints)? These are of course basic questions and necessary conditions for any population to survive, but they are hardly specifically human. Questions of ritual behavior, spirituality, (self)consciousness or religion have more scarcely been addressed with regard to these societies. This might be due to an overall lack of surviving art, burials or other expressions of mental concepts that are generally used in considerations of the human mind, e.g. in the Upper Palaeolithic or in the Middle to Upper Palaeolithic transition debate, as well as in the Mesolithic or Neolithic.

This paper explores whether other avenues might be found to start addressing these themes in the final Paleolithic as well. Two specific and somewhat contrasting cases exemplify that whilst major technological change didn't inevitably necessitate the presence of creative and inspiring intellects, symbolico-religious minds were indeed present in these populations and archaeologically visible. Our first claim is that fundamental technological changes, such as for instance the initiation of the microburin technique at the end of the final Paleolithic, did not necessarily invoke creative, innovative minds. Other factors, including human-independent material constraints, can in fact instigate long-term innovation. Our second claim is that indications of (spi)ritual behavior may be found though in other areas of the human condition than the ones we usually consider, e.g. in the spatial distribution of camp site activities, as exemplified with a case in Belgium.

By considering both investigations in a wider context, the paper explicitly attempts and invites to further explore, test and debate both theses with future studies and to search for additional avenues in cognitive archaeology for the Final Palaeolithic in Northern Eurasia.

**Commission Business: Meeting of the UISPP Commission for the Final Palaeolithic of Northern Eurasia**



# A5b From the Atlantic to beyond the Bug River – Finding and defining the Federmesser-Gruppen / Azilian on the North European Plain and adjacent areas

Commission on The Final Palaeolithic of Northern Eurasia  
(Organisers: S. B. Grimm, L. Mevel, I. Sobkowiak-Tabaka, M.-J. Weber)

Tuesday 2nd (9:00 to 13:30)  
B24 Meeting Room



2014 burgos  
1-7 sept.

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ORAL

## 1. PRECOCIOUS OR UBIQUITOUS? FEDERMESSER-GRUPPEN ELEMENTS IN THE HAMBURGIAN

Weber, Mara-Julia (Centre of Baltic and Scandinavian Archaeology) mara.weber@schloss-gottorf.de

On the North European Plain, the *Federmesser-Gruppen* are preceded by the Hamburgian, which represents the first human occupation of this area after the Last Glacial Maximum and belongs to the Magdalenian tradition. According to the present record of radiocarbon dates, the Hamburgian and the *Federmesser-Gruppen* are not separated by a considerable amount of time but the question of a potential transition between them remains unsolved thus far. Typologically, the pioneer techno-complex differs from the *Federmesser-Gruppen* in its lithic projectile implements – shouldered points in the classic Hamburgian and tanged points in the Havelte Group – and the richness as well as the nature of its tool types. However, lithic elements with affinities to straight- or curve-backed points or to scraper types considered characteristic of the *Federmesser-Gruppen* appear in assemblages of both the classic Hamburgian and the Havelte Group in different regions of the distribution area of the Hamburgian.

This paper will give an overview of these specific assemblages and the varying interpretations of the apparent co-existence of lithic elements attributed to two different techno-complexes. Moreover, the example of Teltwisch 1 in the Ahrensburg tunnel valley (Schleswig-Holstein, Germany) will be discussed in detail taking into consideration typological, technological and spatial data.

At the present state of research, the results of these studies rather tend to a real prehistoric co-existence of components that, individually considered, would be attributed to two different techno-complexes. However, the likelihood of admixtures from neighbouring sites is more or less important depending on the nature of the different sites.

Finally, the presented observations will contribute to the discussion of the origin of the *Federmesser-Gruppen* on the North European Plain.

ORAL

## 2. BACKED PIECES LITHIC TECHNOLOGY IN THE WESTERN POLISH PLAIN

Pyżewicz, Katarzyna (Institute of Prehistory, Adam Mickiewicz University in Poznań) kpyzewicz@gmail.com  
Witold Gruzdz (Institute of Archaeology, Cardinal Stefan Wyszyński University in Warsaw) wittold@gmail.com  
Rozbiegalski, Piotr (Institute of Prehistory, Adam Mickiewicz University in Poznań) p.rozbiegalski@gmail.com  
Rakoca, Aleksandra (Institute of Prehistory, Adam Mickiewicz University in Poznań) rakoca.a@gmail.com

The purpose of the presented paper is to investigate the lithic technology of the Backed Pieces complex. The research was performed by analysing the morphological features of debitage and the reduction processes. Until recently Polish archeology was dominated by the studies associated with the use of dynamic technological classification. Rarely there were presented with the results of applying refitting methods focused on spatial analysis. The studied Late Paleolithic inventories came from few excavation sites (i.a. Święty Wojciech, Santocko, Rogalinek) which are located on the western part of the Polish Plain.

During the detailed interpretation of the particular stages of *chaîne opératoire* we applied the combination of the refitting method, experimental research and microscopic analysis of flint materials.

As a result of our studies we made an attempted to distinguish characteristics of Backed Pieces lithic technology, which differentiate this method of debitage from others - used among other Late Paleolithic and Early Mesolithic societies in the western Polish Plain.

Special attention was paid to the aspect of duality in the approach to the lithic technology among the Backed Pieces groups. These kinds of differences were noted in the preparation of cores as well as blade production and the toolkit used for the debitage.

Late Paleolithic assemblages with Backed Pieces in the western Polish Plain were produced by using two characteristic methods of blade reduction. First method was based on isolation of core platform by facetting before application of direct percussion with hard hammer. A second method was aimed producing more regular and slender blanks with soft stone percussion.

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ORAL

### 3. SIMILAR BUT DIFFERENT. FEDERMESSER SETTLEMENT IN POLAND

*Sobkowiak-Tabaka, Iwona (Institute of Archaeology and Ethnology Polish Academy of Sciences) iwona.sobkowiak@iaepan.poznan.pl*

For the first time inventories related to the Arch Backed Piece techno-complex (Azilian industry at the time) were defined in Poland by S. Krukowski in the 1920s. After almost 100 years of excavations and studies, approximately 110 Federmesser assemblages (including stray finds) have been recorded, of which nearly 50 have been registered at Rydno (northeastern foothills of the Holy Cross Mountains). Based mostly on the lithic inventories marked by substantial technological, typological and morphological differentiation (especially in the group of backed points), three taxonomic units were distinguished (Federmesser Culture, Tarnowian and Witowian) and, lately, also their local variants.

However, the genesis of particular taxonomic units and the wide variety of the Polish assemblages causation are still poorly understood.

The utilisation of chocolate and Cracow- Częstochowa Upland Jurassic flint as well as occasional finds of exotic raw materials, namely obsidian and radiolarite, have been reported, but otherwise most lithic assemblages were made of Cretaceous erratic flint.

The number, size and structure of inventories as well as the character of features indicate various kinds of settlement patterns – from short-stay sites, workshops and camp sites to large aggregations of sites – i.e., Rydno (ochre mine).

Given thirteen radiocarbon dates which have been obtained from different archaeological contexts, Federmesser settlement in Poland can be confined to the period of the Allerød (GI-1a-GI-1c) and the very early Younger Dryas (GS-1). Fairly numerous archaeobiological studies can be used to reconstruct paleo-environmental changes during those periods, conveniently even at the micro-regional scale.

The recognition of subsistence strategies is hardly possible due to the scarcity of animal remains.

Federmesser sites in Poland are located in different kinds of landscapes, i.e., lowlands, highlands and mountains,

which testifies to the great flexibility of the hunter-gatherer societies and their skills in the exploration of diverse environments. The exploitation of contrasting types of biotope together with various functions of sites could have fostered the diversity of lithic tool-kits. The long-term persistence of the Federmesser settlement can provide another plausible explanation.

A wide distribution of different kinds of rocks, sometimes exotic, is indicative of the mobility of these societies and suggests an important role of exchange of goods and of relationships between individuals and groups.

Federmesser groups can be seen analogously to M. Otte's account of the Magdalenian culture, namely as a conglomerate of communities of not necessarily common origin and functioning in different periods, who, in consequence of the adaptation to environmental conditions, generated a similar economic strategy and a conjunctive social and ideological structure.

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ORAL

### 4. TWO LATE PALAEOLITHIC ARCHED-BACKED POINTS VARIETIES IN NORTHERN CARPATHIANS

*Valde-Nowak, Pawel (Institute of Archaeology, Jagiellonian University; Institute of Archaeology and Ethnology, Polish Academy of Sciences) p.valde-nowak@uj.edu.pl*  
*Kraszewska, Anna (Institute of Archaeology, Jagiellonian University) ania.kraszewska@gazeta.pl*

The issue of arched-backed points from the Allerød Interstadial period is best understood in its two Western European variants: Azilian and Federmesser. Intensification of the archaeological research in the northern Carpathian Mountains led to discovery of two relatively big sites of such technocomplexes. Our aim is to focus on them as each one represents a different technological and typological variant.

Both sites are situated within small areas of occurrence of radiolarites and both of them prove that this raw material was exploited. We will present some elements differentiating backed points as well as different ways of stone processing. In view of the proposal of classification of the Arched-backed Points complexes, it may be concluded that one of these sites may represent the Witów group while the other indicates a link with the Federmesser culture. This is even more interesting since both sites are 20 km away from each other and placed in the same river basin. Moreover, it is difficult to indicate

inventories in the Carpathian range providing a context for either of the variants. Only few finds of arched-backed points were made within a radius of several tens of kilometers; furthermore, their connection with the techno-complex we are interested in is not certain. Both sites have features of base camps, most probably with a dwelling construction, situated on a big river in the Central Western Carpathians, where no traces of such settlements have been reported so far. In both cases the assemblage inventories may be regarded as household stone-processing workshops.

The value of these findings is also emphasized by their geographical location. Firstly, they prove that the arched-backed points groups embraced a mountainous landscape, in this case the Tatra Mts. and the Pieniny Mts., with its characteristic climate and fauna. Secondly, intensive studies of the discovered inventories will allow us to better define a South-Eastern boundary of the area penetrated by the population of the Federmesser culture. Thirdly, the finds provide new information for the discussion about the scale of presumed southern (Epi-Gravettian) influences on Arched-backed Points communities developing in the European Lowland in the Allerød period.

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ORAL

## 5. SETTLEMENT STRATEGY IN THE LATE PALAEO-LITHIC OF BOHEMIA AND MORAVIA

*Moník, Martin (Palacky University) martin.monik@gmail.com*

Differences in topography of Late Palaeolithic sites are discussed in this paper and compared to the topography of older (Magdalenian) settlement in the area. All data (altitude, cardinal directions, watercourse distance, vertical drop) are statistically evaluated in order to detect different strategies of groups supplied with different chipped stone materials.

Topographic data are acquired on the basis of known literature or recent surface prospection, certain collections have been recently re-analyzed in order to identify specific composition of chipped stone industry. Maps of Late Palaeolithic and Magdalenian settlement of Bohemia and Moravia have been created, statistical analysis has been made using the Statistica (Stat Soft inc.) program.

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ORAL

## 6. LATE PALEOLITHIC LAND USE IN NORTHERN BAVARIA

*Sauer, Florian (Institut für Ur- und Frühgeschichte Erlangen) florian.sauer@fau.de*

The archaeological landscape of northern Bavaria - especially the Oberpfalz region - knows an extensive amount of late Paleolithic sites. Most of these sites - the frequent occurrence of backed points marks them as belonging to the Federmesser-groups - are known due to surface collections by private collectors, who have been surveying the region for more than 50 years. Only very few sites are known as a result of excavations which mainly took place in the early 20th century and therefore in most cases lack stratigraphic or faunal information.

As mentioned above, most of the sites are known thanks to amateur collectors. The better part of the more than 100 sites classified as late Paleolithic are open air sites that have been brought to the surface by plowing. Therefore it is quite probable that both the vertical and most of the horizontal stratigraphic information is lost to us.

So the wealth of the late Paleolithic sites of northern Bavaria lies not in the well documented intrasite phenomena but in their geographical position, in the abundance and accessibility of the rich, but unstratified and sometimes admixed lithic assemblages and the diversity of the used raw materials that can be quite easily assigned to sources of origin. These three scales of information should bear the potential to draw a more or less colorful picture of the behavior of the late glacial hunters and gatherers in this region.

The scale of geographical information is to be examined with the help of a GIS based archaeological predictive model. This APM will not only focus on typical geographical proxies like aspect, slope or distance to water, but will also take into account ethological ideas - especially concerning the predominant game that is known from different sites in Germany. The results of the geographical scale are then to be combined with information from attribute analyses of several surface collections and the few published sites, containing Federmesser-group artefacts. The attribute analysis already shows a very diverse but also typical pattern of raw material utilization. It shows the frequent use of cherts of the Abensberg-Arnshofen type from the Danube-basin as well as the use of cretaceous flint from the end moraine areas around Erfurt in Thuringia. The combination of tool types in the Bavarian sites also differs from those coming from other

regions in Germany. Burins regularly play a much more important role in the assemblages of this region than for example in those of the Rhineland. This may be due to different land use with a focus on other vegetational or faunal resources. In the end, the combination of the different scales of information will allow the creation of a spatial pattern which can be interpreted in terms of late Paleolithic land use in northern Bavaria.

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ORAL

## 7. FROM CHAÎNE OPÉRATOIRE TO ADAPTIVE CYCLES: CONTEXTUALISING EARLY AZILIAN AND FEDERMESSER-GRUPPEN IN THEIR ENVIRONMENT

*Grimm, Sonja B. (MONREPOS Archaeological Research Centre and Museum for Human Behavioural Evolution, RGZM) grimm@rgzm.de*

*Mevel, Ludovic (Laboratoire "Préhistoire et Technologie", UMR 7055) ludovic.mevel@mae.u-paris10.fr*

The onset of the Lateglacial Interstadial in North-West Europe is characterised by significant climatic and environmental changes. In this unstable period, the first Azilian inventories appeared in the archaeological record. They were clearly related to Late Magdalenian behavioural traditions which were highly resilient during the unstable Late Weichselian Pleniglacial. However, changes in spatial organisation, subsistence strategies, resource procurement, and technical behaviour suggest that the hunter-gatherers increasingly adapted to a temperate environment during the Lateglacial Interstadial. By the mid-Lateglacial Interstadial, the so-called Federmesser-Gruppen occurred which also seemed to be related to a Magdalenian substratum. These inventories were usually associated with forest environments. Thus, the temporal, spatial, behavioural, and ecological relationship of the Late Magdalenian, Early Azilian, and Federmesser-Gruppen is essential for the understanding of the process of adaptation and, consequently, of an important mechanism of behavioural evolution.

At first, a consistent high-resolution chronological framework was created in which climatic, geological, environmental, and archaeological data could be set in a reliable chronological order. In a next step, well dated assemblages from northern France and western Germany were compared to analyse the relationship between the Lateglacial archaeological complexes. Therefore, a technological analysis of lithic industries was used allowing an assessment of the behavioural evolution at different scales of space and time. A necessary objective of this

approach is the discussion of intra- and inter-regional variability among the prehistoric inventories in the context of function and available natural resources. Moreover, these lithic studies had to be accompanied by spatial and faunal evidence to understand variations as part of an adaptive process.

The results of this comparative analysis indicate that the frequently proposed technical impoverishment during the Lateglacial Interstadial reflected an increasing knowledge about the locally and regionally available resources and their properties. In addition, the availability of other resources such as wood made the use of alternative systems possible. The development of some of these resources was not constantly and, thus, changes in the archaeological record also appeared cumulatively. Furthermore, the human willingness to change small things to prevent larger changes can be considered as a source of delayed reactions which in periods of significant environmental variation can result in severe threshold situations for complete societies.

In consequence, the process of adaptation in the Lateglacial can be described as inconstant and depended on the availability of alternatives. Therefore, many Magdalenian behaviours were still preserved during the Early Azilian but became unnecessary in an increasingly temperate environment. Moreover, the small scale adaptations and the neglect of a fundamental change in the behaviour resulted only during a period of severe and short-lived environmental fluctuations in a social collapse and reorganisation.

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ORAL

## 8. PALAEOETHNOGRAPHY OF EARLY AZILIANS. THE CONTRIBUTION OF PARIS BASIN.

*Debout, Grégory (UMR7041) gregory.debout@mae.u-paris10.fr*

*Bignon-Lau, Olivier (UMR7041) olivier.bignon-lau@mae.u-paris10.fr*

*Bodu, Pierre (UMR7041) pierre.bodu@mae.u-paris10.fr*

This contribution aims to review the current knowledge concerning the Early Azilian period in the Paris Basin. This area has been densely occupied by the groups of the Upper Magdalenian. By contrast, Early Azilian sites already known are scarce, but show good archaeological preservation. It is particularly the case of the Le Closeau site located at the bottom of the Seine valley. It has been possible to realize a complete palaeoethnographic inves-

tigation, as it has been done previously on the famous Magdalenian sites of Pincevent and Etiolles, for example. Our results enable us to accurately document the Early Azilian palaeoethnography and to highlight the singularity of their lifestyle.

ORAL

## 9. THE EMERGENCE OF AZILIAN ON THE EDGE OF THE WORLD: TECHNICAL SYSTEMS AND MOBILITY IN THE NORTHWEST OF FRANCE

*Marchand, Grégor (CNRS) gregor.marchand@univ-rennes1.fr*  
*Naudinot, Nicolas (Université de Nice) nicolas.naudinot@cepam.cnrs.fr*

The Tardiglacial coast line flooding deprives us of major information concerning the exploitation on the maritime resources during the Azilian, but it does not totally forbid us to think about the economical consequences of a human setting-up on the edge of European continent. At that time, the current Armorican peninsula is a peneplain which lines the Paleo-Manche estuary. On this crystalline massif, the flint is present only in the form of pebbles along the shores, what implies for prehistoric men a permanent link with the ocean, completed by a more or less use of local rocks (Eocene sandstones, quartzites). These geographical and geological constraints are obviously a key determining factor in population mobility and economic networks.

Technical evidences of this organization can be detailed for Early Azilian within two recent excavations in the rock-shelters of Kerbizien (Huelgoat) and the Rocher de l'Impératrice (Plougastel-Daoulas), in the west of Brittany. In such spaces confined by the walls and with little domestic area, the technical signature that we perceive is extremely original compared to the later choices (Recent Azilian or Mesolithic period). The important fractionation of the reduction process on a wider area and a specialization of the activities in the sites themselves are especially noticeable and open on new economic models. The importation of flint pebbles from the shores is obvious as well as the importation of blades produced in the sedimentary basins, which implies routes of more than 300 km. The integration of local rocks in the toolkit reveals another facet of human mobility, including a regular land surveying by these populations.

The genesis of this particular economic organization is certainly to link with the technical system transformations at the beginning of Azilian. These changes lead to recent Azilian technical system as we know it in tens of

site of western France, les Chalognes (Mozé-on-Louet) being the best-known. The evolution seems very progressive for the lithic system, as well as the symbolic registers. The economic network we perceive in both sites grew up probably with complex interactions with the environment.

ORAL

## 10. LANDSCAPE USE IN THE LATEGLACIAL OF SOUTH EAST BRITAIN

*Mills, William (University of Oxford) william.mills@stx.ox.ac.uk*  
*Barton, Nicholas (University of Oxford) nick.barton@arch.ox.ac.uk*

Recent discoveries in the Wey Valley, a major tributary of the Thames, have highlighted the need to re-examine the question of the relationship between Lateglacial (LG) hunter-gatherers and their use of landscape. The new sites probably date from around the beginning of the second half of the Interstadial (equivalent to the Allerød, 13,950–12,900 Cal BP), when more open environments were replaced by birch and pine woodland and elk, wild cattle and red deer formed the main available hunted species. This period in Britain also coincided with the appearance of Federmesser industries. The flint assemblages at this time become increasingly dominated by tool inventories that include curve-backed blades (*pointes á dos courbé*) but also with well made blades and in the early part of this phase tools such as shouldered points. These recent excavations also highlight the necessity for the re-evaluation of British museum collections of open-air sites preceding the recent advances in the characterisation of LG lithic assemblages in northern Europe.

During this time large river valleys may have played an increasingly important role for humans as places for targeting particular resources (raw materials, meat animals as well as plants) and for channelling movements in the more densely vegetated landscapes of southern Britain. In this paper we examine the position of Later Upper Palaeolithic (including Federmesser) sites in relation to the floodplain of the Wey Valley and in terms of proximity to raw material sources.

The study focusses on a combination of cross-referenced location and descriptive data provided by national databases analysed spatially with a Geographic Information System (GIS) as well as the systematic re-evaluation of museum collections of lithic material from this region.

This is on-going research and I will be presenting the preliminary results for the Wey Valley, a tributary to the Channel River via the Thames, testing the iterated hypothesis of whether river valleys were corridors enabling movement of groups within north western Europe during the LG.

The archaeological layer does not appear to be greatly disturbed as indicated by initial refitting evidence and the presence of fine artefact debris. The surface condition of the flint artefacts is also very well preserved and preliminary results suggest excellent potential for micro-wear analyses. Optically Stimulated Luminescence (OSL) dating studies are in progress and so far broadly confirm a Late Glacial age for the sands. Fitting the Guildford site accurately into a Late Glacial framework presents one of the key challenges in the post-excavation work. It remains to be demonstrated whether the assemblage is part of a transitional phase of the early Federmesser or belongs to a more developed phase within the equivalent of the Allerød interstadial.

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POSTER

**11. A NEW LATER UPPER PALAEOLITHIC SITE AT GUILDFORD FIRE STATION, SURREY, UK**

*Attfield, Ben (Oxford Archaeology, Janus House, Osney Mead, Oxford) twistedjohnson@hotmail.co.uk*

*Barton, Nicholas (University of Oxford) nick.barton@arch.ox.ac.uk*

*Donnelly, Michael (Oxford Archaeology, Janus House, Osney Mead, Oxford) m.donnelly@oxfordarch.co.uk*

*Roberts, Alison (Ashmolean Museum, Oxford) alison.roberts@ashmus.ox.ac.uk*

A rare example of a well-preserved Later Upper Palaeolithic open-air site has recently been discovered in Guildford, Surrey in South-east England. The site came to light during the preparations to build a new Fire Station and the excavations, funded by Surrey County Council, were undertaken by Oxford Archaeology in advance of the development. Excavations revealed two or possibly three dense clusters of flint artefacts covering an area of ~65 m<sup>2</sup> and stratified in sandy sediments just above the present floodplain of the Wey Valley at Guildford. The flint assemblage consists of ~5550 artefacts, excluding finer knapping debris.

A high proportion of the debitage can be classified as blades, some of them well made and slightly curved in profile with carefully prepared faceted butts. All stages of the *chaîne opératoire* seem to be present from the initial shaping and preparation of the cores, including cortical flakes, crested pieces, core tablets and other rejuvenation flakes, to the final discard stages. There are also over 100 retouched tools which is a relatively large number for a British LUP site. The most important categories include scrapers on the ends of blades, burins (both dihedral and truncation), a few piercers and becs, end truncated blades and a number of blades with scalar 'Magdalenian' retouch. Amongst the backed pieces are broken backed blade/lets and points. Two of the latter appear to represent curved backed bi-points of *Federmesser* type but neither of them is complete.

# A6a Human occupations in mountain environments: a comparative methodological perspective

Commission on Human Occupations in Mountain Environments

(Organizers: S. Grimaldi, Sveinung Bang-Andersen, Francesco Carrer, Fabio Cavulli, Ignacio Clemente, Pierre Crotti, Philippe Della Casa, Federica Fontana, Walter Leitner, Maria Estela Mansur, Annalisa Pedrotti, Sabine Reinhold)

Monday 1st (14:30 to 20:30)  
B04 Meeting Room  
Chairman Estela Mansur



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ORAL

## 1. PREHISTORIC FREQUENTATIONS IN THE ALPS: THE PROJECT SURVEY ALTA VAL SESSERA (PIEDMONT - IT)

*Rubat Borel, Francesco (Soprintendenza per i Beni Archeologici del Piemonte e del Museo di Antichità Egizie) francesco.rubatborel@beniculturali.it*

*Berruti, Gabriele Luigi Francesco (Department of Geology, University of Trás-os-Montes e Alto Douro; Associazione culturale 3P - Progetto Preistoria Piemonte) gabrielefberruti@gmail.com*

*Berté, Davide (Sapienza Università di Roma; Associazione culturale 3P - Progetto Preistoria Piemonte) dvb83@libero.it*

*Daffara, Sara (Associazione culturale 3P - Progetto Preistoria Piemonte) saradaffara@virgilio.it*

*Scoz, Luca (Muse-Museo delle Scienze di Trento; Associazione culturale 3P - Progetto Preistoria Piemonte) luca.scoz@gmail.com*

Val Sessera is an underpopulated Italian alpine valley located in the northeastern Piedmont between the provinces of Biella and Vercelli.

We expose here the data obtained during the first and the second year of the project "Survey Alta Val Sessera" held in 2013 and in 2014 under the scientific direction of Soprintendenza per i Beni Archeologici del Piemonte in collaboration with Associazione Culturale "3P" and DocBi that had as its purpose the identification of mesolithic frequentations in the Valley.

The interpretative scheme employed starts from the one developed for Trentino and the South Tyrolean region by Broglio and Improta. This model has already been shown to be applicable also to the western part of the Alps within the research carried out in the area of Monte Fallere (AO).

During the campaigns, surveys in the valleys of the creeks Sessera and Dolca have been carried out using the patterns of settlement and mobility in the alpine environment developed by K. Kompatscher and N.M. Kompatscher, in order to identify the most interesting areas to investigate.

In the considered areas were made samplings in each place that answered to at least two of the four parameters set by K. Kompatscher and N.M. Kompatscher about the mesolithic occupations in high altitude areas.

The samples were carried out by performing the decortifications of the turfy surfaces on an area of 50x50 cm and

the subsequent restoration of the previous environmental situation. Along the paths and in the areas where the turf was relieved or removed by the passage of cattle, we carried out intensive surveys. For each artefact found and for each survey done we took photographic documentation and positioning by GPS technology.

Preliminary results indicate that the valley of the Sessera creek was occupied by human groups using knapped lithic industries while we have not had similar findings in the valley of the Dolca creek. The activities carried out led to the identification of nine sites characterized by the presence of lithic industry made of local quartz. These frequentations should be placed chronologically after the Late Glacial Maximum.

The findings, though the technological study suggests their Mesolithic belonging, have no diagnostic elements for a more precise chronological collocation.

The importance of the data obtained from these first two years of the project "Survey Alta Val Sessera" consists in having successfully tested a method of research aimed at identifying human frequentations at high altitude also in this part of Piedmont.

The data will be compared with those coming from the other alpine regions in attempt to obtain a more complete picture of the Mesolithic occupation of the alpine environment.

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ORAL

## 2. SITE DETECTION IN THE APPENNINES: TWO CASE STUDIES

*van Leusen, Martijn (Groningen Institute of Archaeology) p.m.van.leusen@rug.nl*

The problem of detecting human occupation in mountain areas has been the object of investigation by the Department of Classical and Mediterranean Archaeology of the University of Groningen (NL) in several research programs since 2005. Here I would like to present two case studies, both conducted in the Italian Appennines, that illustrate the approach developed and the kinds of results obtained. Case study 1, on the Monti Lepini (anti-Appennine chain, Lazio region), will focus on the re-interpretation of legacy site data in the light of modern systematic surveys; case study 2, on the Pollino massif (on the border of Calabria/Basilicata regions), will focus

on the detection and interpretation of ephemeral/seasonal occupation traces. It will be argued from these two cases that a substantial concerted research effort is needed to build the comparative methodological perspective advocated by the session organizers.

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ORAL

### 3. PREHISTORIC COPPER PYROTECHNOLOGY IN THE SWISS ALPS: APPROACHES TO SITE DETECTION AND CHAÎNE OPÉRATOIRE

*Della Casa, Philippe (University of Zurich) phildc@access.uzh.ch*

*Turck, Rouven (University of Zurich) rouven.turck@uzh.ch*

*Naef, Leandra (University of Zurich) leandra.naef@uzh.ch*

It has been known for decades that prehistoric copper pyrotechnology was performed in the Oberhalbstein valley (Grisons, Switzerland). However, this copper deposit is among the least explored ancient mining areas of the Alps so far, though various hypotheses on the importance of the copper produced in the valley since the Early Bronze Age have been repeatedly expressed.

A new project by the Dept. of Prehistoric Archaeology at the University of Zurich now focuses on a systematic evaluation of the research situation within a Central and Eastern Alpine framework: surveys, datings, ore analyses, analyses of slags and residues, chaînes opératoires of copper production and use, as well as local Bronze Age settlements with traces of metal working are at the heart of this new research.

Recent fieldwork has provided very promising results: structured slag heaps and production areas with a smelting furnace dating to the beginning of the Iron Age were documented. The contribution will focus on methodical approaches to site detection (survey) and reconstruction of operational sequences.

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ORAL

### 4. CAUCASIA TOP DOWN - 10 YEARS OF GIS AND REMOTE SENSING APPLICATION ON A LBA HIGH MOUNTAIN CULTURAL LANDSCAPE IN THE NORTH CAUCASUS (RUSSIA)

*Reinhold, Sabine (DAI Eurasia-Department, Berlin) sabine.reinhold@dainst.de*

*Belinskij, Andrej B. (GUP Nasledie, Stavropol) abelinski@gmail.com*

*Korobov, Dmitrij S. (Institute of Archaeology, Moscow) dkorobov@mail.ru*

The Caucasus is Europe's highest fold mountains systems, geographically similar to the Pyrenees or the Alps. With a much less intensive modern infrastructure as e.g. in the Alps, site localisation is task to specific survey projects. This overview will present the results of 10 years of multidisciplinary research by a joint Russian-German project in the North Caucasus. This scaled landscape archaeological research focused on the reconstruction of the economic and social parameters of a high mountain community.

Using high resolution aerial photos, satellite images and systematic field survey a complete cultural landscape with more than 260 sites on a remote mountain plateau up to 2400 m asl was documented with an accurateness, that has few parallels in European landscapes. This is due to a nearly intact environment and a high visibility of ancient sites on remote sensing images. Downscaling the site location process, we focused on microregions and single sites, using geophysical prospection, soil analysis and excavation to reveal activity areas in the sites, especially the precise localities of animals.

As a result a complete mountain agricultural system can be reconstructed in its economic as well as its social and ideological aspects. It date to the local Late Bronze Age, i.e. the second half of the 2<sup>nd</sup> millennium BC and is one of the earliest real Almwirtschafts-systems known.

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ORAL

### 5. PLACE-BASED DETECTION OF THE TRANSITION TO AGROPASTORALISM FROM COLLUVIAL SEDIMENTS OF THE FRENCH WESTERN PYRENEES MOUNTAINS

*Leigh, David S. (University of Georgia, Geography-Geology Bldg., 210 Field Street, Athens, Georgia 30602, USA) dleigh@uga.edu*

*Gragson, T.L. (University of Georgia, Geography-Geology Bldg., 210 Field Street, Athens, Georgia 30602, USA) tgragson@uga.edu*

*Coughlan, M.R.*

We detect transition to agropastoral occupation in a mountain landscape by radiocarbon dating physical and

geochemical signatures of conversion from native forest to pasture within colluvial stratigraphic sections. Our study sites are located on hillslope benches, toeslopes, or depressions immediately beneath zero-order hollows draining few to several hectares in the commune of Larrau (Pyrénées Atlantiques, France). Sample sites are chosen to maximize likelihood of spatially and temporally uniform sedimentation (primarily by slopewash). This constitutes a place-based strategy of deciphering the chronology of agropastoral activities within individual fields, which is applicable to other mountain ranges of the world. Stratigraphic columns are augured in contiguous sample levels with decadal to centennial temporal resolution. We find that the colluvial sediments contain evidence of fires that initially cleared and subsequently maintained pastures. Natural or non-anthropogenic fires are very rare in this environment. We therefore interpret the unusually high concentrations of charcoal, rapid sedimentation rates, and high levels of magnetic susceptibility evident in colluvial strata as evidence of intentional fire use. The relative abundance of n-alkane carbon chains (C31/C27) across levels further discriminates sediment that accumulated under forest versus pasture. Results from a limited number of sections thus far indicate that intense burning and clearing occurred during the late Holocene, starting at about 4000 cal yr BP, but sporadic and limited fires also occurred on the landscape during the early and middle Holocene. After 4000 cal yr BP the sedimentation rates increased at least twofold, constituting "legacy" sediment. Elsewhere, similar shifts in fire regimes and vegetation assemblages are found in direct association with anthropogenic proxies (e.g. agricultural pollen taxa, fungal spores of sheep dung, and archaeological sites). Consequently, our method may provide a good indicator of human presence and land-use activities for mountainous areas where archaeological sites are sparse and artifact assemblages are limited.

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ORAL

**6. RESEARCH PROSPECTS OF SINGLE PLATFORM MICRO-UNMANNED AERIAL VEHICLES (UAVS): UNCOVERING THE UPLAND ZONE ARCHAEOLOGICAL HERITAGE OF THE MIRKOVO BASIN, BULGARIA**

*King, Helen (Northumbria University) helen.m.king@northumbria.ac.uk*

*Chapman, John (Durham University) j.c.chapman@durham.ac.uk*

*Dumanov, Boyan (New Bulgarian University) bdumanov@abv.bg*

*Gaydarska, Bisserka (Durham University) b\_gaydarska@yahoo.co.uk*

*Entwistle, Jane (Northumbria University) jane.entwistle@northumbria.ac.uk*

*King, Nigel (QuestUAV) nigel.king@questuav.co.uk*

Autonomous sensor platforms such as unmanned airbourne vehicles (UAVs) are becoming an established technology in many fields of monitoring and their use is steadily increasing, including in the field of cultural heritage. This paper presents the output achievable by a micro-UAV for the rapid generation of aerial imagery, digital terrain models (DTM) and broadband vegetation indices for archaeological prospection from a single platform. Combined, these datasets can be used in the rapid survey of areas of interest that would not normally be considered practical due to time and cost implications and to identify archaeological features that are not readily visible in aerial imagery alone.

The adoption of a single platform with a dual camera set up was used to generate a suite of datasets covering an area of 10km<sup>2</sup> in seven flights. This study provides a work-flow protocol for the deployment of a micro-UAV, data acquisition and processing that can be used for site prospection and site investigation. Real-time processing of the aerial imagery and generation of well established indices (e.g. normalised vegetation index (NDVI), false colour composites, NDVI colour composites) enabled in-field decision making and planning to maximize the best use of researchers in the field.

The time spent post-processing data was significantly reduced as all data was sourced from one platform. The single platform also enabled a high resolution of output (~5cm and 10cm DTM) and aided in the identification of features, such as palaeochannels, pits, remains of buildings and other structures, and relict field layouts and boundaries.

The datasets generated provided new insights into the wider context of known sites and highlighted additional areas of (human) disturbance for field reconnaissance. The Mirkovo Basin is one of the best-mapped upland basins in the Balkans. The results have made significant improvements to the Heritage Mapping aims of the District Council.

ORAL

**7. A "TOTAL ARCHAEOLOGY PROJECT" ON THE UPLANDS OF SAN VITO DI CADORE (DOLOMITES, BELLUNO PROVINCE, ITALY)**

*Carrer, Francesco (Department of Archaeology, University of York, UK) francesco.carrer@york.ac.uk*

*Cavulli, Fabio (Dipartimento di Lettere e Filosofia, Università degli Studi di Trento, Italy) fabio.cavulli@lett.unitn.it*

*Fontana, Federica (Dipartimento di Studi Umanistici, Università degli Studi di Ferrara, Italy) federica.fontana@unife.it*

*Visentin, Davide (Dipartimento di Studi Umanistici, Università degli Studi di Ferrara, Italy) davide.visentin@unife.it*

*Cesco Frare, Piergiorgio (Via Maraga 11, 32100 Belluno, Italy) glcesco1@alice.it*

*Mondini, Carlo (Associazione Amici del Museo di Belluno, Italy) carlomondini46@libero.it*

*Pedrotti, Annalisa (Dipartimento di Lettere e Filosofia, Università degli Studi di Trento, Italy) Annalisa.Pedrotti@lett.unitn.it*

In the paper we will report the first results of the ongoing archaeological survey project developed in the uplands of San Vito di Cadore (Dolomites, Belluno province, 1800-2700 m a.s.l.) from 2011 to 2013. The adoption of a "total archaeology" approach has enabled to record different types of evidence without chronological limits, from prehistoric sites - Late Palaeolithic and Mesolithic - to present day structures, thus allowing a diachronic perspective on human occupation in this area.

The methodology adopted has implied a multi-scale analysis. During the survey different categories of data have been recorded, such as single artefacts micro-scale - and wall structures - macro-scale.

The position of every evidence has been recorded with an handheld GPS. Moreover written and photographic documentation has been drawn up directly on the field. The final step was the creation of a webGIS for the analysis of all the collected data (<http://laboratoriobagolini.it/ais/>).

The archaeological evidence recognised consists of six main categories:

1. Prehistoric sites represented by lithic artefacts which mostly refer to an occupation of the area by Mesolithic hunter-gatherer groups;
2. agro-pastoral sites, like small dry-stone structures (huts), boulders for the distribution of salt to the live-

stock (called "massi del sale", literally "salt boulders"), rock-shelters, small and large dry-stone enclosures;

3. mining exploitation

4. rock engravings, like boundary cross-shaped markers, writings and cup marks; however, the circular engravings are a specific feature of this territory and can be preliminarily interpreted as border markers;

5. World War I structures: trenches, presumed structures for artillery and platforms for military campsites;

6. isolated hearths and rock shelters that testify the modern and contemporary presence of hunters and hikers.

Although this research is still at a preliminary stage, results obtained so far highlight an intense human occupation of this upland territory since prehistoric times. The present Alpine landscape of this gorgeous sector of the Dolomites is the result of several thousand years of human influence. Human occupations and modifications occurred over time and are still active, frequently overlapping one another. According to these considerations, new research and dissemination perspectives should be taken into consideration. First of all the adoption of a "total archaeology" methodology seems to be essential in order to fully understand the evolution of the cultural landscape in this territory. Moreover collected data represent a promising starting point for the creation of tourist itineraries capable of merging naturalistic and archaeological aspects in such a peculiar environment as the Belluno Dolomites.

ORAL

**8. SURFACE SURVEYING IN HIGH MOUNTAIN AREAS, IS IT POSSIBLE? SOME METHODOLOGICAL CONSIDERATIONS**

*Gassiot Ballbe, Ermengol (Universitat Autònoma de Barcelona) ermengol.gassiot@uab.cat*

*Clemente-Conte, Ignacio (IMF-CSIC) ignacio@imf.csic.es*

*García Casas, David (Universitat Autònoma de Barcelona) david.garc83@gmail.com*

*Mazzucco, Niccolò (IMF-CSIC) nicco.mazzucco@gmail.com*

*Obea Comes, Laura (Universitat Autònoma de Barcelona) laura.obea87@gmail.com*

*Rodríguez Antón, David (IMF-CSIC) david.anton79@gmail.com*

Until the last twenty years or so, the high mountain areas were almost excluded from the archaeological research. Firstly, because it was assumed that above 2.000 m.a.s.l. in Europe climatic and environmental settings preclude any stable human settlement. Secondly, because the steep slopes and the rugged terrains typical of the mountain areas make difficult to implement systematic surface surveys. However, this latter point is only partly true. Sampling strategies for flat terrains are difficult to apply in abrupt mountain areas. Nevertheless, recent projects of research in high mountain Alpine and Pyrenean areas have been applying new sampling strategies, which allow to surveys extensive surfaces in this kind of environments. This presentation discusses the methodological organization of the systematic surveying of mountain areas between 1.700 and 2.900 m.a.s.l. in Central Pyrenees, more specifically in the National Park of Aigüestortes i Estany de Sant Maurici. This debate involves not only the field organization of survey and the sampling strategies, but also other problematic: e.g., how to record dispersed but continuous evidences over the space.

As a result of these new surveys in high-altitude environments, unexpected humanized past landscapes are emerging. New images that challenge the historical reconstructions and the visions of the mountain areas traditionally proposed from archaeology.

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ORAL

### 9. UNCOVERING THE FROZEN PAST- SURVEYING & MONITORING GLACIAL ARCHAEOLOGICAL SITES

*Callanan, Martin (Dept. of Archaeology and Cultural History, NTNU-University Museum, Trondheim, Norway) Callanan@ntnu.no*

Glacial archaeological sites are usually located in remote mountainous regions. Many of these sites are now melting and retreating due to warming climates. Managing heritage sites in ice patches, glaciers and in permafrost is particularly challenging for a number of reasons. Firstly, they sometimes contain fragile organic artefacts and eco-facts of great scientific value that need to be recovered quickly. Secondly, the melting processes are uneven and occur over long periods of time, making long-term monitoring necessary. Thirdly, the remoteness of many of these sites means that there are often serious logistical issues to be addressed before archaeological surveying and monitoring can begin.

As global climates look set to continue to warm up, sites will continue to degrade and new artefacts and sites will be exposed. This is the case both in glacial archaeological regions already identified and in several regions around the world where targeted surveys have yet to be organised. For this reason it is important to undertake a review of the surveying and monitoring methods currently employed within this field.

In this presentation, we will look at examples of glacial archaeological sites from around the world and at some of the artefacts and information they have produced about how humans have used remote mountain landscapes in the past. We will also review the different surveying and monitoring approaches that have been employed in the different regions.

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ORAL

### 10. MISSING ELEMENTS IN CULTURAL UNDERSTANDING OF HYDROTHERMAL LANDSCAPE OF CARPATHIANS IN MIDDLE PALEOLITHIC

*Magda Cieśla - (Institute of Archaeology, Jagiellonian University) nn8065@gmail.com*

*Paweł Valde-Nowak (Institute of Archaeology, Jagiellonian University) p.valde-nowak@uj.edu.pl*

As soon as in 1950', when the excavations at Middle Paleolithic sites in Slovakia (such as Ganovce, Horka-Ondrej, Beharovce or Bešenova) had begun, the correlation between archaeological inventories connected with microlithic Taubachian and presence of travertine (sedimentary rock, formation of which in many cases is related to hydrothermal activity) was observed. Connection between two phenomena, cultural and geological, has never played a major role in the discussion of Neanderthal presence in Central Europe, as many sites outside of the Carpathians have not displayed any connection with travertine or thermal waters. Nevertheless, new analysis of data leads to the conclusion, that in light of some new evidence, this problem should be discussed again, especially in context of layer XIX of Obłazowa Cave.

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ORAL

### 11. MIDDLE-LATE PLEISTOCENE MOUNTAIN HUMAN OCCUPATIONS IN THE KARST OF PINILLA DEL VALLE (SPANISH CENTRAL SYSTEM)

*Karampaglidis, Theodoros - (Centro Nacional de Investig-*

*ación de Sobre la Evolución Humana) theodoros.karampaglidis@cenieh.es*

*Ortega Martínez, Ana Isabel (Centro Nacional de Investigación sobre la Evolución Humana) anaisabel.ortega60@gmail.com*

*Pérez-González, Alfredo (Centro Nacional de Investigación sobre la Evolución Humana) alfredo.perez@cenieh.es*

*Bárez Sergio (Dep. de Geodinámica. Facultad de Ciencias Geológicas. Universidad Complutense de Madrid. Ciudad Universitaria s/n. 28040 Madrid. Spain) paleosergio@yahoo.es*

*Alonso Martín, José Ignacio (Museo Arqueológico Regional (MAR). Plaza de las Bernardas s/n, 28801 Alcalá de Henares (Madrid). Spain) jose.alonso.arqueosc@gmail.com*

*Sanchez-Romero, Laura (Centro Nacional de Investigación sobre la Evolución Humana - Escuela Interuniversitaria de Posgrado en Evolución Humana, Universidad de Burgos. C/ Don Juan de Austria 1, 09001 Burgos. Spain) laura.sanchez@eb.cenieh.es*

*Arsuaga, Juan Luis (Centro Mixto UCM-ISCIIE de Evolución y Comportamiento Humano. Monforte de Lemos 5. 28029 Madrid. Spain) jlarsuaga@isciii.es*

*Baquedano, Enrique (Museo Arqueológico Regional (MAR). Plaza de las Bernardas s/n, 28801 Alcalá de Henares (Madrid). Spain) enrique.baquedano@madrid.org*

The karst system of Calvero de la Higuera (Pinilla del Valle) formed in Late Cretaceous limestones and dolomites at the Upper Lozoya valley pop down located in the Eastern part of the Spanish Central System at the Guadarrama mountain range. The archaeological fieldworks, started in 2002, revealed the presence of a middle elevation mountain (1,100 m asl) fossil multilevel karst modeled by lithological-structural controls and Quaternary local base lowering. At least three levels of subhorizontal caves detected hanging above the current thalweg of the Lozoya River. The whole karst system dismantled as result of bed rock weathering and surface processes, and istotally infilled by Middle-Late Pleistocene alluvial sediments, with debris and colluvium deposits. The systematic fieldwork shown Middle-Late Pleistocene human activity and carnivores inhabitants at the complex karstic system composed by the caves of Buena Pinta, Camino, Des-Cubierta and Navalmaillo rock shelter. Camino and Buena Pinta sites were identified such as carnivores inhabitants where the paleontological record summary includes human remains (*Homo neanderthalensis*). At the upper level (Des-Cubierta cave) was identified Middle-Late Pleistocene human activity with important paleontological remains. Finally in the Navalmaillo rock shelter recognized like as Neanderthal site with abundance artifact records.

ORAL

## 12. MOUNTAINOUS SETTLEMENTS MODALITIES DURING PALAEO-LITHIC IN THE LESSER CAUCASUS (REPUBLIC OF ARMENIA)

*Colonge, David (Inrap GSO et UMR 5608 TRACES) david.colonge@inrap.fr*

*Montoya, Cyril (SRA Picardie et UMR 6636 LAMPEA) cyril.montoya@culture.gouv.fr*

*Arakelia, Dimitri (Dpt of Cartography and Geomorphology, Yerevan State University) geo@ysu.am*

*Balasescu, Adrian (National Museum of History of Romania, National Center of Multidisciplinary Researches, Bucarest) abalasescu2005@yahoo.fr*

*Ghukasyan, Robert (Institute of Archæology and Ethnology, National Academy of Sciences of Republic of Armenia) robert\_80kal@yahoo.com*

*Jaubert, Jacques (Université de Bordeaux 1 et UMR 5199 PACEA) j.jaubert@pacea.u-bordeaux1.fr*

*Nahapetyan, Samvel (Dpt of Cartography and Geomorphology, Yerevan State University) nahapetyan@ysu.am*

*Ollivier, Vincent (Collège de France UMR 7192 PrOCauLAC et UMR 6636 LAMPEA) vincent.ollivier@college-de-france.fr*

*Gasparian, Boris (Institute of Archæology and Ethnology, National Academy of Sciences of Republic of Armenia) borisg@virtualarmenia.am*

*Chataigner, Christine (CNRS UMR 5133 Archéorient) christine.chataigner@mom.fr*

If the Great Caucasus is a strong border in the isthmus between Black and Caspian seas, the Lesser Caucasus, with its piedmont with volcanic plateaus, is looking like an area more opened and crossed during Palaeolithic; however, it remains a mountainous region, close of a "middle stage mountain" in Western Europe, with strong topographic and climatic factors.

Recent works in Republic of Armenia allow us to compare very different strategies of settlements and economic exploitations: the set of Middle Palaeolithic sites in the Kasakh middle valley (Aparan district), the Kalavan 2 site Mousterian layers and the Kalavan 1 Epigravettian settlement (Gegharkunik district).

At first, we will explain how these sites have been spotted: a large survey based on geomorphologic problematic with specified goals versus diachronic survey in the known area of a prospector.

Then, we will suggest the patterns we have built with our results: to try to get further than the classical dichotomies Neanderthal-residential versus anatomically

modern human-logistic mobility systems, we are going to try to define these patterns and may be nuancing them also, by examining choices and modalities of these mountainous settlements.

We will end by discussing the geographic dynamic of these lithic techno-complexes in front of the Great Caucasus border.

ORAL

### 13. THE MESOLITHIC WITH GEOMETRICS IN THE SOUTH OF "PICOS DE EUROPA" (NORTHERN SPAIN)

*Neira Campos, Ana (Universidad de León) aineic@unileon.es*

*Fuertes Prieto, M. Natividad (Universidad de León) n.fuertes@unileon.es*

*Herrero Alonso, Diego (Universidad de León) malloango@gmail.com*

In this work we present the main features of a Mesolithic that we have called "Mesolithic with geometrics". It appears in two caves, El Espertín and La Uña (levels III and IV), both located in the south versant of Cantabrian Range, and their chronology goes from the second half of VII mil. cal BC until the end of the VI mil. cal. BC.

This work will be focus on two main issues, the GIS analysis of the sites, and the analysis of the lithic industry. As for the last one, the petrographic characterization of the raw materials will let us examine its acquisition patterns. Also, a techno-typological study of the lithics, focusing on the retouched tools, will be presented.

Some similar traits of these caves are its altitude over sea level (more than 1200 m in both cases) and the small size of the sites. As for the lithics, the raw materials used and the scarcity of geometrics are much the same, and also they share a lithic industry with deeply rooted archaic features linked to the Upper-Paleolithic/Azilian regional tradition.

Nevertheless, there are also some differences between them, as for the geographic situation of the caves and the osseous industry.

ORAL

### 14. A NEW STONE AGE TRANSIT ROUTE ACROSS THE MAIN RIDGE OF AUSTRIAN ALPS

*Leitner, Walter (University of Innsbruck Institute of Archaeology) walter.leitner@uibk.ac.at*

In the course of an Interreg IV-project between Austria and Italy a new prehistoric alpine transit route frequented and prospected by hunters, gatherers and shepherds could be detected. The track area is to be considered very important on the one hand as a hunting and meadow ground and on the other hand as a mining district where Rock Crystal and soapstone has been quarried out. Especially the excellent quality of quartz leads to the cognition that this material had a remarkable economic value and played a significant role in the early countertrade of the Alps.

ORAL

### 15. HUNTING AND FARMING IN THE MOUNTAINS: TWO NEOLITHIC SITES IN THE NORTHEASTERN ITALIAN ALPS

*Santaniello, Fabio (Università degli studi di Trento) fabio.santaniello@unitn.it*

*Grimaldi, Stefano (Università degli studi di Trento) stefano.grimaldi@unitn.it*

*Pedrotti, Annalisa (Università degli studi di Trento) annalisa.pedrotti@unitn.it*

Lithic assemblages coming from two northeastern Italian Neolithic sites have been techno-functionally analysed.

The open air early Neolithic site of Lugo di Grezzana, Verona ("Fiorano" facies, 5300-4900/4700 BC cal) is located in the Monti Lessini, a region rich in flint formations. La Vela open air site, in the Adige valley, provides a stratigraphic sequence ranging from the early Neolithic ("Gaban" facies, 5000 – 4700 BC cal) to the middle Neolithic (Square Mouth pottery, VBQ I, ca.4700 BC cal, and VBQ II, 4500/4440-4300 BC cal). The research will focus on lithic raw material procurement/production/functional strategies which have been adopted in these sites.

The early-middle Neolithic transition is characterized by environmental, economical, and social changes such as the increasing presence of bovines among the domesticated animal species, and an observed variability in settlement strategies.

Results show that early Neolithic lithic production is characterized by a high presence of unidirectional blades while, during the two VBQ phases, the production is characterized by the presence of flakes. Differences in raw material provenance as well as in functional purposes are also noticed.

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ORAL

## 16. EARLY PASTORAL ACTIVITY IN THE EASTERN CANTABRIAN MOUNTAINS. PALAEOENVIRONMENTAL APPROACH

*Pérez-Díaz, Sebastián (Université Toulouse-Le Mirail) sebas.perezdiaz@gmail.com*

*López-Sáez, José Antonio (CCHS-CSIC) joseantonio.lopez@cchs.csic.es*

*Galop, Didier (Université Toulouse-Le Mirail) didier.galop@univ-tlse2.fr*

*Pontevedra-Pombal, Xabier (Universidade de Santiago de Compostela) xabier.pombal@usc.es*

*Souto, Martín (Universidade de Santiago de Compostela) martin.souto@usc.es*

*Fraga, María Isabel (Universidade de Santiago de Compostela) misabel.fraga.vila@usc.es*

The conceptual and methodological bases of modern archaeology demand collaboration between different disciplines to achieve the same objective: to explain adequately the mechanisms of change and evolution in past cultures. In this multidisciplinary context, the study of botanical remains and geochemical record from different deposits helps to characterize past societies, from the standpoint of social and economic development.

In this case, we focus our attention on the studies carried out in the Eastern Cantabrian Range (Ordunte Mountains, Northern Iberian Peninsula). We present a multi-proxy study of the peat bog of Zalama (1330 m. asl). This is a very special place, because is an ombrotrophic (rain fed) and blanket bog formed through paludification of the summit plateau. These kinds of deposits are extremely infrequent in the Iberian Peninsula, and this case, Zalama peat bog, is probably the most south-westerly recorded example of blanket bog in Europe.

The studies carried out determine the use of this area related to pastoral activities in a relatively early chronology. As mentioned, is located in the northern Atlantic area of the Iberian Peninsula, with oceanic climatic conditions.

This area has been considered a marginal area for Neolithic technocomplex. Continuity between the Mesolithic and the Neolithic was assumed, with a long duration of hunting-gathering practices even when some Neolithic materials were available. Further, archaeologists also assumed there would be difficulty in the adoption of neolithic way of life due to the geographic conditions of the Atlantic valleys. The results presented herein, with other from nearby archaeological sites documents the use of this area by the first farmers-cattle rangers of the atlantic area of the Iberian Peninsula.

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ORAL

## 17. LITHIC RESOURCE MANAGEMENT IN MOUNTAIN ENVIRONMENTS. DISCUSSION BASED ON THE CASE OF THE ANDEAN SECTOR OF TIERRA DEL FUEGO.

*Mansur, Maria Estela (CADIC-CONICET) estelamansur@gmail.com*

*De Angelis Hernán (CADIC-CONICET) hernandeangelis@yahoo.com.ar*

Lithic resource management constitutes one of the most important variables for the technological organization of hunter-gatherer societies. As essential resources for the manufacturing of tools that are themselves involved in processing and consumption of different types of resources, rocks constitute the starting point of all production processes. Consequently, the whole technological organization relies on aspects of lithic resource management: identification, collection, processing and use/consumption. In this work, we present a discussion on lithic resource management in mountain and piedmont environments, from new research conducted in the Andean area of Tierra del Fuego.

The materials studied correspond to a regional project on the exploitation of resources and population dynamics in the central area of Isla Grande de Tierra del Fuego. In this project surveys were conducted in different environments, with location of sites, delimitation and excavations. Lithic analysis was conducted following a technofunctional perspective that includes the interrelated study of the technological (raw materials and manufacturing techniques) and functional aspects (microscopic analysis) of the lithic series. Materials belong to sites located in different topographic and environmental positions and with different functionalities, such as camp sites, ceremonial sites, etc.



The raw materials used in the lithic assemblages come essentially from two geological formations, the Le-maire formation (Jurassic) and Yaghan formation (Cretaceous). However, the mountain slopes are covered by subantarctic forest, which produces a very low visibility, hinders access to lithic raw material sources and difficult raw material extraction. Besides outcrops, there are areas associated with lacustrine bodies, mainly located at piedmont sectors, where raw material is accumulated in secondary supply sources. Lithic analysis shows predominant exploitation of materials from secondary sources. Those most commonly used are rhyolites and cinerites, and in lesser measure shales, characterized by their good knapping quality, mainly depending on rock particle size. Usually the best knapping quality rocks are cinerites and shales, although rhyolites are the most abundant. Another characteristic of the assemblages is the predominance of local materials, although there are some allochthonous materials, coming from sources located at different distances, such as a silicified tuff from a primary outcrop located at more than 250 km.

From the results obtained, it is possible to discuss some more general aspects regarding the exploitation of lithic resources in mountain regions. These landscapes may seem, at a first glance, as ideal provision places for hunter-gatherers because of abundance of rock materials. However these are not always accessible in terms of visibility and possibility of exploitation. On the other hand, not all rocks can be used for the manufacture of all types of tools. We can then propose that hunter-gatherer societies that highly depend on lithic resources seek to exploit outcrops where visibility and accessibility are high, but that also search for a variety of raw materials with different characteristics that allow manufacturing of different artifacts. From these data, it is possible to discuss mobility and seasonality of hunter gatherer groups, in relation to raw materials, availability of other resources and the fuegian ethnographic model.

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ORAL

**18. INDIGENOUS KNOWLEDGE AND SKILLS OF THE BHOTIYA WOMEN OF UTTARKASHI, HIMALAYAS**

*Channa, Subhadra (Department of Anthropology Delhi University) channa.subhadra@gmail.com*

The women of the pastoral sheep herding communities on the upper Himalayan ranges have nurtured skills of

wool processing, knitting and carpet weaving from the distant past. They have developed skills passed down the generations for making beautiful items out of raw wool that is given to them by the men of their community, who herd sheep and go long distance trading as a livelihood. The women, who are tabooed from going to the pastures, receive the wool in the village and know how to process, spin and dye the wool and then either knit or weave carpets out of them. They have nurtured these skills as household work and are today able to use it for commercial purposes and find a ready market for many of their items. This transition to market is giving them cash income and is supportive of their social transactions such as gift giving. The women are able to sustain their traditional role playing and augment it in the changing circumstances while keeping alive their traditional crafts and skills. Although they sell their products in the market, every item of production is still collected by them from primary sources and is part of their natural environment.

This community is one of the several that have traversed the natural geographic barriers of the Himalayan range for centuries, ferrying resources from one region to another, using the natural passes made by the river gorges. These age old practices have continued till almost the present times but are today threatened by climate change and manmade changes in the environment.

Field work was done in the Uttarkashi region of the Himalayas on the pastoral community of the Bhotiyas who have also been transborder traders engaged in the Tibetan salt trade. The data is mostly primary in nature collected by interviews and observations spread over about three years, intermittently. Some secondary sources have also been consulted from archives and books.

The work is ethnographic and descriptive so no specific conclusions exist, only a discussion is undertaken in the conclusions.

This paper will discuss the interface of indigenous knowledge, traditional skills and a cash economy in the backdrop of a subsistence mode of living and long sustained life worlds that have evolved in relation to a particular habitat and livelihood patterns. It will also touch upon the transformations brought about by climatic and technological changes.

ORAL

## 19. EL ALMOGAREN DE RISCO CAÍDO: EL TEMPLO PERDIDO DE LOS ANTIGUOS CANARIOS.

*Cuenca Sanabria, Julio (PROPAC S.L., Gran Canaria, Spain)  
<http://www.propacarqueologos.com>  
de León Hernández, José (Inspector de Cultura y Patrimonio Histórico- Arqueólogo, Cabildo de Gran Canaria, Spain)  
[deleon@grancanaria.com](mailto:deleon@grancanaria.com)*

En el año 1996 se descubrió en las tierras altas de la vertiente noreste de la isla de Gran Canaria en el Archipiélago Canario, el Almogarán de Risco Caído, un extraordinario complejo arqueológico de carácter religioso y astronómico de los antiguos canarios. El complejo cultural de Risco Caído, se localiza a 1000 m sobre el nivel del mar, en la localidad de Barranco Hondo, el municipio de Artenara, formando parte de un poblado de cuevas excavadas, muchas de ellas de tiempos históricos, deshabitadas desde principios del siglo XX. Dos de estas cuevas, las de mayor tamaño y complejidad constructiva, presentan manifestaciones rupestres grabadas en bajo relieve en las paredes interiores y en el suelo. Siendo la figura del triángulo píbico femenino la más representada, siempre asociada a las cazoletas o cúpulas, que tanto se encontraron en las paredes como excavadas en los suelos de toba volcánica. Si bien estos grabados poseen una gran importancia dentro de las culturas de los antiguos canarios, por su valor ideográfico y porque apenas se identifican en unos pocos lugares de la isla, lo más sorprendente y singular de este conjunto, es la construcción de una de las cuevas, que representan un hecho sin parangón en la arqueología del Archipiélago y de los contextos culturales de donde eran originarias aquellas poblaciones, tanto por la técnica constructiva, como por los fenómenos arqueoastronómicos y simbólicos asociados a dicha construcción. Todos los indicadores arqueológicos parecen apuntar a que se trata de un antiguo monumento religioso de los aborígenes canarios, sobre el que no se tenía conocimiento. El hecho de que estas cuevas fueron utilizadas como pajero hasta tiempo muy reciente, ayudó a que pasaran desapercibidas para la arqueología, hasta que el arqueólogo, especializado en el estudio de la religión de los antiguos canarios, Julio Cuenca Sanabria, las descubrió durante los trabajos de prospección arqueológica que llevaba a cabo en ese territorio montañoso de Gran Canaria. En el año 2011, La Consejería de Cultura y Patrimonio Histórico del Cabildo de Gran Canaria, ante el interés científico y patrimonial del Sitio Arqueológico, que presentaba un precario estado de conservación, debido a los derrumbes del escarpe donde se sitúa el complejo de cuevas excavadas, pro-

cedió a iniciar un ambicioso programa de recuperación del yacimiento. Este amplio programa ha consistido en la realización de un diverso tipo de intervenciones, tanto de obras de conservación, como de investigación, de restauración y protección, empleándose las últimas tecnologías de reproducción, diagnóstico y análisis, de esta obra prodigiosa de los aborígenes canarios, para concluir, con la adquisición de dichas cuevas, en su puesta en valor, acondicionando el yacimiento a las visitas. Actualmente se trabaja en la construcción de un Centro de Interpretación en la localidad de Artenara, en cuya demarcación se localiza el monumento arqueológico, que servirá de apoyo y complemento a este extraordinario monumento arqueológico. Risco Caído y los santuarios de montaña de Gran Canaria. Risco Caído, se enmarca en un espacio cultural más amplio, vinculado al mundo de las creencias de los antiguos habitantes de la isla. El prodigioso y espectacular relieve del interior de Gran Canaria sirvió para construir y dar apoyo a una singular forma de practicar sus cultos religiosos, que tiene su máxima representación en una serie de santuarios de montaña, en ocasiones asociados a construcciones singulares excavadas o construidas en lugares casi inaccesibles, que parecen situarse en rutas predeterminadas. Aunque, posiblemente existieron diferentes rutas, siguiendo el eje costa cumbre, en una isla surcada por grandes barrancos, será en el macizo central de Gran Canaria, en torno a lo que fue una gran caldera de explosión (Caldera de Tejeda), donde se identifican algunos de los santuarios más espectaculares de los antiguos canarios, siendo Risco Caído, vinculado a una importante ruta centro noroeste, el que alcanza la mayor complejidad y perfección constructiva y simbólica. En ese contexto, la investigación arqueológica vincula una relación funcional entre este templo calendario aborigen de Risco Caído, y lo que denominamos el Santuario de Risco Chapín, a escasos kilómetros, ubicado en el Pinar de Cueva Caballero y la Montaña de Los Moriscos (1772 m), donde se localizan los yacimientos rupestres de Cueva Candiles, Cueva Caballero y Cueva del Cagarrutal, un complejo de cuevas excavadas que presentan en sus paredes interiores la misma tipología de grabados, con representaciones de triángulos píbicos y cúpulas.

Este extraordinario complejo cultural se excavó en la vertiente Sur Suroeste del escarpe que conforma la pared norte de la Caldera de Tejeda, en el centro montañoso de la Isla. Desde este conjunto, donde se divisa el complejo arqueológico y, también cultural, de la Sierra del Bentayga, se bajaba a la cabecera del gran barranco de Agaete, pasando por el santuario o Almogarán de Risco Caído, como hito principal de lo que fue uno de los lugares de peregrinación más importantes de la isla

de los antiguos canarios. Según nos relatan las primeras crónicas tras la conquista, a estos lugares de culto, acudía la población a celebrar los rituales cuando era convocada por el estamento religioso. El relato simbólico de la luz. Los trabajos arqueológicos que se vienen realizando desde comienzo del año 2012 en este complejo cultural, han permitido identificar ciertos elementos excepcionales y novedosos, en relación al conocimiento del que se disponía hasta ahora, sobre la cultura de los antiguos canarios. Elementos que, en buena medida, cuestiona la idea preconcebida sobre el grado de desarrollo de aquellas sociedades, tanto en conocimientos y habilidades técnicas como en el del pensamiento abstracto y simbólico. Actualmente se trabaja en determinar el significado de alguno de los fenómenos que se producen en el interior de la cueva principal de Risco Caído. Quizás el elemento más excepcional, único en el archipiélago canario y sin precedentes en los contextos culturales de donde eran originarios los aborígenes de las islas, es la cueva de planta circular, algo prácticamente único en la arquitectura aborígen, con techo abovedado y con un orificio o ventanuco en su parte media por donde entra la luz solar en ciertas épocas del año, bañando, precisamente, los citados grabados púnicos y proyectando una sucesión de imágenes cambiantes entre equinoccio y equinoccio. La investigación que se viene realizando sobre lo que ocurre en el interior de esta cueva a lo largo del año, debido a la proyección de la luz solar entre equinoccios y durante el solsticio de invierno por la entrada de la luz de la Luna llena, puede dar lugar a un descubrimiento sin precedentes sobre las prácticas culturales de las culturas que vivieron en las canarias antes de la conquista, y que representa, por sus características, una manifestación única no sólo en ámbitos culturales insulares, aislados durante muchos siglos, y muy limitados desde el punto de vista de los recursos estratégicos. Tampoco a nivel internacional no son muchos los ejemplos en que más allá de que la luz juegue el papel de marcador, pueda, además representar un relato simbólico perfectamente diseñado. Lo que no cabe duda, es que la cúpula que se eleva a cinco metros del suelo y la ventana construida en ella, fueron diseñadas y construidas para que funcionaran, y aún hoy lo hace, como un gran proyector de imágenes en movimiento, que cambian de formas, según pasan los días y los meses, entre los Equinoccios de Primavera y Otoño, siendo el momento culmen de ese recorrido el Solsticio de Verano. En los estudios realizados se ha podido comprobar cómo la entrada de los rayos de luz del Orto Solar en el interior de la cueva y la proyección de la imagen lumínica en los grabados rupestres conforma lo que parece ser un relato que podría tener que ver con la fertilidad de la tierra. Así durante al menos los seis meses del año

comprendidos entre Marzo y Septiembre, en el interior de esta cueva se produce una secuencia de imágenes logradas entre la figura proyectada por la luz solar al atravesar el conducto artificial, y los grabados realizados en la pared Oeste de la Cueva, que podría corresponder con un relato, una historia que nos habla de las prácticas culturales de aquellas poblaciones que ha llegado hasta hoy, posiblemente vinculada al control del ciclo agrícola, a través no sólo de un calendario de una enorme perfección y precisión sino de la secuencia de imágenes que adquieren diferente tipología, en ocasiones recordando figura antropomorfas.

# A6b The management of resources and territories in the Pyrenees from the earliest human occupation to the end of the Protohistory. A behavioral perspective

Commission on Human Occupations in Mountain Environments

(Organisers: Xavier Mangado, Álvaro Arrizabalaga, Ignacio Clemente, Ermengol Gassiot, Mathieu Langlais, Lourdes Montes, Javier Peñalbert, Christine Rendu, Nicolas Valdeyron, Abel Forteau)

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A. LITHIC RAW MATERIAL CHARACTERISATION:  
TECHNIQUES 6 METHODS

ORAL

**A1. SOURCING AND MANAGEMENT OF 'GRAIN DE MIL' FLINT DURING THE UPPER PALAEO-LITHIC IN SOUTH-WESTERN FRANCE: NEW DATA, NEW INTERPRETATIONS**

*Caux, Solene (Université de Bordeaux - PACEA)*

*solene.caux@gmail.com*

*Chalard, Pierre (SRA Midi-Pyrénées - TRACES)*

*pierre.chalard-biberson@culture.gouv.fr*

*Ducasse, Sylvain (CNRS - PACEA)*

*s.ducasse@pacea.u-bordeaux1.fr*

*Lacombe, Sébastien (Binghamton University)*

*slacombe@binghamton.edu*

*Langlais, Mathieu (CNRS - PACEA)*

*mathieu.langlais@u-bordeaux.fr*

*Normand, Christian (TRACES) cpjnormand@wanadoo.fr*

*Renard, Caroline (CNRS - TRACES)*

*caroline.renard@univ-tlse2.fr*

*Simonnet, Robert (CNRS - TRACES)*

*Valdeyron, Nicolas (Université de Toulouse - TRACES)*

*valdeyro@univ-tlse2.fr*

*Bordes, Jean-Guillaume (Université de Bordeaux - PACEA)*

*jg.bordes@pacea.u-bordeaux1.fr*

"Grain de mil" flint, first described in the 1980s, is a high-quality, siliceous raw material characterised by a matrix rich in rounded elements and Bryozoan fragments. Documented initially from several Pyrenean sites, it was subsequently identified from archaeological contexts across the Aquitaine Basin and spanning the entire Upper Palaeolithic period, but most notably Aurignacian and Magdalenian sites. Over the last decade, sources of "grain de mil" flint have been documented in the Charente-Maritime, with other possible sources mentioned for the neighbouring Dordogne, meaning that the exact origin(s) of this flint variety remains unknown. Is this flint linked to a specific geological facies of the Charente-Maritime or can it be collected anywhere in the northern Aquitaine Basin?

In order to address this issue, we conducted several raw material surveys across the entire northern region of the Aquitaine Basin, with more than three hundred raw material sources being sampled. Archaeological and survey samples were analysed at low to middle-high-powered magnification (up to x 50) based on sedimentary geology and micro-palaeontological data.

Several criteria for distinguishing "grain de mil" flint were identified at mid- to high-powered magnification, demonstrating that sources of this raw material variety are located uniquely in the extreme north-western part of the Aquitaine Basin in Charente-Maritime. In terms of archaeological material, our analysis identified "grain de mil" flint from the Charente-Maritime to have been transported by Upper Palaeolithic groups across the Aquitaine Basin, reaching as far as the Pyrenees. Despite the non-local origin of this raw material and the presence of another very high-quality flint variety in the Bergerac region, 'grain de mil' flint was nevertheless exploited across the entire Aquitaine Basin.

The simultaneous presence of these two high-quality materials in Pyrenean archaeological sites poses interesting questions concerning Upper Palaeolithic raw material provisioning strategies and transport patterns. What factors influence the selection and exploitation of particular raw materials or structure the raw material provisioning territories of prehistoric group? Further refining the sourcing of "grain de mil" flint not only provides new insights concerning these important questions but forces us to rethink previous models.

ORAL

**A2. CHERTS FROM THE AGUA-SALENZ FORMATION: DISTRIBUTION, PETROLOGICAL CHARACTERIZATION AND ITS EXPLOITATION IN THE SOUTHERN PYRENEES DURING THE MAGDALENIAN PERIOD**

*Sánchez de la Torre, Marta (SERP. Universitat de Barcelona)*

*martasanchezdelatorre@ub.edu*

*Mangado Llach, Xavier (SERP. Universitat de Barcelona)*

*mangado@ub.edu*

Defined in the geological literature as a black chert rich in organic skeletal components (Caus et al. 1993, 1997), cherts from the Agua-Salez Formation, and its corresponding to the east, the cherts of the Pardina Formation, appear as nodular cherts within packstone limestones with pithonelles and sponge spicules, that are ascribed to the Conacian period (Upper Cretaceous). These nodular cherts have been located in the area of Sopeira basin and also in the south of the Turbon massif (Huesca, Spain), where several primary and sub-primary outcrops were detected, as well as remains of ancient flint knapping workshops.

These nodular cherts can reach 35 cm long and possess a high knapping aptitude. In order to identify the use of

this chert by the Magdalenian hunter-gatherer settled in the central and eastern part of the Pyrenees and its foothills, a petrological characterisation has been undertaken.

To carry out this study several fieldworks have been conducted, in which the geographical extension of these Formations has been marked off and many samples of cherts have been collected and later analysed according to the archaeopetrological protocol of analysis.

Firstly, a macroscopic approach has been carried out using a stereoscopic microscope OLYMPUS SZ61 (6.7 to 45 increases). Secondly, many thin sections have been prepared at the Thin Section Services of the University of Barcelona and have been analysed with a petrographic microscope OLYMPUS BX41 (40 to 400 increases).

Finally, in order to know the chemical and mineralogical composition of many selected samples, two geochemical techniques of characterization have been applied: the X-ray diffraction (XRD) and the X-ray fluorescence (XRF) at the laboratories of the National Research Centre for Human Evolution (CENIEH) in Burgos.

The characterization of cherts from the Agua-Salenz formation has provided us very useful results for the study of the circulation of lithic materials and mobility patterns during the Magdalenian in the southern slope of the Pyrenees. We are faced to a new territorial marker, whose exploitation by human groups has been attested.

This communication also aims to show the distribution of these cherts from the Agua-Salenz formation in several Magdalenian sites located in the central and eastern part of the southern Pyrenees. These data has enabled us to better know where those groups moved around and how it was their relation with the lithic sources.

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ORAL

### **A3. SILICEOUS RAW MATERIAL MANAGEMENT IN WESTERN PYRENEES: MAGDALENIAN OCCUPATION OF BERROBERRIA (NAVARRRE, SPAIN)**

*Elorrieta Baigorri, Irantzu (Universidad del País Vasco (UPV/EHU) i\_lobai@hotmail.com*

The Western Pyrenees is an area remarkable for its well-known flint outcrops that were exploited as siliceous raw material sources by the prehistoric societies that occupied the place. Berroberria cave (Urdax, Navarre) is located in this part of the Pyrenees and it has a large

Magdalenian stratigraphy. In this work the results of the siliceous raw materials provenance of the collection of the level G are presented. The selected level dates from the Middle Magdalenian (around 14500 cal BC).

Relevant data have been obtained from the archaeopetrologic analysis of the lithic industry. The employed methodology is based on the identification of the textural macroscopic characteristics determining of each flint by stereoscopic microscope. Once they are described, they are compared with the flint samples from the near outcrops in order to confirm its origin. Similarly, the technologic and typological characteristics of the lithic industry are analyzed and later matched up to the information of the siliceous material provenance.

The results are revealing to know how the resource management by the hunter-gatherer societies of Berroberria was. Firstly, the acquisition points of the siliceous sources have been pointed and defined from the characterization of the elements that integrate the industry. The generated map shows the mobility along a territory that reaches a distance of around 160 kilometres from the site to the most distant outcrop.

Secondly, it has been evaluated how the diverse flint varieties detected in the site are managed. The concept of "chaîne opératoire" is taken into account in order to recognize the acquisition, configuration and discard stages of the lithic industries. The Flysch flint is the most used and the one that best shows the technological process, therefore the flint that offers more information.

The raw material provenance studies include information about the availability and supplying potential of the territory, drawing the management and mobility map of the societies that inhabited the environment. The data obtained in this work need to be contrasted with other data of sites of the region. In this way a model of flint exploitation will be obtained for the Western Pyrenees or different patterns limited to smaller areas.

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ORAL

### **A4. COBBLE SELECTION IN THE QUATERNARY TERRACES OF THE SEGRE RIVER: THE CASE OF BLACK QUARTZITES AND N12 ARCHAEOLOGICAL UNIT OF ROCA DELS BOUS (EASTERN PRE-PYRENEES, IBERIA).**

*Roy Sunyer, Miquel (CEPAP-UAB) miquel.roy@uab.cat  
Roda Gilabert, Xavier.javier.roda@uab.cat (CEPAP-UAB)*

*Plasencia Figueroa,*  
*Javier fcojavier.plasencia@e-campus.uab.cat (CEPAP-UAB)*  
*Benito-Calvo, Alfonso (CENIEH) alfonso.benito@cenieh.es*  
*Mora Torcal, Rafael (CEPAP-UAB) rafael.mora@uab.cat*

Studies about the procurement of lithic raw materials are usually based on the study of primary geological outcrops, leaving apart the so called "secondary deposits", formed by the dismantling of preexisting ones. Secondary deposits present varying features not comparable with those of the primary outcrops. For this reason, their study can be very interesting depending on the geographical context.

Recurrent exploitation of this kind of deposits is evident in Roca dels Bous (Eastern Pre-pyrenees). Cobble fragments abound among lithic remains in late Middle Paleolithic archaeological levels. These cobbles were collected in fluvial deposits of Segre river, that drains a vast watershed from the metamorphic Pyrenean axial zone southwards carrying lithologies of different types and ages (Ordovician – Oligocene).

We developed a geoarchaeologic study in which quaternary terraces near Roca dels Bous were systematically sampled. The purpose was to know in detail the availability of raw materials in these deposits. At a later stage, the study of N12 archaeological level of Roca dels Bous (composed by more than 25.000 lithic remains) has shown a strong dominance of a particular lithology: the so called black quartzite, relatively scarce in quaternary terraces according to the results of our surveys.

An interesting and unexpected scenario outlines for a very specific period of the late Middle Paleolithic in which there was an intensive exploitation of terrace quaternary deposits. Such exploitation was clearly selective and was aimed at obtaining a very particular type of rock: the black quartzite.

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ORAL

#### **A5. RAW MATERIAL PROCUREMENT IN THE LATE MIDDLE PALEOLITHIC AND EARLY UPPER PALEOLITHIC AT COVA GRAN (EASTERN PRE-PYRENEES, IBERIA)**

*Roy Sunyer, Miquel (CEPAP-UAB) miquel.roy@uab.cat*  
*Mora Torcal, Rafael (CEPAP-UAB) rafael.mora@uab.cat*  
*Benito-Calvo, Alfonso (CENIEH) alfonso.benito@cenieh.es*

Lithic raw material provenance is an essential aspect to identify settlement and mobility patterns of prehistoric groups. In southern Pre-pyrenees, these patterns are poorly known compared to its adjacent region of the South of France.

Cova Gran de Santa Linya (Lleida, Iberia) has a wide archeo-stratigraphic sequence comprising chronologies ranging from the end of the Middle Paleolithic to the early Upper Paleolithic. It includes a key and controversial period of our evolutionary origins as the Middle/Upper Paleolithic transition (MP/UP).

We present the study of the provenance of lithic raw materials of six archaeological units of Cova Gran: S1B, S1B1, S1C (Middle Paleolithic) and 497A, 497C, 497D (Upper Paleolithic), formed in barely altered sedimentary contexts. This will allow us to trace the changes in raw material procurement patterns between 20.000 and 50.000 Ky, a time period that involves the presence of two different hominid (*H. neanderthalensis* vs *H. sapiens sapiens*). Results provide valuable data to the current circulation models of raw materials and to the debate that characterizes the transition from the Middle Palaeolithic (MP) to the Upper Palaeolithic (UP). While in MP significant amounts of quartzite are detected, the UP levels are characterized by flint as the only rock type. Local flint types are the major raw materials used but regional and long distance mobility markers have been identified.

Features observed in these archaeological units show confined mobility patterns near the settlement along the entire sequence. However significant changes are seen between MP and UP units with the presence/absence of quartzite and the use of regional resources.

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ORAL

#### **A6. LE SITE MOUSTÉRIEN DE LA GROTTTE DU NOISETIER, PYRÉNÉES CENTRALES FRANÇAISES : UN BILAN INTERDISCIPLINAIRE APRÈS DIX ANS DE FOUILLE**

*Mourre, Vincent (INRAP et TRACES - UMR 5608)*  
*vincent.mourre@inrap.fr*  
*Costamagno, Sandrine (CNRS et TRACES - UMR 5608)*  
*costamag@univ-tlse2.fr*  
*Thiébaud, Céline (TRACES - UMR 5608)*  
*celine.thiebaut@wanadoo.fr*  
*Arte, Ana yeroba@gmail.com*  
*Boudadi-Maligne, Myriam (PACEA - IPGQ - UMR 5199)*  
*m.boudadi-maligne@pacea.u-bordeaux1.fr*

*Bruxelles, Laurent (INRAP et TRACES - UMR 5608)*  
*laurent.bruxelles@inrap.fr*  
*Cavanhié, Nadia (TRACES - UMR 5608)*  
*nadia.cava@gmail.com*  
*Chalard, Pierre (Service Régional de l'Archéologie de Midi-Pyrénées et TRACES - UMR 5608)*  
*pierre.chalards-biberson@culture.gouv.fr*  
*Claud, Émilie (INRAP et PACEA - IPGQ - UMR 5199)*  
*emilie.claud@inrap.fr*  
*Colonge, David (INRAP et TRACES - UMR 5608)*  
*david.colonge@wanadoo.fr*  
*Cravinho, Stéphanie (INRAP) cravinho79@hotmail.com*  
*Deschamps, Marianne (TRACES - UMR 5608)*  
*deschamp@univ-tlse2.fr*  
*Jeannet, Marcel (ARPA et UMR 6636 - LAMPEA - MMSH)*  
*m.jeannet.arpa.mf@wanadoo.fr*  
*Laroulandie, Véronique (CNRS et PACEA - IPGQ - UMR 5199)*  
*v.laroulandie@pacea.u-bordeaux1.fr*  
*Mallye, Jean-Baptiste (PACEA - IPGQ - UMR 5199)*  
*jb.mallye@pacea.u-bordeaux1.fr*  
*Maureille, Bruno (CNRS et PACEA - UMR 5199)*  
*b.maureille@pacea.u-bordeaux1.fr*  
*Théry, Isabelle (Cé pam - UMR7264) thery@cepam.cnrs.fr*

La Grotte du Noisetier s'ouvre à 850 m d'altitude dans la vallée d'Aure, sur la commune de Fréchet-Aure (Hautes-Pyrénées, France). La présence de vestiges archéologiques dans cette cavité a été signalée en 1985 et deux campagnes de sondage y ont été menées par M. Allard en 1987 et en 1992-93. La reprise des travaux en 2004 était motivée par le caractère quasiment inédit de ce site, pourtant d'un intérêt majeur pour la compréhension des stratégies d'occupation du territoire et des comportements humains à la fin du Paléolithique moyen.

De nombreux résultats nouveaux ont déjà été obtenus, remettant en cause l'interprétation initiale du site comme une halte de chasse dédiée à l'exploitation des herbivores de montagne. Il a pu être démontré en effet que l'assemblage faunique avait une histoire complexe puisque les restes d'Isard (*Rupicapra pyrenaica*) ont été essentiellement accumulés par les carnivores (*Cuon alpinus*) tandis que le Cerf (*Cervus elaphus*) et le Bouquetin (*Capra pyrenaica*) ont été chassés par les Néandertaliens. L'utilisation de l'os dans la sphère technique est bien documentée, notamment à travers l'emploi de diaphyses osseuses comme retouchoirs sur silex et sur quartzite.

L'industrie lithique est essentiellement réalisée aux dépens de matériaux locaux soigneusement sélectionnés. Les ressources locales sont complétées par une importation ponctuelle de silex depuis différentes sources distantes dessinant un vaste territoire connu ou par-

couru. Les débitages Discoïde et Levallois coexistent et l'outillage moustérien est fortement influencé par les propriétés des matières premières locales. Des variations dans la composition de l'outillage semblent toutefois perceptibles au sein de la séquence (association de biface et hachereau dans un niveau, faciès à outils multi-ravivés par retouches écailleuses scalariformes quinoïdes dans un autre). La présence de quatre dents déciduales humaines complète une image complexe qui renvoie plus à celle d'un site résidentiel qu'à une halte de chasse en montagne.

ORAL

## A7. THE WESTERN ROUTE FROM/TO IBERIA

*Arrizabalaga, Alvaro (Universidad del País Vasco)*  
*alvaro.arrizabalaga@ehu.es*  
*Iriarte-Chiapusso, Maria-José (IKERBASQUE/ Universidad del País Vasco) mariajose.iriarte@ehu.es*  
*Calvo, Aitor (Universidad del País Vasco)*  
*aitorcmg@gmail.com*  
*Domínguez-Ballesteros, Eder (Universidad del País Vasco)*  
*eder.dominguez.ballesteros@gmail.com*  
*García-Ibaibarriaga, Naroa (Universidad del País Vasco)*  
*naroa.garcia.ibaibarriaga@gmail.com*  
*Ochoa, Blanca (Universidad del País Vasco) blanca.ochoa@raile@gmail.com*  
*Ordoño, Javier (Universidad del País Vasco) javier.ordono@ehu.es*  
*Prieto, Alejandro (Universidad del País Vasco) alejandro.prieto@ehu.es*  
*Romero, Antonio (Universidad del País Vasco) romeroalonsoaj@hotmail.es*  
*Villaluenga, Aritza (Monrepos Archaeological Research Centre and Museum for Human Behavioural Evolution) villaluenga@rgzm.de*  
*Tapia, Jesús (Sociedad de Ciencias Aranzadi) jtapia@aranzadi-zientziak.org*  
*Ayerdi, Miren (Universidad del País Vasco) mirenayerdi@gmail.com*  
*Echazarreta, Amaya (Universidad del País Vasco) amayaechazarreta@gmail.com*  
*Hernández-Beloqui, Begoña (Universidad del País Vasco) beg Hernandez@gmail.com*  
*Bradtmöller, Marcel (Universidad del País Vasco) marcel.bradtmoeller@ehu.es*  
*Suárez, Aitziber (Universidad del País Vasco) aitziber\_suarez@hotmail.com*  
*Sarasketa, Izaskun (Universidad del País Vasco) izaskun.sarasketa@gmail.com*



It has traditionally been thought that movement of human groups across the Pyrenees would have been difficult in the Palaeolithic, although there are data contradicting this view. It may even be proposed that a Pyrenean region existed in the Palaeolithic with specific cultural traits and a series of sites, especially in the Magdalenian. The existence of routes across the central parts of the Pyrenees is not incompatible, however, with a preference for the western and eastern routes between the Iberian Peninsula and the rest of Europe. With this hypothesis, we propose to explore the western route for the movement of populations, the one that crosses the Basque Country, through different kinds of record: the location of the archaeological sites themselves, the distribution of lithic raw materials, the technocomplexes, and the similarities and differences in the cultural and subsistence behaviour of the human groups.

## DISCUSSION

### B. THE RESOURCES MANAGEMENT AND THE OCUPATION OF THE PYRENEES DURING THE PLEISTOCENE

#### ORAL

#### **B1. LA GESTION DES MATIÈRES PREMIÈRES À LA GROTTÉ DE GARGAS (HAUTES-PYRÉNÉES, FRANCE) : UNE ÉCONOMIE DE PIÉMONT PYRÉNÉEN AU GRAVETTIIEN**

*Foucher, Pascal (Service régional de l'archéologie - D.R.A.C. Midi-Pyrénées et UMR 5608 - TRACES, Université de Toulouse-Le Mirail) pascal.foucher@culture.gouv.fr*

*San Juan-Foucher, Cristina (Service régional de l'archéologie - D.R.A.C. Midi-Pyrénées et UMR 5608 ? TRACES, Université de Toulouse-Le Mirail) cristina.san-juan@culture.gouv.fr*

*Vercoutère, Carole (Département de Préhistoire du Muséum national d'Histoire naturelle / CNRS - UMR 7194 « Histoire Naturelle de l'Homme Préhistorique ») cvercout@mnhn.fr*

*Ferrier, Catherine (Université de Bordeaux, UMR 5199 PACEA/PPP) c.ferrier@pacea.u-bordeaux1.fr*

*Séronie-Vivien, Marie-Roger (125 avenue d'Eysines, 33110 Le Bouscat, France) rseronie@club-internet.fr*

*Peña (de la), Paloma (School of Geography, Archaeology and Environmental Studies and Evolutionary Studies Institute, University of the Witwatersrand, South Africa) paloma.delapenya@gmail.com*

*Fernandes, Paul (Paléotime et Université de Bordeaux, UMR 5199 PACEA) paul.fernandes@paleotime.fr*

*Servelle, Christian (Service régional de l'archéologie - D.R.A.C. Midi-Pyrénées et UMR 5608 - TRACES, Université de Toulouse-Le Mirail) christian.servelle@culture.gouv.fr*

*Colonge, David (Inrap et UMR 5608 - TRACES, Université de Toulouse-Le Mirail) david.colonge@inrap.fr*

Situé au centre de la chaîne des Pyrénées, le site de Gargas – grotte ornée et habitat – fait l'objet de nouvelles recherches depuis 2004. A partir des études croisées des matières premières utilisées pour les assemblages lithiques, osseux et les parures, ainsi que de l'analyse archéozoologique des vestiges de faune, nous avons obtenu un meilleur aperçu des ressources mobilisées par les groupes gravettiens ayant fréquenté cette grotte entre 28 000 et 25 000 BP. Le cadre économique s'inscrit dans un environnement de piémont, entre moyenne montagne et grandes plaines alluviales (celle de la Garonne et de la Neste) tant dans les ressources vivrières (faune chassée, ramassage des bois de chute des cervidés) que lithiques (quartzites alluviaux, silex du Flysch et des Petites Pyrénées).

Dans ce contexte particulier, nous aborderons les stratégies d'approvisionnement en silex piémontais développées par les Gravettiens, étant donné l'absence de cette matière première aux alentours de la grotte dans un rayon de 25-45 km.

A une échelle régionale, on perçoit toutefois un élargissement des sphères économiques et sociales jusqu'à l'Atlantique et le Périgord, à travers l'origine des supports des parures (coquillages percés) et de certains silex allochtones.

#### ORAL

#### **B2. ADAPTATIVE STRATEGIES OF HUNTER-GATHERER GROUPS IN MONTANE ENVIRONMENTS IN THE UPPER PALAEOLITHIC: COÍMBRE CAVE (ASTURIAS, SPAIN)**

*Alvarez-Alonso, David (UNED) dalvarez@gijon.uned.es*

*Yravedra, José (Universidad Complutense) joyravedra@ghis.ucm.es*

*Arrizabalaga, Avaro (Universidad del País Vasco) alvaro.arrizabalaga@ehu.es*

*Jordá Pardo, Jesús F. (UNED) jjorda@geo.uned.es*

Cueva de Coímbre (Besnes, Peñamellera Alta, Asturias) is located on the south-west side of Mt. Pendendo (532m) in the small valley of the River Besnes, a tributary of the River Cares (Álvarez-Alonso et al., 2009, 2013b). Coímbre (135m asl) is located within the geological region known as Cantabrian Spain, more precisely in the Cuera Region, where it is situated in the front part, very near the bound-

ary with the Picos de Europa Unit (Marquínez, 1988). The cave formed in Lower Carboniferous limestone, on the southern edge of Sierra del Cuera (which reaches an altitude of 1000m in this sector), to the north of the Picos de Europa Central Massif, with altitudes of well over 2000m (Martínez García, 1981). The surroundings of the cave, which is situated in an inland valley but near the modern coast and at a low altitude, can be described as mountainous, with valleys, hills and more rugged peaks with high escarpments, which provide the area with a relatively large variety of ecosystems.

The Cave of Coímbre contains an important archaeological deposit divided into two different areas, in which most of the excavations carried out to date have taken place in Zone B. Coímbre B displays a full and very interesting Magdalenian sequence (with lower, middle and upper Magdalenian levels), in addition to a Gravettian layer. The excavations were performed from 2008 to 2012 (Álvarez-Alonso et al., 2009, 2011, 2013a, 2013b).

The hunter-gatherers who lived in Coímbre in the Upper Palaeolithic made use of several adaptation strategies allowing them to exploit all the abiotic and animal resources the environment afforded them. In this way, the faunal assemblage includes remains of ibex and chamois, associated with the mountains and crags in the immediate surroundings of the site, and also red deer, roe deer, aurochs and horses, indicating the exploitation of the animal resources living in the Besnes valley, at the foot of Sierra del Cuera.

When the faunal remains in the Magdalenian levels, dated between 16.4 and 12.8 ka BP, and those in the Gravettian layer, of about 24 ka BP, are analysed in greater detail, significant differences are identified, which indicates a differential use of the terrain. Thus, in the Gravettian, the preferential hunting of aurochs and red deer suggests the valleys in the vicinity were exploited while steeper and more mountainous areas were visited less. In contrast, in the Magdalenian, the most common faunal remains belong to ibex, which was hunted the most. Together with ibex, chamois is also very common, whereas bovids are found in very small numbers in the Magdalenian levels. These patterns reflect a change in the hunting behaviour of the occupants of the cave, in which the hunting of valley resources was transformed into a more intensive use of animals in more rugged areas, such as ibex and chamois.

ORAL

### **B3. EXPLOITATION DU MILIEU MONTAGNARD PAR LES MAGDALÉNIENS ET LES AZILIENS DES PYRÉNÉES FRANÇAISES : QUE NOUS APPREND LA FAUNE ?**

*Chevallier, Aude (Univ Paris I - UMR 7041 - Equipe Ethnologie préhistorique) aude.chevallier@gmail.com*

*Costamagno, Sandrine (CNRS - UMR 5608) costamag@univ-tlse2.fr*

*Ferrié, Jean-Georges (Archéozoologue contractuel) jgf\_fr@yahoo.fr*

*Kuntz, Delphine (Post-Doctorante, UM 5608 TRACES) kuntz@univ-tlse2.fr*

Cette communication se propose d'interroger la fréquentation du milieu montagnard par les Magdaléniens et les Aziliens des Pyrénées françaises à travers l'exploitation de la faune, à partir de données inédites et bibliographiques. La chronologie de la reconquête des territoires d'altitude sera d'abord abordée à l'aide des nombreuses datations radiocarbone disponibles. Le désenglacement des Pyrénées ne semble pas s'être déroulé au même rythme sur toute la chaîne (Jalut & Turu i Michels, 2009 ; Calvet, et al., 2011 ; Delmas, et al., 2012) et on peut en effet s'attendre à observer des décalages géographiques dans le réinvestissement des différentes vallées. La comparaison des spectres de faune d'occupations situées à différentes altitudes permettra ensuite de caractériser les gibiers recherchés et de mettre en évidence une éventuelle variation dans les espèces exploitées à différents étages altitudinaux. Sur le versant sud des Pyrénées, une certaine complémentarité est évoquée entre les sites de plaine, plutôt orientés vers l'acquisition du cerf, et les sites de hauteur, où le bouquetin est souvent la première espèce chassée (Costamagno & Mateos Cachorro, 2007). On peut alors se demander si le même schéma peut être mis en évidence sur le versant nord de la chaîne. En mobilisant les indices de saisonnalité, on pourra aussi s'interroger sur les modalités de fréquentation du milieu montagnard : était-il parcouru à l'année ou seulement à certaines saisons ? Dans les Alpes italiennes, les sites d'altitude semblent avoir été occupés majoritairement au cours de la belle saison (Broglio, 1992 ; Phoca-Cosmetatou, 2009) et on pourrait s'attendre à ce qu'il en soit de même dans les Pyrénées françaises.

ORAL

**B4. FROM WHERE CAME THE AZILIAN FROM ANDORRA? AN APPROACH TO THE POSSIBLE INFLUENCES IN THE FORMATION OF THE EPIPALEOLITHIC-MESOLITHIC IN THE INNER PYRENEES**

*Martzluff, Michel (Université de Perpignan-UMR 7194) marztzulf@univ-perp.fr*

*Turu, Valenti (Fundacio Marcel Chevalier) igeofundacio@andorra.ad*

*Guilaine, Jean (Institut de France) jguilaine@wanadoo.fr*  
*Remolins Zamora, Gerard (Fundacio Marcel Chevalier) me-nairo@hotmail.com*

The monographic publication of Balma Margineda offers, since 2004, a database wanting fullest possible on "Azilian" industries and "Sauveterriennes" in their stratigraphic and paleo environmental (C. 10-4, Allerød at Boréal) context. The fact that this reference had little influence in the literature syntheses of the Epipaleolithic-Mesolithic of the Ebro Basin and even Aquitaine make it a problem. Thus, industries observed in Andorra are more comparable with Cantabrians sites, central Languedoc or the Alps rather than those from the Pyrenees. The Azilian from Andorra is necessarily linked to its surroundings we were led to point out this specificity.

We propose to pay attention to the study of primary sources and the environmental data (especially for layer C8 containing harpoons) to explain sporadic passages from the south or north in the eastern Pyrenees. The massive use of acid lavas (and rock crystal) are related with a lamellar breakdown of these prismatic materials in layer C8. Quartzite decreasing and lamellae increasing in C8 and C7 confirms a lithologic preference. Although there are veins of lava in Andorra, most of the rhyolite outcrops seems to come Cadi Cerdanya. The results of geomorphic studies conducted in recent years on the glaciated areas of the Pyrenees indicate that the direct passage by passes from the valley of the Ariège was hardly possible during the Bølling - Allerød interval; probable path then would be through Oriège to the Cerdanya plain devoid of the Late Glacial freeze.

Several factors may explain this ambivalence: 1) A cluster analysis disparity that make it difficult to assess the details (type of cutting, microlithism more or less accentuated, use of truncation, etc.). 2) The presence of special tools "à bord abattu" that may related to uses that we don't really know if the traceology technique is not used (backed knives, darts). 3) Pronounced typological variability of the "pointes à bord abattu" in the Azilian of

Andorra within a dominant fusiform group, which makes comparisons with other assemblages from neighboring foothills. 4) In these mountains the typological variability may reflect episodic stations of several groups of hunter-gatherers settled on both sides of the chain. Barely perceptible stratigraphy despite rapid sedimentation, the influx from the basins of the Ebro and Garonne are better identifiable typology, especially compared to known sets of Aquitaine (absence of large Malaurie segments and tips of Andorra).

The sharp increase in the rhyolite at layer C8 indicates more frequent paths through the Cerdanya in Allerød coming from the Ariège. However, certain flint tools from the Azilian industry point more to the Spanish Ebro side".

ORAL

**B5. UPPER PALAEOLITHIC MOBILITY PATTERNS IN THE WESTERN PYRENEES: COST AS A MEANS FOR ANALYZING FLINT PROCUREMENT STRATEGIES THROUGH GEOGRAPHIC INFORMATION SYSTEMS**

*Sánchez, Aitor (Universidad del País Vasco) aitor.sanchezl@ehu.es*

*Domínguez-Ballesteros, Eder (Universidad del País Vasco) eder.dominguez.ballesteros@gmail.es*

*Maite García Rojas - (Universidad del País Vasco) maitensx@gmail.com*

*Prieto, Alejandro (Universidad del País Vasco) alejandro.prieto@ehu.es*

*Calvo, Aitor (Universidad del País Vasco) aitor.calvo@ehu.es*

*Ordoño, Javier (Universidad del País Vasco) javier.ordoño@gmail.com*

Research on mobility patterns of the prehistoric societies in the Western Pyrenees based on the exploitation and distribution of lithic raw materials is actually under review due to three main facts. Firstly, the development of studies concerning the petrological characterization of the different flint types. Secondly, the progressive application of such an approach to the analysis of archaeological lithic assemblages. And, thirdly, the increasing use of mobility models thanks to the analytical tools provided by Geographic Information Systems (GIS).

The present study seeks to include the knowledge derived from the aforementioned approaches to deep on the understanding of the mobility patterns of the Upper Palaeolithic societies. To that end, a general accessibility model to each flint outcrop from the studied area is elaborated, based on the most accurate methods for

calculating cost factor in human movement and on the application of some common Spatial Analyst tools of ArcGIS.

The created model reflects on the map the spatial relation between the main flint procurement sources and the archaeological sites with petrological evidence of their exploitation located to both Pyrenean sides. This is used for: 1) defining the spread dynamics of flint from each source by generating isocost lines; 2) creating a corpus of measures, based on cost units, to provide quantitative data in order to establish and compare any possible journey planning and patterning in the spatial management of raw materials; and 3) identifying least cost paths between each archaeological site and flint outcrops, which could be the main axis of these journeys. A joint analysis and discussion of the results provide a new approach to the mobility and territoriality of the Upper Palaeolithic groups who settled the Western Pyrenees. Furthermore, new clues on the use of the region as a flow area for early human populations are obtained, stressing the idea of a Basque Crossroad as proposed by some scholars in the last decade.

#### DISCUSSION

#### C. THE RESOURCES MANAGEMENT AND THE OCCUPATION OF THE PYRENEES DURING THE HOLOCENE

ORAL

### C1. LES OCCUPATIONS HUMAINES DANS LA GROTTTE DES ERMITONS (MASSIF DE L'ALTA GARROTXA, PYRÉNÉES MÉDITERRANÉENS) AU LONG DE LA PRÉHISTOIRE

Maroto, Julià (Universitat de Girona) [julia.maroto@udg.edu](mailto:julia.maroto@udg.edu)  
Ortega, David (Institut Milà i Fontanals (CSIC) [ortega@imf.csic.es](mailto:ortega@imf.csic.es)

Albizuri, Silvia (Universitat Politècnica de Catalunya) [silvia.albizuri@upc.edu](mailto:silvia.albizuri@upc.edu)

Allué, Ethel (Institut Català de Paleoecologia Humana i Evolució Social (IPHES) [eallue@iphes.cat](mailto:eallue@iphes.cat)

Ramió, Sònia (Parc de les Coves Prehistòriques de Serinyà) [promocioeconomica@plaestany.cat](mailto:promocioeconomica@plaestany.cat)

Rivals, Florent (Institut Català de Paleoecologia Humana i Evolució Social (IPHES) [frivals@iphes.cat](mailto:frivals@iphes.cat)

Solés, Alba (Atzagaia SL) [albasic.labisbal@gmail.com](mailto:albasic.labisbal@gmail.com)

La grotte des Ermitons (Sales de Llierca, nord-est de la Péninsule Ibérique) se trouve à l'intérieur du massif calcaire de l'Alta Garrotxa, dans les Pyrénées Méditerranéens. Elle

est dans un milieu extrêmement abrupt et son accès est à partir de la Vallée du fleuve Llierca.

Malgré son difficile accès, d'une partie, et malgré être un site archéologique modeste, qu'au même temps présente des problèmes de résédimentation, la grotte des Ermitons nous montre des occupations humaines pendant quatre périodes différentes: Paléolithique moyen de l'ISO 5, Paléolithique moyen récent, Néolithique moyen et Bronze final.

On présente l'analyse des aspects économiques, paléoenvironnementales et culturels de ces occupations, avec des contrastes entre eux. Les néandertaliens du Paléolithique moyen auraient profité la grotte comme hôte de chasse du bouquetin et la diversité des matières premières du milieu pour la fabrication de ses utiles, au même temps qu'ils convièrent avec les grands carnivores. Les berges et les agriculteurs de la Préhistoire récente, qui auraient ses habitats dans les zones adjacentes au massif, utiliseraient les grottes du son intérieur pour le stockage des graines.

ORAL

### C2. CULTURAL EVIDENCES OF THE MESOLITHIC BEHAVIOUR IN THE PYRENEAN NORTH AND SOUTH FACES: CONVERGENCES AND DIVERGENCES

Alday Ruiz, Alfonso (Universidad del País Vasco) [a.alday@ehu.es](mailto:a.alday@ehu.es)

Domingo Martínez, Rafael (Universidad de Zaragoza) [rdomingo@unizar.es](mailto:rdomingo@unizar.es)

Fullola Pericot, Josep Maria (Universidad de Barcelona) [fullola@ub.edu](mailto:fullola@ub.edu)

Mangado Llach, Javier (Universidad de Barcelona) [mangado@ub.edu](mailto:mangado@ub.edu)

Montes Ramírez, Lourdes (Universidad Zaragoza) [Imontes@unizar.es](mailto:Imontes@unizar.es)

Petit Mendizábal, M.<sup>a</sup> Àngels (Universidad de Barcelona) [petit@ub.edu](mailto:petit@ub.edu)

Soto Sebastián, Adriana (Universidad del País Vasco) [kura-jadri@yahoo.es](mailto:kura-jadri@yahoo.es)

Valdeyron, Nicolas (Université de Toulouse II-le Mirail) [valdeyro@univ-tlse2.fr](mailto:valdeyro@univ-tlse2.fr)

Historiographical traditions have considered both Pyrenean versants as two independent areas, with the exception of the Pyrenean Culture, that L. Pericot proposed to explain the megalithic phenomenon in this territory. However, north-south connections were actually common throughout the prehistoric times. The Pyrenees are

a territory where ideas and products can be shared, but also, due to their geomorphological features, both versants develop their own entities.

In this sense, some French and Spanish research teams are responsible of intense fieldworks dealing with the Mesolithic (*sensu lato*). They evidence for this period a dense population of the region and fluent exchanges. Hunter-gatherer groups were well established in both sides of the Pyrenean range and developed consecutive cultural solutions: Microlaminar Mesolithic/Sauveterrian; Notches and Denticulates Mesolithic; Geometric Mesolithic. These phases shared points in common, but kept their own personalities across the concerned regions.

This study intends to offer a common approach to the disposable information, harmonising data to offer a proposal that should be global, synthetic and fluent. The wide series of radio-chronological dates will evidence the rhythms of the cultural developments; the lithic raw material and specific tool-types will show not only the personality of the communities but also the borrowings among them; the description of the activities carried out by the human groups, the game management and the geographical disposition will define the concept of territoriality and will allow us to evaluate whether the populations were becoming sedentary.

Therefore, our main aim is to build an inclusive discourse that could explain the common actions and dynamics of the last hunters-gatherers that dwelled in the Pyrenean counterforts, without disdaining the particular processes.

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ORAL

### **C3. LITHIC PRODUCTION AND USE AMONG THE LAST HUNTER-GATHERERS OF THE UPPER EBRO VALLEY: THE CASE OF LEVEL IIIB2 OF ATXOSTE (VÍRGALA MAYOR, BASQUE COUNTRY).**

*Perales Barrón, Unai* (Universidad del País Vasco) [perales.unai@gmail.com](mailto:perales.unai@gmail.com)

*Soto Sebastián, Adriana* (Universidad del País Vasco) [aso.to.sebastian@yahoo.es](mailto:aso.to.sebastian@yahoo.es)

*Alday Ruíz, Alfonso* (Universidad del País Vasco) [a.alday@ehu.es](mailto:a.alday@ehu.es)

In this work we present a comprehensive study on the lithic industries as a means of approaching to the socio-economic systems of the last hunter-gatherers groups from the VIII-VII millennia BP in Atxoste settlement.

Complementing the data coming from raw material, technological and use-wear analysis, we have recognized the main patterns of production and management of flint industries.

The results show a strong interrelationship between manufacture and use strategies of the lithic tools and permit us to throw some light on the sense of occupations and also on the understanding the role of the settlement in the human groups subsistence. While it is true that Atxoste may act as a strategic enclave, the new data coming from our researches reveal that the occupations would have been longer than expected for a rock-shelter, making us reconsider the strategies of land occupation of these Mesolithic communities.

The combination of three disciplines (raw material, technological and use-wear analysis) has proved to be a powerful tool not only for understanding the lithic tools management, but also the behaviours and organization patterns of prehistoric societies.

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ORAL

### **C4. FROM NATURAL ENVIRONMENTS TO SOCIAL LANDSCAPES. HUMAN OCCUPATIONS IN THE HIGH MOUNTAIN AREAS OF THE CENTRAL PYRENEES SINCE MESOLITHIC**

*Gassiot Ballbe, Ermengol* - (Universitat Auonoma de Barcelona) [ermengol.gassiot@uab.cat](mailto:ermengol.gassiot@uab.cat)

*Clemente-Conte, Ignacio* - (IMF-CSIC) [ignacio@imf.csic.es](mailto:ignacio@imf.csic.es)

*García Casas, David* - (Universitat Auonoma de Barcelona) [david.garc83@gmail.com](mailto:david.garc83@gmail.com)

*Mazzucco, Niccolò* - (IMF-CSIC) [nicco.mazzucco@gmail.com](mailto:nicco.mazzucco@gmail.com)

*Obea Comes, Laura* - (Universitat Auonoma de Barcelona) [laura.obea87@gmail.com](mailto:laura.obea87@gmail.com)

*Rodríguez Antón, David* - (IMF-CSIC) [david.anton79@gmail.com](mailto:david.anton79@gmail.com)

Current research in the high mountain environments is challenging the traditional perceptions that from archaeology have been proposed during the last century. Indeed, the Pyrenees had been object only of partial and discontinues researches. Despite that, has been often claimed that the Pyrenees have represented a path or connection bridge between the predominant chronological models. Intensive surveys and open-air excavations in the Southern Central Pyrenees, over the last 14 years, revealed the existence of an extensive archaeological record, with hundreds of settlements and others types of archaeological vestiges. In the National Park

of Aigüestortes i Estany de Sant Maurici, where surveys and excavations have been carried out between 1.600 and 2.900 m.a.s.l., almost 350 new sites have been documented. This sequence covers the entire Holocene period, among which a Mesolithic occupation of the alpine altitudes; an early Neolithic use of the valleys bottom around 2.000 m.a.s.l. and, later, a new phase of occupation at higher altitudes after ca. 5300 calBP. The combination of such archaeological dataset with paleoenvironmental proxies has improved our reconstruction. As result, we are able to outline an innovative scenario for of the prehistoric colonization, occupation and exploitation of the high mountain areas of Central Pyrenees.

ORAL

### **C5. FROM THE PLAINS TO THE HIGHEST PEAKS: PRODUCTIVE ACTIVITIES IN THREE EARLY NEOLITHIC SITES IN THE CENTRAL PYRENEES**

*Mazzucco, Niccolò (IMF-CSIC) niccomazzucco@imf.csic.es*  
*Gassiot Ballbè, Ermengol (UAB) ermengol.gassiot@uab.cat*  
*Clemente-Conte, Ignacio (IMF-CSIC) ignacio@imf.csic.es*

The aim of this work is to advance a reconstruction of the productive activities that were carried out with the lithic tools recovered in three Early Neolithic sites (VI-V millennium calBC) located at different altitudes (1300-1800 m.a.s.l.) in the Central Spanish Pyrenees, between the Cinca and Noguera Ribagorçana rivers. The study of the archaeological materials was based on an integrated approach that considers lithic resources as a part of an overall process of production; analyses have been made integrating different disciplines: provenance, technological and traceological analysis. Both local (1-10 km of distance) and exogenous (30-150 km) raw-materials have been identified, each one transformed and used on the basis of its technical proprieties and its accessibility. The traceological analysis evidenced the existence of diverse economic processes, both primary - associated to the main productive cycles - and secondary - scarcely structured, result of occasional or punctual activities. Our data contributed to the interpretation and the understanding of the analysed sites and of their functionality.

ORAL

### **C6. EXOKARSTIC SEDIMENTARY RECORD AS PALEOENVIRONMENTAL AND HUMAN IMPACT INDICATORS DURING THE BEGINNING OF THE NEO-**

### **LITHIC IN THE PYRENEES: THE ELS TROCS CAVE (ABELLA, HUESCA)**

*Eneko Iriarte (Laboratorio de Evolución Humana, Departamento de Ciencias Históricas y Geografía, Universidad de Burgos, Burgos, Spain) eiriarte@ubu.es*

*Uribe, Naiara (Laboratorio de Evolución Humana, Departamento de Ciencias Históricas y Geografía, Universidad de Burgos, Burgos, Spain) naiarauriablanco@gmail.com*

*Arriolabengoa, Martín (Departamento de Mineralogía y Petrología, UPV/EHU Universidad del País Vasco, Leioa, Spain) marriolabengoa@hotmail.com*

*Rojo-Guerra, Manuel (Departamento de Prehistoria, Universidad de Valladolid, Valladolid, Spain) marojo@fyl.uva.es*

*Royo, José Ignacio (Dirección General de Patrimonio Cultural, Gobierno de Aragón, Zaragoza, Spain) nacho.royo57@gmail.com*

*Tejedor, Cristina (Fundación del Patrimonio Histórico de Castilla y León Arcadia, Valladolid, Spain) tejedor.cristina@gmail.com*

*Garrido, Rafael (Departamento de Prehistoria y Arqueología, Universidad Autónoma de Madrid, Madrid, Spain) rafael.garrido@uam.es*

*García, Iñigo (Área de Prehistoria, U.P.V./E.H.U.-Laboratoire TRACES UMR5608 Université de Toulouse Le Mirail 2, Toulouse, Francia) igmtzl@gmail.com*

*Acusa, Héctor (C/ Zaragoza 91113, Esc. 3, 2\_C, La Muela, Zaragoza, Spain) hectorarcusa@gmail.com*

*Lancelotti, Carla (Complexity and Socio-Ecological Dynamics, IMF-CSIC, Barcelona, Spain) carla.lancelotti@imf.csic.es*

*Balbo, Andrea L. (Complexity and Socio-Ecological Dynamics, IMF-CSIC, Barcelona, Spain) balbo@imf.csic.es*

*Pérez Jordá, Guillem (Instituto de Historia-CSIC, Madrid, Spain) guillem.perez@uv.es*

*Peña-Chocarro, Leonor (Instituto de Historia-CSIC, Madrid, Spain) leonor.chocarro@csic.it*

This work addresses the geoarchaeological study (stratigraphy, sedimentology, radiocarbon dating and XRF geochemistry) of exokarstic sediments from a doline near the Neolithic archaeological site called Els Trocs Cave (Abella, Huesca), located in high altitude mountain area of the Central Pyrenees (1564 m asl). We detect and characterize palaeoenvironmental change and human impact proxies in the area for the Neolithic. The results obtained point to the occurrence of Neolithic anthropic deforestation events and subsequent soil erosion/sedimentation phases in order to get pasture areas.

We study a 190 cm long sedimentary record from a doline nearby the Els Trocs cave from 2 cores obtained in 2010. The research includes: sedimentological study (stratigraphy and sedimentary facies description), high-

resolution geochemical analysis (XRF core scanner), statistical multivariate analysis (PCA), mineralogical analysis by X-ray diffraction (XRD), particle size analysis and the radiocarbon dating by AMS.

The Age-Depth model of the sedimentary core was obtained from 5 radiocarbon dates using the R-CLAM software. The obtained ages comprise the last ca. 8000 years.

Three sedimentary facies were observed corresponding to 1) charcoal rich red clays, 2) clastic red clays and 3) organic matter rich red clays. The recovered sedimentary record was divided in 2 main stratigraphic units. In the basal Unit 1 alternating facies 1 and 2 subdivide the unit in 5 lithostratigraphic subunits. The Unit 2 is homogeneous and is uniformly constituted by the facies 3 with an increasing organic content towards the top.

The geochemical analysis of the sediments was undertaken using an Avaatech XRF core scanner. 28 chemical elements were measured: Al, Si, P, S, Cl, Ar, K, Ca, Ti, V, Cr, Mn, Fe, Rh, Ag, Ni, Cu, Zn, Ga, Ge, As, Br, Rb, Sr, Y, Zr, Nb and U. A multivariate statistical analysis, Principal Component Analysis, was applied to the XRF results. Seven main components were extracted and explain the main variations in organic matter content, charcoal content, edaphization processes or allochthonous sediment input in the studied record.

The sedimentological, geochronological and geochemical study of an exokarstic sedimentary sequence cored in a doline nearby the Neolithic archaeological site of Els Trocs points to the existence of deforestation events (charcoal-rich facies) between 7500-7300 yr cal BP, coinciding with the Neolithic occupation of the cave. The deforestation is interpreted to be anthropic in order to get high mountain pasture areas for ovine cattle during spring and summer.

In addition to deforestation, subsequent soil erosion and increasing sedimentary rates in the surrounding exokarstic dolines are detected.

The combined study of the Els Trocs archaeological site and the exokarstic sedimentary record has enabled the detection and characterization of palaeoenvironmental changes due to the human impact during the beginning of the Neolithic in the high altitude mountain area of the Central Pyrenees.

ORAL

### **C7. TIERRA BUCHO (HUESCA, SPAIN). DOMESTIC SPATIAL ANALYSIS AND TERRITORIAL FUNCTIONALITY OF A PREHISTORIC COMMUNITY IN THE PRE-PYRENEAN RANGES.**

*Montes Ramírez, Lourdes (Universidad Zaragoza) lmontes@unizar.es*

*Bea, Martínez Manuel (Scanner, Patrimonio e Industria) manubea@unizar.es*

*Domingo Martínez, Rafael (Universidad Zaragoza) rdomingo@unizar.es*

*Sánchez Cebrián, Pilar (Universidad Zaragoza) pilarsance@gmail.com*

*Sebastián López, María (Universidad Zaragoza) msebas@unizar.es*

The Upper basin of the Vero forms a small valley surrounded by mountains up to 1500 m in the central area of the province of Huesca. During the Late Neolithic and the Chalcolithic its 25 km<sup>2</sup> territory hosted a detached ensemble of archaeological sites that indicate an intense exploitation: two occupational caves (Drólica and Carasca) or sepulchral (Cristales), three dolmens (Capilleta, Caseta de las Balanzas and Pueyoril) and even two schematic rock-art shelters (Peña-Miel I and II) can be related to this phase. A coherent series of more than ten radiometric dates help us to frame a dense human occupation of this territory for several centuries between 3100 and 2500 cal BC.

Then, and even nowadays, the agricultural economy seems to be based on sheepherding and farming, which is seriously limited due to the poor environmental conditions, both climatic and orographic. The altitudes in the lower zones are around 850 m, and the two main chalcolithic caves, Drólica and Cristales, are at 1200 m. Currently, the landscape is covered by a scarce Mediterranean-type vegetation, adapted to a hard climate with a precipitation index up to 900 mm per year, but severe temperatures. The abrupt landscape of the surrounding areas, where the rivers Vero and Cinca force their pass south through narrow canyons, makes this basin a clear corridor to communicate the smoother region of the Somontano with the Pyrenean valleys. This condition is also well documented for the Middle Ages, when a dense grid of fortifications and watch-towers were built in order to secure the territory.

In this sense, our spatial research is focused on two vectors: the relationships between these sites, with special attention to their catchment territories and their visual

domains, in order to recognize the landscape exploitation patterns; and the inner management of the domestic spaces, based on the spatial distribution of the archaeological remains in the settlements.

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ORAL

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**C8. SAN ADRIAN: A NEW SITE FOR THE STUDY OF THE BRONZE AGE IN NORTHERN IBERIA**

*Tapia, Jesus (Sociedad de Ciencias Aranzadi) jtapia@aranzadi-zientziak.org*

*Cubas, Miriam (Instituto Internacional de Investigaciones Prehistóricas de Cantabria/Sociedad de Ciencias Aranzadi) mcubas@aranzadi-zientziak.org*

*Ceberio, Manuel (Sociedad de Ciencias Aranzadi) mzeberio@aranzadi-zientziak.org*

*Moraza, Alfredo (Sociedad de Ciencias Aranzadi) amoraza@aranzadi-zientziak.org*

*Agirre-Mauleon, Juantxo (Sociedad de Ciencias Aranzadi) zuzendaritza@aranzadi-zientziak.org*

*Alonso, Euken (3DTS) euken@dts.eu*

*Álvarez-Fernández, Esteban (Universidad de Salamanca) estebanalf@hotmail.com*

*Aranburu, Arantza (Sociedad de Ciencias Aranzadi/Universidad del País Vasco-Euskal Herriko Unibertsitatea) arantza.aranburu@ehu.es*

*Areso, Pablo (Sociedad de Ciencias Aranzadi) sedimentologia@aranzadi-zientziak.org*

*Armendariz, Angel (Instituto Internacional de Investigaciones Prehistóricas de Cantabria/Sociedad de Ciencias Aranzadi) angel.armendariz@unican.es*

*Castaños, Jone (Universidad del País Vasco/Euskal Herriko Unibertsitatea) jcastanosdlf@yahoo.es*

*Castanos, Pedro (Sociedad de Ciencias Aranzadi) pedro-castanos@yahoo.es*

*Etxeberria, Francisco (Sociedad de Ciencias Aranzadi/Universidad del País Vasco-Euskal Herriko Unibertsitatea) paco.etxeberria@ehu.es*

*Garmendia, Joseba (Sociedad de Ciencias Aranzadi) jgarmendia@aranzadi-zientziak.org*

*Herrasti, Lourdes (Sociedad de Ciencias Aranzadi) lourdes.herrasti@gmail.com*

*Iriarte, Maria José (Ikerbasque-Basque Foundation for Science/Universidad del País Vasco-Euskal Herriko Unibertsitatea) mariajose.iriarte@ehu.es*

*Pérez, Daniel (Sociedad de Ciencias Aranzadi) dperez@aranzadi-zientziak.org*

*Ana Uriz, (Sociedad de Ciencias Aranzadi) sedimentologia@aranzadi-zientziak.org*

*Zapata, Lydia (Universidad del País Vasco/Euskal Herriko Unibertsitatea) lydia.zapata@ehu.es*

Bronze Age studies carried out in the Cantabrian Region have traditionally focused on prestige goods and funerary contexts. As a result of this, the lack of information about daily activities, subsistence strategies, and human settlement on a regional scale was evident in the state of art. However, current research has achieved new discoveries in recent years, allowing a reconstruction of some aspects of the economic structure, settlements, material culture and the palaeoenvironment during the Bronze Age. Indeed, besides the funerary practices discovered in 1983 in San Adrian (Parztuergo Nagusia, Gipuzkoa), research has now revealed the presence of Upper Palaeolithic and Early Bronze Age occupations.

This paper presents a first characterization of the retrieved evidence and a preliminary evaluation of the archaeological site and its environment. San Adrian is a tunnel-shaped cave located at 1,000 meters a.s.l. in the Aizkorri mountain range, opening a passage beneath the Atlantic-Mediterranean watershed in northern Iberia. The strategic character of this mountain site is demonstrated by the presence of Upper Palaeolithic and Bronze Age occupations, and by the construction of a road passing through it and the fortification of both its entrances in the Middle Ages.

The aim of the archaeological survey started in 2008 was to identify, describe and evaluate the heritage potential of the cave, because previous fieldwork had only managed to make surface finds in the side galleries, including a medieval hoard and Bronze Age human remains. The work carried out by the research group at San Adrian includes a series of test pits and the excavation of an area nine square metres in size following stratigraphic criteria. In the current state, we identified at least two contexts corresponding to Late Upper Palaeolithic and Bronze Age occupations in the cave.

Fieldwork included the sieving and flotation of sediment and the collection of samples for different types of analysis: palynology, carpology, sedimentology, and radiocarbon dating. The evidence is being studied by a multidisciplinary team according to expertise requirements for each topic: palaeobotany and environment, archaeozoology, sedimentology, geology, physical anthropology, prehistoric industries (lithics, pottery and bone) and archaeological and historical documentation.

Because of its recent discovery, Upper Palaeolithic evidence remains still under study, but first results on Bronze Age layers can be presented. The ongoing archaeobotanical and archaeozoological studies reveal the exploitation of domestic plants and fauna complemented by



hunting and foraging of wild species. At the same time, the archaeological artefacts and their production sequences show the exploitation of nearby resources on both sides of the mountain range, while prestige goods are absent. This evidence is also used to estimate the regularity of cave occupations and to propose a model of seasonal exploitation of the mountain environment. The results obtained reveal the exploitation of resources from both the Mediterranean and Atlantic basins, and contribute towards an understanding of the daily activities of Bronze Age societies. In addition, the evidence shows the exchange and circulation of quotidian products between the Cantabrian region and inland Iberia in other networks than those of prestige goods.

# A7b Emergence and consequences of technical innovations in America

Commission on American Settlements during Prehistory

(Organisers: Boëda, Lourdeau Antoine, Franco Nora, Viana Sibeli, Carlos Aschero)

Tuesday 2nd (9:00 to 13:30)  
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ORAL CONTRIBUTIONS

ORAL

### 1. NORTH AMERICAN SOLUTREAN CONNECTIONS: A PERSPECTIVE FROM BERINGIA

*Dixon, E. James (Director, Maxwell Museum of Anthropology) [jdixon@unm.edu](mailto:jdixon@unm.edu)*

Archeological and genetic data from northern Eurasia and North America indicate the first New World colonists migrated from northeast Asia during the late Pleistocene. Lithic technological analysis suggests that northern Eurasian Solutrean-like technology may have provided the technological foundation for subsequent North American lithic industries. This early migration may have first occurred along the southern coasts of eastern Beringia and southward along the coasts of the Americas. Early Solutrean-like technology subsequently developed into at least two distinct North American technological traditions: 1) the Western Stemmed Point tradition, and 2) the Clovis complex. This hypothesis suggests that technological similarities between early North American Paleoindian technological traditions and European Solutrean industries may be explained by a common relationship to a larger Eurasian technological tradition that subsequently developed distinct New and Old World technological adaptations.

ORAL

### 2. CHANGES AND CONTINUITIES IN THE LITHIC ARCHAEOLOGICAL RECORD OF THE UPPER SANTA CRUZ RIVER BASIN (PATAGONIA, ARGENTINA) BETWEEN THE MIDDLE AND LATE HOLOCENE

*Franco, Nora Viviana (CONICET - Universidad de Buenos Aires) [nvfranco2008@gmail.com](mailto:nvfranco2008@gmail.com)*

*Vetrisano, Lucas [lucasvetri@yahoo.com.ar](mailto:lucasvetri@yahoo.com.ar) (Universidad de Buenos Aires)*

The Santa Cruz river originates in the Andean mountains and has its mouth in the Atlantic Ocean. Human circulation is limited to the west, where the southern Ice Field is located. The area comprises lowlands and highlands with *Nothofagus* forest to the west and steppe to the east. The highlands have passes which allow human movement to the Pacific coast. The climate is wet to the west and more arid to the east. Paleoclimatic studies have shown the existence of more arid and wetter periods in the past. There is also evidence of rock fall-off

and ashes coming from volcanic eruptions, which would have affected human life.

The first evidence of human utilization of the upper Santa Cruz river basin dates to the early Holocene, and comes from Chorrillo Malo 2 rock shelter, located south of it. The use of the area seems to have been discontinuous until ca. 4,300 <sup>14</sup>C yr BP when, according to technological and raw material information, both lowlands and highlands have been integrated within the home range of the same cultural group. Between ca. 3,800 and 3,600 <sup>14</sup>C yr BP, the same cultural group buried their dead at the same rock shelter. A similar kind of burials was identified at similar ages at spaces located between 150 and 250 km to the south, supporting the idea of regular social ties between human groups using these spaces.

The purpose of this paper is to analyze the existence of technological continuities and changes in the lithic archaeological record recovered from two rock shelters (Chorrillo Malo 2 and Río Bote 1) located in the lowlands, south of the Santa Cruz river basin. There is a distance of ca. 60 km between the two sites.

Here we will concentrate on strata dated between ca. 6000 to 2800 <sup>14</sup>C yr BP. Analysis will focus on cores, flakes and tools which can provide information on the technology involved. Raw material availability will be taken into account in order to understand lithic variability during this time period.

Although the two sites could have had different through time, in both of them Levallois technology was identified between ca. 4,300 and 3,600 <sup>14</sup>C yr BP. This technology is also present at the Pacific slope of the highlands by ca. 4,500 <sup>14</sup>C yr BP. Previous deposits show the presence of blades, although no evidence of core preparation has been recovered until the moment.

Results obtained are useful to understand the process of incorporation of a new technology -which implies additional effort and time in core preparation- into the area and the integration of these spaces within the home range of a single cultural group.

ORAL

### 3. MINIATURE PROJECTILE POINTS IN THE LATE PLEISTOCENE/EARLY HOLOCENE

*Flegenheimer, Nora - (CONICET-AyA) [norafleg@gmail.com](mailto:norafleg@gmail.com)*

*Mazzia, Natalia - (CONICET-AyA) [natymazzia@yahoo.com.ar](mailto:natymazzia@yahoo.com.ar)*

Weitzel, Celeste - (CONICET-AyA) [celweitzel@gmail.com](mailto:celweitzel@gmail.com)

In spite of their reduced size, miniatures always call for special attention in archaeological contexts. Miniature projectile points have been described both in North and South American early peopling literature and are explained as toys, practice pieces or ceremonial objects. In the southern cone they were part of the tool repertoire corresponding to an early technology which lasted few millennia spanning the Pleistocene /Holocene transition.

In this presentation, the focus is on the significance of miniature points found at Cerro El Sombrero Cima (Buenos Aires province, Argentina), an early site in the Argentine pampas. Information from both objects and space has led to propose that the hilltop was a look-out with control of the surroundings and a place chosen for refurbishing weapons and discarding tools broken elsewhere. Small projectile points are represented by six specimens, five are fishtail projectile points (FTPP) and the sixth is a non described stemmed type, here referred to as ESP. They are found both during surface collection and excavation associated to the full sized points recovered at the site.

All miniature points are complete specimens which is an exceptional trait in the assemblage mostly composed of broken tools. Raw material employed to manufacture these miniature points is the same used for the full sized specimens. Also, all miniatures have a low labor investment, some show minimum retouch on the blades while others were only marginally shaped. No attention has been paid to represent the three dimensional aspect of these objects. This simple manufacture has been effective in producing points which exhibit an outline clearly recognized as the type represented. Yet, technical traits of full sized points show a variable complexity and on occasions include complete bifacial reduction and fluting. Thus these small points are clearly different from their full sized counterparts in technology. Also, life history of miniatures and full sized points discarded at the site are different, while the former possibly were made at the same place where they were used and discarded, the full sized points were used elsewhere. Also fatty acids and sterols analyses have revealed contrasting results for both groups of artifacts.

Miniature points in use among Late Pleistocene/Early Holocene hunter gatherer societies are an interesting case to reflect about people materializing abstractions, encoding visual communication, and developing special practices related to particular places. Miniaturizing

reduces detail and demands selection. It is our proposal that in these miniatures the outline has been selected as the significant trait probably encoding social meanings. We propose that in this particular case, design not technique was the most significant trait represented. Finally, the role of these miniatures among early pampean hunter gatherers will be addressed.

ORAL

#### 4. CAZADORES EN MOVIMIENTO Y SUS RASTROS EN ANTOFAGASTA DE LA SIERRA DURANTE EL HOLOCENO MEDIO INICIAL (PUNA MERIDIONAL DE ARGENTINA)

*Martínez, Jorge G. (Instituto Superior de Estudios Sociales-CONICET/Instituto de Arqueología y Museo-Universidad Nacional de Tucumán. Argentina) [jormartin1969@yahoo.com.ar](mailto:jormartin1969@yahoo.com.ar)*

*Pintar, Elizabeth L. (Austin Community College, Austin, Texas (USA) [lizziepintar@gmail.com](mailto:lizziepintar@gmail.com)*

Diversas evidencias arqueológicas del noroeste de Argentina, confirman que la caza de animales fue la principal actividad de subsistencia. Tempranas ocupaciones humanas en la Puna septentrional se remontan hacia fines del Pleistoceno ca.11,000 años (Aguerre *et al.* 1973; Aschero 1979, 1984; Hernández Llosas 2000).

Para la Puna meridional argentina, las evidencias arqueológicas más tempranas provienen del sitio Peñas de la Trampas 1.1 (3582 msnm) con dataciones entre ca.10,190-10,030 AP (Martínez 2013). Análisis zooarqueológicos permiten definir que la interacción hombre-fauna queda definida por la caza sistemática de camélidos silvestres: vicuña (*Vicugna vicugna*) y guanaco (*Lama guanicoe*)(Elkin 1996).

Como objetivo principal se evalúa la variabilidad en los diseños y materias primas de puntas de proyectil líticas, y de los sistemas de armas asociados dentro del lapso ca.8000-6000 AP en la microrregión de Antofagasta de la Sierra (Puna meridional de Argentina).

El abordaje se basó en el estudio comparativo de caracteres tecno-tipológicos (*sensu* Aschero 1975, 1983) referidos al diseño de puntas recuperadas en estratigrafía en los sitios Cueva Salamanca 1, Peñas de la Cruz 1 y Quebrada Seca 3, para el Holoceno medio inicial, lapso de transición paleoambiental hacia un período hiper-árido a escala macroregional (ca.6500-3500 AP). Este fue el punto de partida para poder establecer los sistemas de

armas asociados, y en base a ello, las técnicas de caza en las que fueron empleados.

La recuperación de otros componentes de los sistemas de armas, como fragmentos de astiles, intermediarios y gancho de propulsor, nos permitió definir con mayor certeza el uso simultáneo de propulsor de gancho y lanza arrojadiza para el lapso bajo estudio. De este modo nos aproximamos a la dinámica en el uso sincrónico de distintos espacios y sistemas de armas, orientados a la caza de camélidos.

Se identificaron distintos tipos morfológicos (*sensu* Aschero 1988) de puntas de proyectil, y sumado al interjuego registrado en cuanto al uso diferencial de materias primas líticas locales vs. alóctonas, pudo distinguirse un esquema de micro y otro de macromovilidad en torno al uso de distintos sistemas de armas, "cotos" de caza y al aprovisionamiento de recursos líticos. En cuanto a este tópico, análisis de Fluorescencia de RX sobre artefactos y desechos de talla de obsidiana, permitieron identificar cinco fuentes de procedencia. El rango de distancias varía entre 40 y 120 km a los sitios bajo análisis, lo cual denota una amplitud importante en las redes de circulación/interacción de gente y materias primas, conectando diferentes sectores dentro de la Puna meridional de Argentina.

La información surgida a partir del análisis integral realizado, nos permite plantear que en relación a otros grupos de artefactos, las puntas de proyectil son muy buenos indicadores de movilidad y trayectorias espaciales de su uso, permitiendo "rastrear" hasta sus contextos de producción, uso y descarte. En una escala regional, diseños y materias primas de puntas de proyectil permiten definir cierta circunscripción territorial para el lapso 8000-6000 AP, donde los registros de cazadores-recolectores de Puna norte y Puna sur no presentan evidencias de interacción.

ORAL

## 5. LOWLANDS HUNTERS TECHNOLOGY: THE CASE OF LITHIC PROJECTIL POINTS

*López Mazz, José (Dpto. Arqueología. FHCE/Universidad de la República, Uruguay) lopezmazz@yahoo.com.ar*

*Marozzi, Oscar (CURE/Rocha/Universidad de la República) oscar.marozzi@lappu.edu.uy*

*Aguirrezábal, Diego (CURE/Rocha/Universidad de la República) diego.aguirrezabal@gmail.com*

Au long of 25 years of field works, scholar team recovered 100 projectile points, from San Miguel Hills, trough

extended marches of San Miguel, Las Maravillas, Los Indios and Laguna Negra, still Atlantic coast of Cabo Polonio. The material are in very different state of conservation, and came from domestic settlement, cemeteries and hunt camps.

The sample was produced in a controlled archaeological task. Most of them are located in a very detailed stratigraphic and archaeological record, associated with radiocarbon dates. The sample cover different chronological and cultural periods, from Pleistocene/Holocene transition human occupation, Early Holocene hunter gather to a Middle and Late Holocene mounds builders.

This presentation analyse lithic row material procurement, forms and measures of different types, and knapping technics employed. The results suggest changes in social mobility and in propulsion system of projectile points. Is a good opportunity to discuss the evolution of hunter gatherer mode of production, in a specific environment.

ORAL

## 6. APROXIMACIÓN A LA DIVERSIDAD TÉCNICA DE LOS SISTEMAS DE PRODUCCIÓN DEL SITIO CATALÁN CHICO, URUGUAY.

*Fariás-Gluchy, María (Profesora de la Universidade do Rio Grande do Sul - FURG. Brasil. Vice coordinadora del Laboratorio de Ensino e Pesquisa em Arqueologia e Antropologia (LEPAN- FURG). Colaboradora en el Laboratório Multidisciplinar de Investigaçao Arqueológica (LAMINA- Universidade Federal de Pelotas - Brasil) mgluchy@gmail.com\*,*

*Boëda, Eric - boeda.eric@gmail.com (Université Paris X Nanterre/La Défense, UMR 7041 CNRS ArScAn - AnTET)*

*Baeza, Jorge (Profesor de la Facultad de Humanidades y Cs. de la Educación - UDELAR- Uruguay) edithma007@hotmail.com\*\*\**

Con el descubrimiento de sitio Catalán Chico (Departamento de Artigas, República Oriental del Uruguay) realizado por Antonio Taddei, (Taddei, 1967), Uruguay entra categóricamente en las discusiones arqueológicas de la zona de la Cuenca de Plata, así como de América Latina. Este lugar está situado en el noroeste del departamento de Artigas. Por las características morfológicas de sus artefactos líticos y por los diferentes estudios geocronológicos realizados en esta época, hallaron que este sitio podría ser uno de los más antiguos del territorio del Uruguay, su edad aproximada sería de unos 10.000 A.P. Los materiales arqueológicos de este sitio fueron inter-

pretados a través de diferentes perspectivas teórico-metodológicas.

Hoy en el marco de una perspectiva tecnológica, los primeros análisis atestiguan una diversidad de los conocimientos técnicos en este sitio. Un gran número de sistemas técnicos de producción basados en diferentes modos de "debitage" y de "façonnage" son puestos en evidencia, y para cada una de estas modalidades la producción de un tipo o de varios tipos de soporte que serán transformados o no en herramientas específicas. La diversidad así atestiguada indica múltiples comportamientos técnicos ciertamente jerarquizados

ORAL

## 7. TECHNOLOGICAL ORGANIZATION OF PREHISTORIC HUNTERS AND GATHERERS IN THE EXTREME SOUTH OF SANTA CATARINA, BRAZIL.

*Pereira Santos, Marcos César - (UNESCO) marcoscesar@unesco.net*

*Zocche, Jairo José - (UNESCO) jjz@unesco.net*

*Bitencourt Campos, Juliano - (UNESCO) jbi@unesco.net*

The southern Brazilian territory was occupied in different moments (13,000 BP in the South and 3,000 BP in the North) and with distinct interior routes, by two different cultural groups of hunters/gatherers whose costumes were remarkably connected to the manufacture of stone tools. The two populations are the group of Umu tradition and the group of Macro-Ge linguistic branch (Xokleng and Kaingang).

The archaeological sites associated with hunters/gatherers located on the southern border of the State of Santa Catarina show great morphological and technological diversity. Polished and flaked materials are often found associated, supporting the hypothesis of a palimpsest of different occupations, or pointing that in the same chronological period this territory may have been a crossroad between culturally different groups, with consequent cultural exchanges.

In this study we present a preliminary analysis of the lithic material found in open-air sites located in the Extreme South of Santa Catarina. We will focus on settlement patterns, technological organization and chronology of the prehistoric hunter/gatherer group of this region.

ORAL

## 8. BLADE PRODUCTION IN SOUTH BRAZIL

*Lourdeau, Antoine - (Muséum National d'Histoire Naturelle, Paris - France) antoine.lourdeau@mnhn.fr*

*Carbonera, Mirian (Universidade Comunitária da Região de Chapecó, Chapecó - Brasil) mirianc@unochapeco.edu.br*

*Hoeltz, Sirlei E. - sirleinhoeltz@yahoo.com.br (Archeo Pesquisas Arqueológicas Ltda, Cuiabá - Brasil)*

*Viana, Sibeli A. - sibelij@pucgoias.edu.br (Pontifícia Universidade Católica de Goiás, Goiânia - Brasil)*

Current archaeological researches in South Brazil, in the western part of Santa Catarina, are yielding new data for understanding the Early Holocene regional settlement. The greatest novelty is in lithic productions, which differ, in part, from what it was known until now in the area.

In three archaeological sites in the Linha Policial locality, two archaeological programs succeeded one to another: a rescue project between 2006 and 2010 by Scientia company; and, since 2013, a Franco-Brazilian academic field. Surveys and excavations yielded lithic artefacts that demonstrate a complex technical system.

The analyses identify bifacial shaping and large flakes *debitage* – which are common in this period and region, and define what regional archaeologists name Umu Tradition – associated with a unique production for South Brazil: blade *debitage*. This blade production was realized by a centripetal preparation of the core's flaking surface and a unidirectional production of blades. The blades were obtained by two techniques: internal percussion with stone and marginal percussion with soft hammer. Laminar blanks show very different functional potentials.

Such findings contribute to a better understanding of the first steps of the settlement of South Brazil and invite to discuss the notion of Umu Tradition, because it conducts to a too homogeneous perception of South Brazilian prehistory.

ORAL

## 9. LANDSCAPE ARCHEOLOGY IN THE NORTHERN REGION OF SÃO PAULO STATE, BRAZIL

*Rocha Luz, Juliana Aparecida (Faculdade de Ciências e Tecnologia, Universidade Estadual Paulista (FCT/UNESP) juli-luzz@yahoo.com.br*

*Barrocá Faccio, Neide - (Faculdade de Ciências e Tecnologia, Universidade Estadual Paulista (FCT/UNESP) nfaccio@terra.com.br*

*Rodrigues Nunes, João Osvaldo (Faculdade de Ciências e Tecnologia, Universidade Estadual Paulista (FCT/UNESP) joaoosvaldo@fct.unesp.br*

A study was undertaken in an area with eight archeological sites in the northern region of São Paulo state, Brazil. The aim was to investigate regional settlement patterns. The study adopted the theoretical-methodological hypotheses of Landscape Archeology. In that context the Geomorphology–Geography interface offers a significant contribution to investigating factors related to the implantation of the sites in the landscape. Geographic information (maps, plans, and satellite images) was used and the indispensable corroboration of the data for landscape analysis and salvaging archeological material was done by field work carried out in the area of the archeological sites. Effectively the methodology consisted of: locating, delimiting and mapping the sites using geoprocessing techniques; verifying the degree of degradation of the sites; characterizing the region's geomorphological, geological and pedological aspects; verifying the types of settlement and the use made of natural resources, and producing images to support landscape analysis. The results show that the sites in question were inhabited by populations associated to the Aratu Tradition and their possible descendants the Kayapo, located in the northern region of the state of São Paulo. The indigenous groups associated to the Aratu Tradition that produced the pottery installed their villages on gentle slopes leading down to the rivers, or close to perennial rivers and stream or on the upper and lower slopes of hills or flat-topped mountains.

The peoples that produced the material culture (pottery or stone) associated to the Aratu adition preferred the tops of flat-topped hills but near to streams to construct their habitations. The study sites selected occupied the lower and middle parts of hillside slopes and were relatively close to one another, on average 21 km apart and with ages ranging from approximately  $395 \pm 65$  to  $485 \pm 65$  years. That means the various sites may be the remains of contemporaneous occupations and accordingly part of the same regional settlement system.

This paper reports on the first studies to be carried out in small scale sites located in the northern region of São Paulo state. In that light it offers contributions and addresses questions that assist in the formulation of hypotheses about societies that inhabited the region in the past.

ORAL

## 10. GUARANI SETTLEMENTS ON THE RIGHT BANK (SÃO PAULO STATE) OF THE PARANAPANEMA RIVER VALLEY, BRAZIL

*Barrocá Faccio, Neide - (Faculdade de Ciências e Tecnologia, Universidade Estadual Paulista (FCT/UNESP) nfaccio@terra.com.br*

*Rocha Luz, Juliana Aparecida (Faculdade de Ciências e Tecnologia, Universidade Estadual Paulista (FCT/UNESP) juli-luzz@yahoo.com.br*

*Barrocá, Diego - (Universidade de Santo Amaro) diego.barroca@agronomo.eng.br*

In the Paranapanema River valley region, on the São Paulo side (right bank), which is the object of this study, archeological research has been going on since the 1960s. This study sets out an analysis of seven sites located in the lower Valley of the Paranapanema River. They are the sites of indigenous settlements of Guarani groups dating back from  $700 \pm 160$  to  $900 \pm 180$  years. We sought to study the elements of material culture to be found at the sites with a special focus on pottery material – the main identifying feature of Guarani culture.

The archeological investigations made use of geo-technology including Global Positioning Systems to construct a Geographic Information System (GIS) enabling effective analysis of the data and their reproduction in graphic form.

The state of Sao Paulo was densely populated by Indians and up until the beginning of the 20th century they were notably present in the valley of the Paranapanema River. The stretch of land where the archeological sites are located lies on the right bank of the river (São Paulo state) and to date has revealed itself to be the area where the sites are most closely grouped, given that all seven lie in a stretch of land only 10,800 metres long. Only parts of the sites were accessible to our study and it is unknown how much of each of them lies submerged in the waters of the Capivara Hydroelectric Dam reservoir. Even in the dry season when the water level drops 10 meters, they do not completely emerge. In the classification proposed by Moraes, the regional settlement was done by agricultural peoples and that is the methodological theoretical framework we adopt to contextualize this study. At most of the sites, considerable amounts of pottery, flaked stone and polished stone artifacts can be found, as well as funeral urns, black patches on the ground and ornaments fashioned from the resin of the South American locust tree (*Hymenaea courbaril*)

Man's considerable technological progress has failed to curb the progressive degradation of the environment and the cultural heritage. While on the one hand such progress has made it possible to perfect many work processes with the use of highly efficient equipment, on the other it has contributed to serious environmental degradation and that is especially true of hydroelectric plant installations and associated land use management. Such interference and failure to preserve the environment includes the archeological heritage that lies within it. That heritage does not always find support for its preservation in spite of its being nominally an asset under Federal Government protection.

Despite the Constitutional Provision for such protection, in reality the protection of archeological sites depends on the existence of an efficient protection policy designed to make conservation feasible, on the existence of the will to preserve them on the part of the government bodies and other entities that finance archeological research, and on the active engagement of a greater number of professional archeologists.

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ORAL

### 11. AS THICK AS NEEDED? POTTERY THICKNESS AND THE CONSOLIDATION OF AGRICULTURAL PRACTICE

*Vidal, Aixa (UCM/INAPL) aixavidal@gmail.com*  
*Pérez, Martina (UBA-FFyL/INAPL) martinainesperez@hotmail.com*

Due to its cultural nature, pottery is the material expression of the many dimensions of the society responsible for its creation and use. Hence, its analysis can provide useful information for the characterisation of the life context they participated in. In the same way, this context may explain the presence of certain features in the ceramic object.

The materials considered in this analysis cover a sample from different sites in the archaeological area of Antofagasta de la Sierra (Catamarca, Argentina). They represent two clearly distinctive periods, locally known as Formative and Late Period.

The Formative is defined by the introduction of agriculture and mainly herding to the subsistence repertoire of the local inhabitants. It is also a moment when residential bases or small villages are settled in a system which relates locations in different altitudinal areas. In this analysis, pottery sherds from Casa Chávez Montículos (a vil-

lage site), Real Grande (temporary mountain bases) and Cueva Cacao (a symbolic-laden rockshelter) are selected. In the case of the Late Period, the samples came from Bajo del Coypar (agricultural terraces) and La Alumbra (large village). They represent the main spatial functional-related divisions distinguished for the period, which is also characterised by the consolidation of agricultural practice and large demographic growth.

Amongst the several attributes identified in these samples, the study will focus on wall-thickness. It is a straightforward measure which does not demand more sophisticated equipment than a calliper. However, it can be highly informative when the materials from different provenance are compared, due to the lack of ambiguity in the measurement regardless of the material and the variability it may present.

A clear increase in the number of sherds with rather thick walls (>10mm) is noted throughout the two time periods considered. On the other hand, the sherds collected in the different locations did not report such a large difference in representation as in the case of the temporal axis. In this sample, thickness seems to be consistently related to the general dimensions of the vessel, as seen in the reconstructions from the sherd profiles.

In the case of the pottery produced in Antofagasta de la Sierra, wall thickness may be considered a highly time-sensitive variable, although minor variations in thickness representation are also noted amongst different functional sites of the same period.

It may be interpreted that this increase is related to a different conception of pottery in the two periods considered. Probably highly connected to a change in the appropriation of the landscape due to the increasing dependence on agricultural returns, the technological process regarding pottery-production needed to be re-adjusted. The new economic strategy demanded containers to store the surplus they generated for a relative long time, as well as the smaller vessels in use from previous times as temporary recipients. It triggered a change in the potter's strategies as well, as the increase in wall thickness demands restructuring the chaîne opératoire and the ability of the potter.

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ORAL

### 12. BIFACIAL SHAPED TOOLS FROM CERAMIC GROUPS: THE CASE STUDY OF PRAÇA DE PIRAGIBA SITE



*Machado, Juliana - (Université Paris Ouest Nanterre La Défense) ju.drmachado@hotmail.com*

*Rodet, Maria Jacqueline - (Universidade Federal de Minas Gerais) mjrodet.ufmg@gmail.com*

*Fernandes, Luydy Abraham - (Universidade Federal do Recôncavo da Bahia) luydyabraham@gmail.com*

The consolidation of archaeology as a scientific discipline was a late process in Brazil. In the middle of the 20th century, archaeologists have engaged in establishing an overview of archaeological cultures in order to trace routes of diffusions and migrations. In this way, pottery studies were largely emphasized. Recently, research of flaked-stone industries with assemblages from the Late Holocene period increased. Given these developments, our study is about the lithic collection from the *Praça de Piragiba* site, located in the west of *Bahia* state. The large collection available is characterized by the presence of bifacial shaped tools and pottery recipients used in burial.

The database for this study comprises 279 tools and 719 *débitage* remains. These originated from a field season accomplished by the *Universidade Federal do Recôncavo da Bahia* in collaboration with the *Universidade Federal de Minas Gerais*. Technological analysis was adopted as the main methodology in order to understand the *chaîne opératoire* involved and its technical evolution. Therefore, the technical condition concept is an important methodological tool in this study.

Using blocks and flakes of sandstone and silexite, both of median quality, tools were bifacial shaped by hard hammer percussion. Afterwards, flanks and the proximal part were intensely pecked. They present themselves in different technical conditions: beginning, middle and end of technical life; with intentional fractures or not; restructured, or even transformed in other tools. The evolution of the wire edge, the reduction of the reserve of raw material and probable macro traces of use are fundamental elements to understand the technical evolution of these objects.

Prehistoric groups who frequented the *Praça de Piragiba* site were concerned with perpetuating the usefulness of these objects. They evolved technically until being abandoned (due to exhaustion) or transformed. In fact, the region encompassing the west of *Bahia* state, the north of *Minas Gerais* state and the northeast of *Goiás* state presents objects that are morphologically very similar. Although frequently associated with a specific archaeological pottery "tradition", these objects are also found in relation with other pottery "traditions".

ORAL

### 13. CHRONO-CULTURAL VARIABILITY IN THE SERRA DA CAPIVARA REGION (PIAUI, BRAZIL): NEW ADVANCES

*Pagli, Marina - (UMR 7041 Archéologie et Sciences de l'Antiquité - Equipe «Anthropologie des Techniques, des Espaces et des Territoires au Pliocène et au Pléistocène») marina.pagli@gmail.com*

*Lourdeau, Antoine - (Muséum National d'Histoire Naturelle) a.lourdeau@gmail.com*

*Guidon, Niède - (Fundação Museu do Homem Americano) guidon@fumdam.org.br*

We present recent advances about the archaeological sequence of the Serra da Capivara Park (Piauí, Brazil) based on new studies of lithic industries from this region, and their implications for the reconstitution of the human settlement in the region. This area witnesses a dense and continuous prehistoric occupation, starting from Pleistocene period until the Holocene. Nevertheless, detailed lithic analyses have been realized just for few sites until now, with a specific focus on Pleistocene industries. The general techno-cultural characteristics of the successive occupations are still scarce for the whole region.

The analysis of several well-dated archaeological sequences allows an approach of the technical variability through time and shows the technical trends of each period.

Using a technological method to study lithic assemblages and a techno-functional approach of retouched tools, we highlight that different techno-cultural groups are attested in the region.

These results allow a preliminary outline of the changes in lithic production during the prehistoric occupation of the Serra da Capivara region, and can be discussed and integrated in the framework of the settlement of North-East Brazil.

ORAL

**14. HUMAN OCCUPATION IN THE SOUTH-WEST REGION OF GOIÁS (BRAZIL) FROM THE OLD HOLOCENE**

*Viana, Sibeli sibeli@pucgoias.edu.br (PUC Goiás)*

The past occupations in the south-west region of the State of Goiás, remount until this moment to the Old Holocene, with dates around 10 thousand years B.P., represented by archeological sites of Serranópolis region. Sites from Middle Holocene, dated around 6 to 4 thousand years B.P., are found in Serranópolis and in Palestina de Goiás. And, finally, evidences of end Holocene occupations, with the presence of pottery and horticulture also belong to the occupational context of these regions.

The adopted methodology for the analysis of the lytic objects follow the propositions in the way that the objects are conceived and materialized in function of the human environment, that means, being related to subject, that uses and confers the status of instrument to some objects (Rabardel, 1995). In a synchronic perspective, these objects are analyzed from the concept of operative chain (Leroi Gouhran, 1964) and, from a diachronic perspective, building on the concept of technic structure, we'll discuss about the technic of the objects construction over the time (Simondon, 1969 e Boëda, 2013), with the intention of understand their technical transformations.

Based in the available results from the technological analysis, we will reflect about technical insight, knowledges and doings, present between the different occupational periods. By the available data, we observe that the complexity of the lytic industries more remote from Serranópolis is represented by unifacial molded instruments, with elongated and symmetric shape in relation to the longitudinal axis (Lourdeau, 2013), and represent technical changing processes performed over the time in the region. The core exploration system indicates variables technician schemes, related to the production of supports with variable characteristics. About the technical objects from the Middle and End Holocene of Serranópolis and Palestina de Goiás region, the system of core exploration, the system of production and operation of the instruments reveals persistence and important technical ruptures between the sites over the time.

When we bring data about the different spheres of production of the lythic set of the south-west region of Goiás, we intend to contribute with the fruitful discus-

sions in development about the behavior strategies of the human occupations in the South America.

ORAL

**15. EARLY HOLOCENE DIACHRONIC TRANSFORMATIONS IN LAGOA SANTA REGION, CENTRAL BRAZIL**

*Strauss, André - (Max Planck Institute for Evolutionary Anthropology - Dpt. of Human Evolution) andre\_strauss@eva.com.br*

*De-Oliveira, Rodrigo - (Universidade de Sao Paulo - Dpt. de Genetica e Biologia Evolutiva) eliaso@usp.br*

*Villagran, Ximena - (Eberhard Karls Universität Tübingen - Institut für Naturwissenschaftliche Archäologie ) ximena.villagran@uni-tuebingen.de*

*Bernardo, Danilo - (Universidade Federal do Rio Grande do Sul - Instituto de Ciências Humanas e da Informação) danilobernardo@furg.br*

*Bissaro Jr., Marcos César - (Faculdade de Filosofia, Ciências e Letras de Ribeirão Preto - 6Laboratório de Paleontologia) marcosbissaro@gmail.com*

*Pugliese, Francisco - br (Universidade de São Paulo - Museu de Arqueologia e Etnologia - Laboratório de Arqueologia dos Trópicos) pugliesefrancisco@yahoo.com .*

*Hermenegildo, Tiago (University of Cambridge - Department of Archaeology and Anthropology) thermenegildo@gmail.com*

*Santos, Rafael - (Fundação Nacional do Índio - Coordenação Regional Xavante) rafael.santos@funai.gov.br*

*Inglez, Mariana -(Universidade de Sao Paulo - Dpt. de Genetica e Biologia Evolutiva) mariana\_inglez@ib.usp.br*

*Kipnis, Renato - (Scientia Consultoria Científica) rkipnis@scientiaconsultoria.com.br*

*Astolf, Araujo - (Universidade de São Paulo - 16Museu de Arqueologia e Etnologia - Laboratório Interdisciplinar de Pesquisas em Evolução, Cultura e Meio Ambiente) astwolfo@usp.br*

*Neves, Walter - (Universidade de Sao Paulo - Dpt. de Genetica e Biologia Evolutiva) waneves@ib.usp.br*

*Hublin, Jean-Jacques (Max Planck Institute for Evolutionary Anthropology - Dpt. of Human Evolution) hublin@eva.mpg.de*

Lapa do Santo is an archaeological site located in the Lagoa Santa karst in eastern Brazil that testify the dynamic nature of the groups inhabiting South America at the beginning of the Holocene. Human occupation in the site starts at 12.7-11.7 cal kyBP and formation process analysis characterizes the Lapa do Santo's deposits as mainly anthropogenic and composed by repeated combustion activities that indicate an intense occupation of

the same locality. The long archaeological sequence of the site offers a unique opportunity for archaeologist to access first Americans' diachronic behavior. The use of Lapa do Santo as an interment ground started between 10.3-10.6 cal kyBP with primary burials. Between 9.4-9.6 cal kyBP the reduction of the body by means of mutilation, defleshing, tooth removal, exposure to fire and cannibalism followed by the secondary burial of the remains according to strict rules became a central element in the treatment of the dead. In the absence of monumental architecture or grave goods, those groups expressed their rituals through the use of the human body as a symbol. Between 8.2-8.6 cal kyBP another change occurred whereby pits were instead filled with disarticulated bones of a single individual without signs of body manipulation. The lithic technology was focused on flakes and cores during the millennia the site was occupied. However, after 9.9 cal kyBP there is an abandonment of allochthonous raw material for lithic production, reflecting some kind of technological shift in those groups. In conjunction, Lapa do Santo's archaeological record reveals dynamic groups in constant transformation with many innovations over a period of centuries, contradicting the view of hunter-gatherers as static a-historic societies. Moreover, funerary rituals focusing in the manipulation of the human body are considered part of a broader system of ceremonies that reflects a high degree of symbolic complexity. In South America this was sometimes assumed to be an Andean phenomenon preceding the rituals arising later with the emergence of complex societies. Lapa do Santo in eastern Brazil changes this scenario and the Chinchorro can no longer be considered "the oldest known rituals in America". The presence of mortuary rituals focusing in the reduction of the body in sites distant thousands of kilometers from each other such as Pampa de los Fósiles, Lauricocha, Huchichocana Cave, La Chimba, La Fundición, Baño Nuevo, Tequendama and Lapa do Santo suggests a possible shared identity in South America dating as far back as the early Holocene.

ORAL

#### **16. A TECHNOLOGICAL APPROACH OF THE LITHIC PLEISTOCENE INDUSTRIES OF THE SANTA ELINA SHELTER (MATO GROSSO, BRAZIL).**

*Vialou, Agueda Vilhena avialou@mnhn.fr (MNHN PARIS)*

The lithic industries of the rock shelter from the level of 25,000 years BP and 10,000 years BP Santa Elina, both associated with extinct fauna brought to the site and explored - *Glossotherium Letsomii*, have their own tech-

niques and morphological characteristics. The choice of raw material in the particular environment of the Serra das Araras and select the support type, blocks or platelets and flakes guided mode of debitage and retouching for the production of the tools.

The Pleistocene occupations are characterized by tools made by tangential retouches on: small platelets in Silicia and limestone, and robust platelets, only on limestone, and also flakes exclusively on limestone. Levels Pleistocene-Holocene transition of 10,000 years BP have taken an industry with more diversified rocks, limestone, flint (opaque red) and sandstone.

In two separate for 15,000 years without noticeable traces of other occupations periods that there is always dealing with a peripheral chip or work plate, without modifying the shape of the support, without Façonnage.

ORAL

#### **17. PRODUCTIVE PROCESSES AND THEIR TESTIMONY ON THE QUARTZ TOOLS OF THE PLEISTOCENE SITES OF THE SIERRA DE CAPIVARA (PIAUI-BRASIL).**

*Clemente-Conte Ignacio (AGREST & Grupo de Arqueología de las Dinámicas Sociales, Departamento de Arqueología y Antropología, IMF-CSIC, Barcelona) ignacio@imf.csic.es*  
*Boëda, Eric - boeda.eric@gmail.com (Université Paris X Nanterre/La Défense, UMR 7041 CNRS ArScAn – AnTET)*

In this paper we are going to present the results of the functional analysis of the many lithic materials from a number of Pleistocene sites from the Sierra de Capivara: Boqueiro da Pedra Furada, vale da Pedra Furada y Sitio do Meio. A microscopic analysis of the surfaces of the quartz tools has been realized on each one of the 'types' of tools identified on the basis of the technological analysis: "ros-tres" "borers", "denticulated" and other edges prepared as scrapers. The use-wear traces identified have been compared with the experimental program realized, leading us to the identification in the different sites analyzed of: butchering activities, hide working activities, bone/antler boring, wood working and vegetal fiber processing.

ORAL

**18. ANALYSE TECHNOLOGIQUE DES INDUSTRIES LITHIQUES DU PLÉISTOCÈNE RÉCENT AU PIAUI, BRÉSIL.**

*Boëda, Eric - boeda.eric@gmail.com (Université Paris X Nanterre/La Défense, UMR 7041 CNRS ArScAn – AnTET)*

*Lahaye, Christelle - hri.lahaye@gmail.com (Michel de Montaigne Bordeaux 3 University, UMR 5060 CNRS – IRAMAT- CR- P2A Institut de Recherche sur les Archéomatériaux, Maison de l'Archéologie, 33607 Pessac, France)*

*Fontugne, Michel - Michel.Fontugne@lsce.ipsl.fr (Laboratoire des Sciences du Climat et de l'Environnement UMR 8212 CNRS-CEA-UVSQ, Domaine du CNRS, 91198 Gif sur Yvette, France)*

*Lourdeau, Antoine - a.lourdeau@gmail.com (Département de Préhistoire - Muséum national d'Histoire Naturelle, UMR 7194 CNRS)*

Depuis 2008 dans le cadre de la mission archéologique franco-brésilienne du Piauí, 7 séquences archéologiques provenant de contextes géomorphologiques différents ont été datées du pléistocène récent. Chacune de ces séquences présentent une succession de plusieurs niveaux archéologiques comprenant des artefacts lithiques et des restes osseux pour certains d'entre eux. La principale matière première utilisée est le quartz. Mais, uniquement certaines qualités de quartz, les plus aptes à la taille sont utilisées. Deux schèmes opératoires distincts sont réalisés -façonnage et débitage- dans le but de fabriquer plus d'une dizaine d'outils différents. Dans une moindre mesure d'autres matières premières comme le quartzite sont utilisées, servant à la fabrication de certains outils spécifiques peu réalisables sur le quartz. L'ensemble de ces données obtenues aux dépens de plus d'une vingtaine de niveaux archéologiques montrent sur le plan diachronique une variation de faciès technique témoins de connaissances et de savoir-faire différentes et sur le plan synchronique des sites aux fonctions différentes. L'occupation au pléistocène récent au sud du Piauí apparaît comme une réalité bien établie avec une densité de sites qui nous est rendue visible du fait de la conservation des horizons sédimentaires pléistocènes dans de nombreux contextes géomorphologiques aussi différents les uns que les autres.

**Technological analysis of some lithic late-Pleistocene industries from Piauí, Brazil**

Since 2008, within the framework of the French-Brazilian archaeological project in Piauí, seven archaeological sequences, located in various geomorphological contexts,

have been dated from the late Pleistocene. All of these sequences present a series of several archaeological levels, containing lithic artefacts, and osseous rests for some of them. The most used raw material is quartz. But only certain qualities of quartz, the ones most suitable for knapping, are used. Two distinct operating schemas are used – shaping and knapping – in order to make more than ten kinds of distinct tools.

To a lesser extent other types of raw material, like quartzite, are used, to obtain some specific tools hardly obtainable with quartz. All these data, acquired from more than twenty archaeological levels, show, on a diachronic perspective, a variation in the technical facies that testimony of different knowledge and know-how, and on a synchronic perspective sites with different functions. The late Pleistocene occupation in the South of Piauí appears as a well-established reality, with a site density that can be observed thanks to the conservation of the Pleistocene sedimentary horizons in various geomorphological contexts.

# A7C Climate change and use of animals in South America during the Holocene

Commission on American Settlements during Prehistory  
(Organizers: Hugo Yacobaccio, Olivera Daniel)

Tuesday 2nd (14:00 to 19:30)  
B06 Meeting Room



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ORAL

## 1. EXPLORING ENVIRONMENTAL IMPACT ON HERD MANAGEMENT AND HUNTING PRACTICES IN PASTORALIST SOCIETIES OF NORTHWESTERN ARGENTINA DURING THE LAST 1400 YEARS

*Yacobaccio, Hugo - (CONICET-UBA) hdyacobaccio@gmail.com*

*Morales, Marcelo - (CONICET-FCEN) marcelomoralesarq@gmail.com*

*Mercolli, Pablo - (IIT-UBA) pablomercolli@gmail.com*

The links between environmental characteristics and climatic change with human subsistence have been the subject matter of research and publications during decades in anthropology and archaeology. This relation was usually studied in a coarse grain in terms of their spatial and temporal resolution in both, extractive and productive societies. The improvement in the resolution of the paleoenvironmental information in the past two decades, and the better understanding of the relationship between climatic signals of different scope allowed the refinement of the questions that currently can be made, and the models which can be built about this topic.

In the recent years a new high resolution paleoenvironmental records have been studied in the South-Central Andes and in Northwestern Argentina as well. This record provided rich and detailed data about the main trends in climate and their impact in the environment during the past 2000 years. Laguna Pululos 1012 core is the only of this record which is located in the Puna or Altiplano of the Jujuy Province, Argentina. It is the more representative source of paleoenvironmental information for the region in order to test some hypothesis regarding particular subsistence strategies carried out by pastoralist societies that inhabited both the Puna and Quebrada de Humahuaca during the past 1400 years.

In this presentation we compare the mentioned paleoenvironmental information with the archaeozoological record from 13 archaeological sites, in order to explore and discuss two particular aspects about the relationship between climate and subsistence in llama herder's societies: a) the links between sustained draught periods and the strategies of herd conservation through differential culling, and b) the relationship between climatic uncertainty and the frequency (i.e. abundance) of the hunting practices on wild camelids.

ORAL

## 2. CLIMATE CHANGE AND HUMAN OCCUPATION IN THE DRY PUNA OF ARGENTINA DURING THE LITTLE ICE AGE

*Oxman, Brenda - (Conicet-UBA) oxmanbrenda@gmail.com*

*Yacobaccio, Hugo - (CONICET-UBA) hdyacobaccio@gmail.com*

*Lupo, Liliana - (UNJu-Conicet) lupolc@yahoo.com.ar*

*Tchilinguirian, Pablo - (INAPL) pabloguirian@gmail.com*

In recent decades climate change has become a central issue for studying pasto societies within and ecosystemic approach directed to understand the complex relationship between people and environment. This paradigm has direct consequences to present complains about global climatic change, and the future of humankind. The objective of this presentation is to advance paleoenvironmental results obtained from a research program carried out in the Dry Puna of the Jujuy Province, through the use of pollen analysis. In this case we will deliver the results from the study of the Lapao 2 profile (1400-1800 calDC). This study seeks to contextualize the environment of the human occupations which inhabited the area in this time-period. The chronology correspond to the period known as the Little Ice Age, considered one of the most recent global climate variations (decreased temperature and increased precipitation) so far historically recorded (1350-1850 DC). Recognition of this period in the Puna of Argentina is still poorly understood, although have been detected in other parts of South America. Disputes over its particular climatic characteristics remain. Some authors postulate a cold-wet period, while others favor an alternate between wet and dry-cold phases. In order to discuss this question for the studied area the results of this presentation are quite important. The Lapao 2 profile measured 1,60 m high, and it has a high resolution chronological sedimentation. Twenty-eight samples for pollen and sedimentary analyses were taken. The results of this study allowed to identify two moments in the composition of vegetation:

1. a mixed steppe with high proportion of Poaceae, accompanied by the expansion of the marsh, that indicate a wetter moment;
2. also a mixed steppe with higher proportion of Asteraceae, that would indicate a drier moment.

In any case, there is no evidence of significant changes in vegetation composition and water availability on a local scale that could have affected the characteristics of the herding groups which lived in the area. These results are interesting in order to evaluate the differential impact of

this global climatic change in particular settings, and the potential of this kind of studies in restricted timescales.

ORAL

### 3. CURRENT VICUÑAS CONSERVATION AND MANAGEMENT. AN APPROACH

Vilá, Bibiana (CONICET-UNLu) [bibianavila@gmail.com](mailto:bibianavila@gmail.com)

Vicuñas (*Vicugna vicugna*) are a wild South American camelid that are being valued since prehispanic times mainly because of their fine fiber, one of the finest in the world. Since prehistoric times this species have been managed as a resource. Wildlife management is the science and art of deciding and acting on the structure, dynamics, and relationships among populations of wild animals, their habitats and people in order to achieve certain objectives. This management can be passive (when the goal is to preserve or protect a natural entity at the mercy of natural processes) or active (involves changes the current situation through direct and planned intervention to increase, stabilize or reduce the population). For a successful vicuña management approach it is crucial to incorporate an ethnozoological view as it necessarily includes the local indigenous knowledge and practices, and an Andean regional cosmovision on the species and its use. Vicuña management is a risky situation that involves uncertainty, has numerous actors and interest in dispute, and the decisions are urgent.

There is an International Convention for the Conservation and Management of the Vicuña signed by Argentina, Bolivia, Chile, and Ecuador. In this convention the right of the local communities for the use of the species is theoretically guaranteed by article 1: "The signatory governments agree that the conservation of the vicuña is an alternative economic production for the benefit of the Andean people and is committed to its gradual use under strict state control". Currently, situations that put in risk the spirit of the Convention are emerging, because foreign textile firms have bought thousands of hectares in the Andes and they negotiate the usufruct of the vicuñas in their area. Some examples of the current discussions on vicuña management, and some concrete management examples will be presented: (a) wild or captive management; (b) ethnozoology approach to the neo-chakus rituals; (c) risk of hybridization; (d) embryo transfer in relation to the need or not, of this technique.

ORAL

### 4. SOCIO-ECOLOGICAL PRESSURES AND HUMAN ADAPTATION IN THE HIGHLANDS OF ARGENTINA: CONTRIBUTIONS OF THE ARCHEOLOGY OF THE PUNA OF SALTA DURING THE MIDDLE HOLOCENE AND BEGINNING OF THE LATE HOLOCENE

López, Gabriel - (CONICET, Instituto de Arqueología, Universidad de Buenos Aires) [gabelope@yahoo.com](mailto:gabelope@yahoo.com)

The aim of this paper is to study the relationship between environmental changes and use of faunal resources and technology during the Middle Holocene and beginning of the Late Holocene in the Puna of Salta, Argentina. During the Middle Holocene and especially toward the end of the Middle Holocene, the high segmentation in resource patches led to human aggregation, increasing the size of the groups, spatial circumscription and competition. These socio-ecological pressures could affect human adaptation. In particular this analysis will focus in the changes in the economic niche and the technology. The materials of analysis of these changes come from different archaeological sites in the Puna of Salta (specially Abrigo Pozo Cavado and Alero Cuevas). The method of study will be based in the analysis of archaeological evidence of these sites (faunal and lithic analysis).

Archaeological record of the Puna of Salta indicates changes related to intensification and domestication. The faunal analysis shows changes in the composition of taxa (domesticated camelids), age profile and processing marks. The lithic technology shows the increase of blades and lanceolate tools known as *saladillenses*.

From models of human behavioral ecology can be predicted strategies aimed at increasing efficiency and minimizing risk by the end of the Middle Holocene. The intensification and domestication of camelids (high ranking resources) were a possible response to socio-ecological pressures. These changes were consolidated in the Late Holocene with a new economic niche.

ORAL

**5. TOCA DA PENA, PIAUI, BRÉSIL : UN SITE ARCHÉOLOGIQUE DATANT DE LA TRANSITION PLÉISTOCÈNE-HOLOCÈNE AVEC DES INDICES D'ACTIVITÉ DE BOUCHERIE SUR DES OSSEMENTS DE MÉGAFAUNE**

Boëda, Eric (Université Paris X) boeda.eric@gmail.com  
Griggo, christophe Griggo christophe - (Université Grenoble 1) Christophe.Griggo@ujf-grenoble.fr  
de Souza, Iderlan (UNIVASF) iderlanz@hotmail.com

Le site de Toca da Pena, découvert en 2008 dans le massif calcaire d'Antero, au sud ouest du parc Capivara (Piauí), est un site mixte, à la fois grotte et abri sous roche. Fouillé sur une épaisseur de plus de 4 mètres, ce site présente en stratigraphie plusieurs couches archéologiques dont la plus récente est datée de 10 000 ans BP. De très nombreux vestiges osseux ont été retrouvés tout le long de cette séquence. L'une des couches archéologiques provenant de la partie supérieure de la stratigraphie indique une interaction directe entre l'homme et la faune. En effet, cette couche a livré des restes d'un paresseux géant : *Scelidodon piauense*, associés à des artefacts lithiques, et dont une partie de la palette costale droite présentait, sur sa face interne, au dépend de quatre côtes successives, des stries de boucherie très courtes, de section en V, caractéristiques de l'utilisation d'un outil. La localisation des stries indique une désarticulation avec les vertèbres thoraciques pour trois d'entre elles et pour la dernière une désarticulation avec la palette costale. Les études taphonomiques excluent toute origine naturelle. D'autres stigmates anthropiques ont été retrouvés sur d'autres espèces dont plusieurs Ongulés. Il s'agit de cassures fraîches réalisées sur des os longs. Par ailleurs, à part quelques os grignotés par des Rongeurs, aucune trace liée à la présence de Carnivores n'a été observée. Ce site, qui permet pour l'une des premières fois de réaliser des analyses archéozoologiques dans cette région du Piauí, atteste donc bien d'une interaction de l'homme sur la Méga-faune, ainsi que sur d'autres espèces, à la fin du Pléistocène récent.

The site of Toca da Pena, discovered in 2008 in the calcareous massif of Antero, in the southwest of Capivara park (Piauí), is a mixed site, both cave and rock shelter. Excavated over a thickness of more than 4 meters, this site presents several archaeological layers in stratigraphy whose most recent is dated 10 000 years BP ago. Numerous skeletal remains were found throughout this sequence. One of the archaeological layers from the upper part of the stratigraphy indicates a direct interaction be-

tween man and wildlife. Indeed, this layer has provided bones of a Giant ground sloth: *Scelidodon Piauense*, associated with lithic artifacts and part of the right rib cage presented on its inside face, on four successive coast, short butchery marks, with V-section characteristic of the use of a tool. The location of the cut-marks indicates the disarticulation with the thoracic vertebrae for three of them and, for the last, disarticulation with the costal palette. Taphonomic studies exclude any natural origin. Other anthropogenic stigmata were found on other species including several Ungulates. These are fresh breaks made on long bones. Moreover, except for some nibble bone by Rodents, no trace associated with the presence of Carnivores has been observed. Consequently, this site that allows for one of the first times to realize archaeological analyzes in this region of Piauí, attests to human interaction on megafauna and other species at the end of the late Pleistocene.

ORAL

**6. PALEO-ENVIRONMENTAL EVOLUTION AND THE FIRST EVIDENCES ON BIG CETACEANS EXPLOITATION IN THE LOW PARANÁ-PLATA BASIN (ARGENTINA)**

Loponte, Daniel - (CONICET) dloponte@inapl.gov.ar  
Voglino, Damián - (Museo de Ciencias Naturales "Antonio Scasso") damianvogolino@yahoo.com.ar  
Liotta, Jorge - (Fundación OGÁ y Museo de Ciencias Naturales "Antonio Scasso") museoscasso@lycos.com  
Acosta, Alejandro - (CONICET) acosta@retina.ar

In the frame of a model which deals with changes in the resources' availability based on paleo-environmental evolution of the Low Paraná-Plata basin, some years ago we proposed a phase of mixohaline-polihaline resources' exploitation by human societies that inhabited the area during Middle Holocene. In this communication we present the first evidences supporting this phase, discussing the bone remains of a cetacean individual recovered in the Arroyo Las Hermanas archaeological site (Ramallo, Buenos Aires). It is located in the right bank of Las Hermanas stream, an affluent which flows into the right bank of Paraná River through a short and wide estuary dated in the Middle Holocene marine ingression.

The archaeological site was excavated in different stages, mapping the exposed material with the aim of testing different taphonomic and cultural aspects, such as the spatial distribution of remains, bones' articulation, and the relationship of osseous material with other anthrop-



ic evidences. The sedimentary sequence of the site was determined on the basis of local geological and paleo-environmental data.

The archaeological site shows a particular stratigraphic sequence. It starts with an actual entisol poorly developed, typical of local low floodplains, which forms an A level sterile in archaeological materials. Below, it develops a 2-2.5 m-thick sequence of fluvial sands without a visible stratification (B level, 1 sub-unity) which is sterile in cultural materials. In the basis of this level there is a 30m thick concentration of alkaline phytosilicates (level B, sub-unity 2) where *Balaenoptera sp.* remains were recovered highly disarticulated. Some specimens show longitudinal marks, which trough macro and microscopical features can be linked to lithic edges. Cervical, toraxical, lumbar and caudal vertebrates were identified, as long with ribs and the cranium (not yet recovered), counting 45 NISP and 33 MNE. Sawing marks suggest processing activities: it is highly possibly that the soft tissue were removed and transported to final consumption loci, leaving *in situ* big and heavy anatomic units (similar behaviors were recorded among other hunter-gatherer groups exploiting mammals weighing several tons). More than 50 lithic fragments were recovered, some of them in direct association with bone remains. Fine grained quartzite of different colors and translucent chalcedony were identified as raw materials. Most of them are micro-flakes and discard flakes result of edges' reactivation made after raw materials from the interior of the Pampa plain.

Arroyo Las Hermanas archaeological site conforms one of the first evidences in the last portion of Paraná basin of human adaptation in the coastal area of the marine estuarial golf of Middle Holocene. It can be interpreted as a *locus* of specific activities of primary processing of *Balaenoptera* (*cf. physalus*). Lithic materials associated suggest it would have been developed by hunter-gatherer groups from Pampean sector which had access to raw material sources located in southern ranges of Buenos Aires.

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#### ORAL

### 7. HOLOCENE PALEOENVIRONMENTS HUMAN OCCUPATION AND ANIMAL RESOURCES AT SOUTH ANDEA PUNA (25°-27°S), ARGENTINA

Olivera, Daniel Enzo - (CONICET-INAPL y UBA) [deolivera@gmail.com](mailto:deolivera@gmail.com)

Tchilinguirian, Pablo - (CONICET-INAPL y UBA) [\[irian@gmail.com\]\(mailto:irian@gmail.com\)](mailto:pablogu-</a></p></div><div data-bbox=)

The Southern Puna is a morphostructural region which belongs to the Alean Cordillera. It covers 2,000,000 km<sup>2</sup>, and extends from 24° to 27° S and 66.5° to 68° W. It is characterized by extreme aridity with dry conditions (120 mm/yr), and ten year cycles of extreme drought (<10 mm) interrupted by years of abundant rain (200-300 mm). In this kind of environment, risky and uncertain conditions have to be considered in order to analyze economic strategies of the human groups.

The aim of this work is to study the paleoenvironmental evolution in the Southern Puna during the Late Pleistocene and early-middle Holocene, in particular the changes between aridity and humidity, and to link this evolution to human occupation and animal resources management.

Aerial photos and satellite images were analyzed to identify glacial, periglacial and lacustrine landscape geomorphs with the aim of reconstructing the paleogeography from the late Quaternary to a regional scale. Detailed field studies of the Holocene deposits were performed on outcrops exposed over three valleys (Las Pitas (26.015°S, 67.325°W, 3645 m), Miriguaca (25.998°S, 67.388°W, 3471 m) and Confluencia (26.056°S, 67.41179°O, 3360m), and by sediment cores taken from different parts of the Salar of Laguna Colorada (26.032°S, 67.451°O, 3420m). Lithofacies and depositional environments were determined on all recovered units, using visual core descriptions and standard sedimentological facies analytical techniques. Emphasis was placed on the identification of changes in the vertical and horizontal facies indicated by variations in grain size, sedimentary structures, biogenic, pedogenic components and the abundance of organic material. Radiocarbon (AMS) dates (30) were obtained from bulk organic matter or plant debris. Different stable isotopes (<sup>2</sup>H, <sup>18</sup>O and <sup>3</sup>H) were analyzed in Los Colorados River (26.031° S, 67,448 °W, 3421 m) and Las Pitas River (26,028°S, 67.343°W, 3581 m) in order to determine the origin of the recharge, its altitude and age.

The results of these multiproxy analysis has allowed the differentiation of five paleoenvironmental phases, some regional and some local, that developed between 15000 and 4500 yr BP. These phases would be associated to climatic changes due to the obedience of the regional paleohydrological variability of the lakes and desert water courses towards, mostly, the hydric balance originated by the rainfall and evapotranspiration.

Finally, in order of these results we make some obser-

variations about the potential incidence that the different paleoenvironmental conditions could have had for the human groups that inhabited the Puna during early and mid Holocene and the beginnings of the late Holocene considering the available archaeological record.

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ORAL

## **8. ECONOMY AND CAMELIDS IN THE PREHISPANIC AGROPASTORAL SOCIETIES OF ANTOFAGASTA DE LA SIERRA (ARGENTINE PUNA) (CA. 3000-500 YEARS BP)**

*Olivera, Daniel Enzo - (CONICET-INAPL y UBA) deolivera@gmail.com*

*Grant, Jennifer - (INAPL) jennygrant62@yahoo.com.ar*

South American camelids have occupied a central role in the economic, social and ritual lifeways of ancient Andean hunter-gathers, herders and farmers, being the only large herd mammals domesticated in the Americas. Their domestication is especially important for highlands areas such as the Argentine Southern Puna where critical resources – water, grass, fertile soils, etc. – are limited for both humans and animals.

When interpreting ancient productive economies it is crucial to differentiate between the presence of wild (*Vicugna vicugna* and *Lama guanicoe*) and domestic (*Lama glama*) camelids in faunal assemblages. This is because the predominance of certain resource acquisition strategies or the presence/absence of some of these strategies could have had repercussions on the logistical organization of the groups. It has been an accepted fact that the expansion of agriculture during the late Prehispanic period had a major impact on group organization. Yet, it is likewise evident that herding and hunting also played an important, though still unclear, role during this period.

Given this uncertainty and with the purpose of further understanding human-camelid relationships our aim here is to compare and contrast the use tendencies of these animals in agropastoral societies from Antofagasta de la Sierra (Argentine Puna) during the Late Holocene – ca. 3000 to 500 years BP.

Our approach highlighted and evaluated different zooarchaeological indicators such as: size variation observed in camelids (osteometry), their assignment to age cat-

egories and different indices of skeletal element abundance (MAU, MNE, PBE). These indicators were applied across a series of different type-sites, distributed across different ecological zones in the region, the results of which were then set against the paleoenvironmental data for the Late Holocene of the area.

Results indicate that wild camelid hunting was important throughout this whole period, even if its characteristic sand intensity varied, with an important peak during the latter part of this timescale. Furthermore, throughout this time, the pastoralist evidence shows a change in type of llama from a more generalized form – ca. 3000 to 1000 years BP – providing meat, fiber and transport, to a more specialized form for the period after this.

In essence, over these ca. 2500 years highlands societies experienced an intensely important and crucial relation with both wild and domestic camelids, although the essential characteristics of this relationship changed over time.

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ORAL

## **9. MID-HOLOCENE CLIMATE CHANGE IN CENTRAL ARGENTINA (35°-40° S): EXPLORING ITS IMPACT ON THE PREDATOR-PREY SYSTEM INVOLVING HUMANS AND GUANACOS (*LAMA GUANICOE*)**

*Barrientos, Gustavo - (División Antropología, FCNyM, UNLP; Centro de Estudios Arqueológicos Regionales, FHya, UNR; CONICET; República Argentina) gustavbarrie@yahoo.com.ar*

*Belardi, Juan Bautista - (UNPA-UARG; CONICET; República Argentina) juanbautistabelardi@gmail.com*

*Catella, Luciana - (División Arqueología, FCNyM, UNLP; Centro de Estudios Arqueológicos Regionales, FHya, UNR; República Argentina) catellaluciana@hotmail.com*

*Morales, Natalia - (División Arqueología, FCNyM, UNLP; Centro de Estudios Arqueológicos Regionales, FHya, UNR.) moralesnatalia@live.com*

In central Argentina (35°-40° S), mid-Holocene warming began about 8.2 cal. Ky BP and lasted for almost 4000 years. During most of this period, the archaeological signal of human populations was exceedingly low. While acknowledging the potential influence of taphonomic and research bias on the general picture, one of the authors (G.B.) previously interpreted this fact as the result of a decline in the demography of human populations subsequent to a climate-induced reduction in the population size of the main animal resource, the guanaco (*Lama guanicoe*). Climate warming beyond the optimum

temperature range for conception and estrual activity can significantly reduce mammalian fertility leading to decrease in population numbers and, eventually, to local extinction. This factor, affecting cycles of prey population contraction and expansion, may impinge upon regional carrying capacity and hence on human demography. To properly evaluate this hypothesis there is much that we need to learn about guanaco physiology and human-guanaco interaction from an ecological standpoint and within the frame of medium to long-term ecosystem and biome evolution. As a first step in this endeavor, we proceeded to assess by indirect means the likely degree of dependence, in our study area, of past human populations on terrestrial game in general and on guanaco in particular. In this paper we present the preliminary results of this research, aimed to model regional hunter-gatherer niche properties and diet composition.

In order to functionally define the ecological niche that was likely available for hunter-gatherers between 35° and 40° of latitude, we constructed an ethnographically-based empirical (statistical) model that relates latitude with the relative dependence on three basic subsistence economies: a) gathering of wild plants and small land fauna; b) hunting, including trapping and fowling; c) fishing, including shellfishing and the chase of large aquatic animals. To assess diet composition, we collected two samples of georeferenced data from the southern cone of South America: a) human  $\delta^{13}\text{C}$  and  $\delta^{15}\text{N}$  measurements on bone collagen ( $n \approx 500$ ) and b) guanaco  $\delta^{13}\text{C}$  and  $\delta^{15}\text{N}$  measurements on bone collagen ( $n \approx 200$ ). Data were graphically represented and processed using GIS technology and statistically analyzed in order to recover information about latitudinal differences in diet composition and trophic level.

On the basis of the quantitative combination of subsistence economies it is possible to identify three main ecological roles: a) "gatherer-hunter-fisher" (G-H-F) at latitudes below 44°, b) "hunter-fisher-gatherer" (H-F-G) between 44° and 51°, and c) "fisher-hunter" (F-H) above 51°. Isotopic data show that below 44° there is a significant representation of low trophic level diets ( $\delta^{15}\text{N} \leq 10\text{‰}$ ) and a greater superposition of  $\delta^{13}\text{C}$  and  $\delta^{15}\text{N}$  values of guanaco and humans relative to that found in more southern regions (*i.e.* Patagonia and Tierra del Fuego).

In combination, our results suggest that dependence of human populations on guanaco was lesser in our study area respective to regions located above 44° S. In Central Argentina the existence of a G-H-F niche may have buffered, to a certain extent, any sudden or progressive fall in the demography of guanaco linked to climate change.

# A8a Lobbying for Archaeology (18th- 21st centuries). Innovative alliances in the establishment of archaeology

Commission on History of Archaeology  
(Organisers: M. A. Kaeser, G. Delley)

Thursday 4th (14:00 to 19:30)  
B25 Meeting Room



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XVII World UISPP Congress  
XVIIe Congrès Mondial de l'UISPP  
XVII Congreso Mundial de UISPP

ORAL

## 1. INNOVATIVE ALLIANCES IN THE HISTORY OF ARCHAEOLOGY: INTRODUCTION TO A NEW FIELD OF INQUIRY

Marc-Antoine, Kaeser (Latenium / University Neuchâtel)  
marc-antoine.kaeser@unine.ch

During the last decades, the strong development of the historiography of archaeology has taken advantage of post-processual approaches and postmodern attitudes, which have favoured the questioning of the involvement of our discipline in the legitimization of the main ideological, political, nationalist, and colonial trends of the 19th and 20th centuries.

From now on, we consider that historians of archaeology should concentrate their attention on other forms of lobbying, more strictly economic and technical. It has been observed indeed that since the creation of modern states, archaeologists have often managed to gain the interest of non archaeological organs or institutions in order to establish flourishing alliances and to reinforce their own scientific practices – especially in the context of economical and structural upheavals.

In this introduction to the session A8a, we do not intend to present the materials of a case-study, but rather to set the methodological and heuristic framework of what we consider as a new, promising field of inquiry for the historiography of archaeology's past.

The study of « innovative alliances » offers the opportunity of a better articulation between the history of archaeological ideas and the epistemology of the discipline on the one hand, and the history of archaeological techniques and practices on the other hand. It should also contribute to the development of diachronic perspectives through the history of archaeology, from the beginning of modern times up to the immediate past and the present challenges of our discipline.

Fundamentally, the critical historiography of archaeological « lobbying » should contribute to a reflexive approach on sensitive ethical questions such as the current problems of the financing of archaeological research. Considering archaeology as a scientific, social, cultural, and ideological, but also as a technical, Financial, and economic activity, it could offer the archaeological community some guidelines as to the ways to deal with the new liberal order, especially in the present context of global economic crisis.

ORAL

## 2. THE CREATION OF THE FRONTIERS OF THE TRANSNATIONAL ROMAN EMPIRE WORLD HERITAGE SITE AS AN EXAMPLE OF ARCHAEOLOGICAL LOBBYING

Hingley, Richard - (Durham University) richard.hingley@durham.ac.uk

This paper addresses the context of the debate about the inscription of the Frontiers of the Roman Empire World Heritage Site as an example of archaeological lobbying that has involved various state parties, the European Union and UNESCO. Over the past decade, a sustained campaign has been undertaken to encourage the inscription of the Frontiers of the Roman Empire as a transnational World Heritage Site and the project that spearheaded this initiative received substantial funding from the European Union (D. Breeze and S. Jilek 2008 *Frontiers of the Roman Empire*. Edinburgh). The paper assesses the successes and limitations of this initiative and explores the alliances that have emerged and also the limitations of the initiative.

The paper addresses the ways that archaeologists and heritage managers have led a debate about the inscription of regional sections of this transnational monument into a single World Heritage Site and addresses some of the connotations for the process of definition of a monument that spans western, central and eastern Europe, the Near East and North Africa. It addresses the debates that have identified, defined and interpreted the sections of the Roman frontiers in different regions (cf. D. Mattingly et al. 2013 *Frontier of the Roman Empire: The African Frontiers*. Edinburgh) and also the attempts to write a statement of Outstanding Universal Value for the entire monument and its constituent parts. In particular, it addressed the relationships that are developing between the various state parties along the course of these former frontiers and the role of UNESCO in this debate.

The creation of a unified agenda for the entire monument has led to new forms of co-operation and is also highlighting different regional approaches to archaeology and heritage management. In addition, the initiative has a complex relationship to the contemporary bordering practices of the European Union and also the idea of encouraging tourism. In particular, potential national and regional agendas that appear to divide particular parts of the broader region are defined, exploring the different meanings of former imperial frontier works across various parts of this broad region.

Although highly supportive of the considerable efforts that have been made to create a united agenda, this paper aims to articulate the contrasts in approaches that characterise particular parts of the monument—ideas that help to articulate differing attitudes to the past and to the present. In particular, it emphasises the geopolitics of the global world order in which Roman places are being remade (cf. D. Totten and K. Lafrenz Samules 2011 *Making Roman Places*. Journal of Roman Archaeology Supplementary Series).

ORAL

### 3. LOOKING FOR POWERFUL ALLIES. THE EXAMPLE OF ARCHAEOLOGY AND 14C DATING METHOD

*Delley, Géraldine (Université de Neuchâtel, Institut d'archéologie) geraldine.delley@unine.ch*

After WWII it became necessary for nuclear research to find new applications in civil and pacific domains. Isotopic dating methods like 14C correspond to the kind of applications nuclear research laboratories were interested to develop. Several positive dispositions explain the quick diffusion of the 14C method from the USA to Europe: a clear position of governments regarding the massive supporting of nuclear research from the 1950s onward; the diversity of the domains of application of 14C (archaeology, botanic, geology, climatology, etc.); the supports of politics of sciences to research projects presenting multidisciplinary practices.

This research is based on the analysis of published and unpublished sources (correspondence between scientists, unpublished reports and interviews).

A critical analysis of the introduction of the 14C method in Switzerland reveals that for archaeologists, the potential of method was not only heuristic. Given the attractiveness of nuclear research, archaeologists knew that if they made their collaborations with nuclear physicists visible, they could expect positive effects regarding the position of archaeology in the scientific landscape. On the other hand, such collaborations were perceived positively by physicists as well. Providing archaeologists with absolute dates was a demonstration of the usefulness of nuclear physics even in the domain of humanities.

In the 1950s, the redefinition of the relationship between science and politics encouraged archaeologists to establish alliances with radiocarbonists. These alliances profited directly from the powerful position physics, and in particular nuclear physics, occupied among the

sciences after WWII. Such contextual details, in addition to the modern dimension of the method and its heuristic potentials, explain the power of seduction of the 14C for archaeologists and politics of sciences.

ORAL

### 4. COMPUTING, ENGINEERS AND ARCHAEOLOGY: DISCIPLINE BORDERS AND MIGRATION IN FRANCE (1950-2000)

*Plutniak, Sébastien - (Lisst-Cers, EHESS, France) sebastien.plutniak@ehess.fr*

All along the second half of the 20th Century, both analogical and digital electronic computing technologies encountered a fast and flourishing development. Applications were performed in various civilian, industrial and scientific fields. Scientific applications, more and more unavoidable, led to the creation of specialties and “hyphenated computing” disciplines, following P.-M. Mounier-Kuhn’s word (Mounier-Kuhn, 2010), such as computational linguistics, bioinformatics and more recently neurocomputing and computational archaeology. On this matter we shall distinguish between process of quantification (involving measurement) and process of mathematisation (involving formal abstraction) of a scientific practice: historiographical account of mathematisation have a long-standing tradition, concerning above all physics (Gingras, 2001) and instrumentation (Joerges, Shinn, 2001). Methodological and technological transfers in science are not limited to a cognitive phenomena and can lead to changes in the institutional and social organisation of a discipline: lines and objects of research, legitimacy and recognition can be redistributed, as it was the case between linguistics, computing science and engineering (Grosseti, Boë 2008). These studies offer us a robust framework to investigate the archaeological case, as fewer studies have been led about humanities disciplines.

Contrary to the English-speaking archaeological case, formalisation and computing had a far more restricted role in French archaeology, which has been characterized as a “continental insularity” (Audouze, Leroi-Gourhan, 1981). In this paper we aim to investigate this peculiar situation, relying on a limited set of cases regarding the relationships between archaeology, computing and engineering. This recent side of the history of French archaeology has been less enlightened (Djindjian 2009) and led us to propose a socio-historical account of these developments. The case of Jean-Claude Gardin’s

innovative collaborations will be stressed. Starting from the 1960's he established several contracts, both with inter-governmental and private institutions in order to elaborate archaeological applications of mechanical and electronic computing. The *Centre d'automatique documentaire pour l'archéologie* he set up in Marseille in 1964, recruited mathematicians and engineers: both in order to develop methodological innovations and to offer computing services to archaeologists (and, in fact, to various scientific communities).

Issues related to disciplines' forms and dynamics and to boundary-objects underlie this case. What kinds of positions had these engineers reached and occupied in the archaeological and scientific fields? What were their professional trajectories and their influences on the archaeological discipline? We will emphasize the determination of social relations in these innovative collaborations. Doing so, we aim to contribute to the issues related to "lobbying" by exposing the variability related to the relationships between archaeological and engineering communities.

ORAL

## 5. THE AUSTRALIAN RESEARCH COUNCIL AND THE ARCHAEOLOGY OF THE MODERN CITY IN AUSTRALIA

*Murray, Tim (Faculty of Humanities and Social Sciences, La Trobe University, Melbourne) t.Murray@latrobe.edu.au*

From the late 1990s the Australian Research Council radically reformed its grant schemes in order to underwrite a significant expansion in research funding through developing close links between the academy and industry. Two schemes in particular (SPIRT - Strategic Partnerships Industry Research and Training; and Linkage) provided a framework within which the strategic value of archaeology to industry, especially in the resources sector and in prorty development, was significantly enhanced. In the 20 years that have followed Australian archaeology has been transformed by these new connections, especially those related to the re-development of building stock in the cores of fast-growing cities such as Sydney and Melbourne. Not only has a great deal of archaeology been done, the financial requirements of industry have led to developments in excavation, recording and analysis methodologies practiced across all fields of archaeology.

ORAL

## 6. LOBBYING FOR ARCHAEOLOGY IN THE ITALIAN "FIRST REPUBLIC"

*Guidi, Alessandro (università roma tre) alessandro.guidi@uniroma3.it*

Nowadays, the period between the Liberation from Fascism (1945) and the explosion of scandals that characterized the chronicles of 1992 is defined, in Italy, as the "First Republic".

The paper will examine, in this period, three examples of political lobbying finalized to an (economic) advantage of the major political party, the Democrazia Cristiana (DC) and, from the late 1970s onwards, of their preferred partner, the Italian Socialist Party (PSI)

- the history of the Cassa del Mezzogiorno, a sort of State Bank created to stimulate with massive sums of money the economy of the underdeveloped South of the Country, an organism that specially in the 1950s and in the 1960s allowed many excavations of the most important Greek and Roman cities and/or monuments and the consequent creation of modern Museums and Archaeological Parks;

- the promanation, in the late 1970s, of a law for the creation of young people cooperative societies in the field of Cultural Resource Management (legge 285; many of the young archaeologists, historians of art and architects were later absorbed in the State Antiquity Offices [Soprintendenze]);

- the metaphor, in the 1980s, of Cultural Resources as our "oil" (hence the name "cultural reservoirs"), with the creation of societies whose first aim was the computerization of the cultural patrimony ("Beniculturali").

In all these study-cases archaeologists exploited for their researches the relevant quantities of money that were at the same time the first incomes (and sometimes a real access to stable occupation) for many generations of young practitioners, creating a sort of patron-client relationship with political or academic authorities.

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ORAL

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## **7. INNOVATIVE ALLIANCES IN THE TWENTIETH-CENTURY HISTORY OF SPANISH ARCHAEOLOGY.**

*Díaz-Andreu, Margarita (ICREA-Universitat de Barcelona)  
m.diaz-andreu@ub.edu*

The Fons Pericot (Pericot Archive) contains an amazing number of letters received by Prof. Luis Pericot (1899-1978), mainly after the Spanish Civil War, as well as other items.

Although a complete study of the material is yet to be undertaken, the selection of the correspondence so far studied reveals some alliances that archaeologists were establishing at the time with administrations and non-archaeological institutions in order to strengthen their scientific practices.

Alliances with non-archaeologists included members of the diplomacy, wealthy sponsors and touristic offices. Other alliances were established with archaeologists from major powers of the time, a novelty which reported great benefits for Spanish archaeology.

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ORAL

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## **8. LOBBYING FOR ARCHAEOLOGY: AN OVERALL ASSESSMENT**

*Marc-Antoine, Kaeser (Latenium / University Neuchâtel)  
marc-antoine.kaeser@unine.ch  
Géraldine, Delley - (University Neuchatel) geraldine.delley@unine.ch*

In view of the novelty of the field of historiographical inquiry into the « Lobbying for archaeology », this contribution aims at a general synthesis of the teachings of the session A8a.

The different contributions to the session A8a will be taken into account. The synthesis will focus on the identification of similarities and possible permanent features – as well on the thematic level as on geographical, regional/national/international, political, chrono-historical levels.

The generic role of « innovative alliances » will be the subject of an overall assessment, evaluating their contribution to the establishment of the archaeological discipline.



# A8b International relations in the history of archaeology

Commission on History of Archaeology

(Organisers: Víctor M. Fernández, Margarita Díaz-Andreu)

Tuesday 2nd (9:00 to 13:30)  
A11 Meeting Room



2014 burgos  
1-7 sept.

**uispp**

Union International  
de Sciences Préhistoriques  
et Protohistoriques



XVII World UISPP Congress  
XVIIe Congrès Mondial de l'UISPP  
XVII Congreso Mundial de UISPP

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ORAL

## 1. FROM FAR AWAY: MUSEUMS, COLLECTIONS AND SCIENTIFIC RESEARCH

*Chichkoyan, Karina Vanesa - (IPHES- URV) karinavch@gmail.com*

Nineteen century was of movements and immigration of large contingents of people. But this also included the extrapolation and storage of fossil materials in different museums, like happened with South American paleontological collections that were translocate to Europe. In an era where crossing frontiers was easier, objects moved along with peoples, and control over the exit of national territory and entrance into a new one was generally celebrated. This contrast with nowadays situation, were patrimonies are reclaimed and increasing controls are done in order to stop the illegal contraband of archaeological and paleontological pieces.

Today we found these collections distribute in several museums and institutions, miles away from its original point. A reflection about this situation is useful after one hundred years of this event: shall they return to their home countries or shall they stay away. Although the importance in housing material in its original places, a different point of view is taken here: material housed outside allows the diffusion of the own patrimony to citizens that perhaps will never travel to those countries, and encourages intercultural knowledge, but also they provide useful material to realize new studies in international programs which imply an extension of the institutional ties. This material can be focus with the application of methodologies that are not used in the original country, so in an indirect way, this patrimony provides to the research developed there. These conditions also allow integrating and contrasting different theoretical frameworks and data that improve interregional/intercontinental comparisons.

The experience realized in the Natural Science of Valencia, Spain where the Rodrigo Botet collection is housed, is an interesting example case. This is the most important collection of South American fossil megafauna in Europe and was studied by Boscá Casanoves, first curator of the museum. It was part of the first Paleontological Museum in Europe and it is characterized by the diversity and the large amount of material. The same was donated by Rodrigo Botet at the end of the XIX Century and it is the result of non-systematic excavations done by Enrique de Carles at the north-eastern sector of the Pampas Region in Argentina. It also has important human remains, as

the "Samborombon skeleton", that unleashed in Spain the polemic about the antiquity of the first American peopling, as was postulated by Ameghino at that time. This collection was studied under the Erasmus Mundus Master in Quaternary and Prehistory program and currently is part of a PhD. thesis that will include material from this country housed in different museums in Europe and were translocate to this continent in the Nineteen century.

This kind of experiences can only developed because of the political situation the world was passing thought more than one hundred years ago. Thanks to that flow of goods, today, investigation outside the country can be realized and this allows the application of different methodologies, provides new data, and, contrary to what it is supposed, it broaden scientific research from far away.

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ORAL

## 2. BRITISH IDEAS IN A FRENCH WORLD. VICTORIAN ANTHROPOLOGISTS AND THE CREATION OF THE "PALAEOLITHIC ART" CONCEPT (1890-1906)

*Palacio Pérez, Eduardo - (Instituto Internacional de Investigaciones Prehistóricas de Cantabria (Universidad de Cantabria) eduardo.palacio@unican.es*

The concept of "Palaeolithic art" changed completely in the late nineteenth and early twentieth century. A concept based on naive realism and the decorative nature of the representations changed into one founded on an evolutionist explanation of the artistic form and in the symbolic-religious meaning of the different motifs. This change was determined by the introduction of a series of ideas developed by British evolutionists in the field of French prehistory. This took place within a complex scenario marked by tension between each country's own archaeological traditions and a clear trend towards the international transmission of ideas. The French researchers Salomon Reinach (1858-1932) and Henri Breuil (1877-1961) played a vital role in this process.

Papers, monographs, conference and congress proceedings, autobiographical diaries and correspondence of the main actors.

The traditional concept of "Palaeolithic art" which appeared in the early twentieth century was the result of the transfer of ideas from British evolutionist anthropology to French prehistory.

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ORAL

### 3. THE "FIRST DOCTOR OF CASTILLO": NELS NELSON AND TRANS-ATLANTIC ENGAGEMENT IN PALEOLITHIC ARCHAEOLOGY IN THE 1910S

*Snead, James E. - (Department of Anthropology California State University, Northridge) jsnead@csun.edu*

Because of the cultural primacy of Old World history and prehistory for scholars in the in the 19th century United States, engaging this past through programs of field-work and scholarship were a deep concern to American intellectuals. Limited resources were available, however, and for much of the century such interaction was limited to exchanges of letters and specimens, with modest programs of classical research, occasional tours of European museums, and meetings with specialists. The turn of the 20th century ushered in new ambition for more direct involvement. The American Museum of Natural History in New York sought to establish a European presence that would extend its curatorial expertise in mammalian paleontology into the realm of human prehistory. Opportunities to develop such a program, however, were scarce, so when a personal visit to France and Spain provided museum president Henry Fairchild Osborn with a range of new contacts, he quickly responded by dispatching a junior colleague, Nels Nelson, to Spain. Nelson's experience at Castillo, where he worked under Hugo Obermaier with an international team, was influential for all concerned. The experience of the "first doctor of Castillo"—as he was humorously designated by Obermaier—thus documents a formative episode of trans-Atlantic engagement in Paleolithic archaeology.

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ORAL

### 4. INTERNATIONAL RELATIONS WITHIN EARLY MESOLITHIC RESEARCH IN NORTHERN SPAIN

*Fano, Miguel Ángel - (Universidad de La Rioja) miguel-angel.fano@unirioja.es*

*Cubas, Miriam - (IIIPC - Sociedad de Ciencias Aranzadi) mcubas@aranzadi-zientziak.org*

The relationship between researchers, at both local and international levels, is a key factor in the historiographical evolution of any research topic. In this paper, the work of the pioneers of Mesolithic research in northern Spain (1914-1930) is described within the framework of scientific and personal relationships at that time. The goal is to analyze their impact on the early research on the period

and its subsequent historiographical development.

The study examines monographs and excavation reports, as well as other documents (diaries, correspondence and biographies) directly related with the scholars involved in prehistoric research in northern Spain during the first third of the twentieth century: Count of la Vega del Sella, Hugo Obermaier, José Miguel de Barandiarán, Henri Breuil, Lorenzo Sierra and Jesús Carballo, among others.

As in the case of Palaeolithic studies, the first research on the Mesolithic in the region did not take place in isolation from European prehistoric studies at the time. The study of the Mesolithic in Cantabrian Spain began within a historiographical context marked by the existence of relationships between local pioneers in Prehistory and a number of foreign archaeologists. These relationships fostered, for example, Obermaier's collaboration in some of Vega del Sella's excavations. In this way, the German prehistorian was witness to the start of Mesolithic research, and he also took part in it. However, the available information reveals that relationships between Spanish archaeologists were rather lukewarm, in general.

The feedback between Spanish and foreign archaeologists sometimes had a significant impact from the historiographical point of view, such as the early location of the *Asturian* culture in its European context. At the same time, the cooler relations among Spanish researchers meant that no debates took place about matters that still remain open, such as the existence of "different Mesolithic facies" in Cantabrian Spain.

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ORAL

### 5. THE CHICAGO CONNECTION IN SPANISH PALEOLITHIC PREHISTORY

*Straus, Lawrence - (University of New Mexico) lstraus@unm.edu*

A half-century has passed since anthropological archeologists from the University of New Mexico began collaborating with Spanish prehistorians and paleontologists in the study of the Paleolithic of central and northern Spain. While international politics may have provided the initial background for work at Torralba, Ambrona and Cueva Morin in the mid-late 1960s, the long trajectory of interdisciplinary cooperative research has been mutually fruitful for the development of our understanding of Pleistocene hominin adaptations as a result of pro-

ductive, amicable, mutually respectful cooperations that continue to this day. This presentation reviews and indeed celebrates the work and interactions of Clark Howell, Emiliano Aguirre, Leslie Freeman, Joaquin Gonzalez Morales, Karl Butzer, Jesus Altuna, and a whole generation of their students, including the present author and his Spanish and American colleagues, as well as their current and recent students.

The author was a student of Howell, Freeman and Gonzalez Echegaray and has conducted research in Spain with both G.A. Clark (another Freeman student) and M.R. Gonzalez Morales (an Echegaray disciple, while also collaborating with J. Altuna and many other Spanish specialists).

The interactions and mutual influences that developed during the course of excavations at Torralba, Ambrona, Cueva Morin, La Riera, El Juyo, Altamira and Cueva del Miron are analyzed in the light of the development of both the practice of prehistoric archeology in Spain as it turned toward a more anthropological (and less culture-historical) direction and in light of the vast increase in substantive knowledge and practical experience for American researchers, including students. Field experiences, analyses of materials (both cultural and "ecofactual"), participation in meetings and congresses in the U.S., Spain and internationally, joint publications, research/teaching visits in host institutions, scholarships/fellowships, service on thesis/dissertation committees, etc. all contributed (and continue to contribute) to a rich synergy of mutually fruitful professional and personal relationships that changed the course of prehistoric research both for Spain and for certain American prehistoric archeologists.

The overall balance (from my admittedly biased viewpoint) has been positive, and as a participant, the author wishes to make this point in the significant venue of Burgos, not far from Atapuerca, and about mid-way between Soria and Cantabria, where the Chicago connection has had its main impacts on the development of paleoanthropological science in Spain.

ORAL

## 6. AN INFLUENTIAL OUTSIDER: GEORGES LAPLACE IN ITALY

*Plutniak, Sébastien - (Lisss-Cers, EHESS) sebastien.plutniak@ehess.fr*

*Tarantini, Massimo - (Soprintendenza per i Beni archeologici della Toscana) massitarantini@gmail.com*

French prehistorian Georges Laplace defended his thesis in 1961 and published it in 1966. Entitled *Recherches sur l'origine et l'évolution des complexes leptolithiques* this work has been of crucial importance in the field of Upper Palaeolithic studies. Beside its methodological insights with regards to the quantitative approaches of the lithic industries, this work gathered data from an unusually broad area. He studied assemblages from North Africa to Central Europe, passing by Spain and before all France (75 assemblages) and Italy (38 assemblages). However, this innovative study was unequally received, discussed, and extended in these countries. It became very influential in Spain and particularly in Italy.

In this paper, we aim to come back to this formative period of Georges Laplace's scientific life: the period he spent in Italy, doing his doctoral thesis. Social and historical studies of science proposed several ways to account for spatial and social mobility as a critical feature of the scientific activities and their dynamic (Ben-David, Collins 1966; Daryl 1976). Grounded on sociological frameworks regarding migrations in science we scrutinize the Italian years of Georges Laplace. In order to go beyond a biographical account we consider his stay and his researches in Italy in relation to their intellectual and institutional environments. How Laplace got the opportunity to reach Italy? What role played his French supports (as l'Abbé Breuil) and the contemporary policy of the *École française de Rome*? How was structured the prehistoric field in Italy and how Laplace succeeded to manage his own research while taking benefit from his outsider position? How its methodological and interpretative approach was received and reprocessed in Italy?

Our paper aims to answer these questions, drawn upon archives kept at the *Musée National de la Préhistoire* (Les Eyzies-de-Tayac, France), l'*École française de Rome* (Italy), the *Muséum national d'Histoire naturelle* (Paris) and at the *Istituto Italiano di Paleontologia Umana* (Anagni, Italy) and numerous interviews performed with prehistorians who were close to Georges Laplace.

ORAL

**7. AFRICANISM AND INTERNATIONAL RELATIONS OF THE SPANISH PREHISTORIC ARCHAEOLOGY (1939-1956)**

*Gozalbes Cravioto, Enrique (Universidad de Castilla -La Mancha) enrique.gozalbes@uclm.es*

After the Spanish Civil War, a struggle for control of Archaeology broke out. One of the elements of that struggle was precisely the outer extension in the nearest territories through the doctrines of the Africanism. In particular the participation in Morocco was of paramount importance, as it allowed the Commissioner General of Excavations, J. Martínez Santa-Olalla, try to check his thesis about the Spanish origin of the North African cultures. However, he was displaced by Luis Pericot in the African context.

Documentation of the Archaeological Museum of Tetouan. Analysis of Bibliography and official Acts and other materials of the First Archaeological Congress of the Spanish Protectorate in Morocco (1953).

In the context of this time, the presence of the Spanish prehistoric and archaeological research in the Protectorate allowed the contact with European and American prehistorians.

In our contribution we have analyzed these contacts. Especially in the final part of our paper we have paid attention to the collaboration developed between M. Tarradell and L. Balout around the celebration of the Archaeological Congress in Tetuan in Spanish Morocco and after the synthesis of Maghreb prehistory of Balout, documentation from the Archaeological Museum of Tetouan.

ORAL

**8. ARCHAEOLOGICAL CONNECTIONS: TRACKING AND TRACING INTERNATIONAL RELATIONS THROUGH PORTUGUESE COLONIALISM**

*Conde, Patrícia - (Tropical Research Institute, Lisbon, Portugal) patricia2conde@gmail.com*

*Martins, Ana Cristina - (Tropical Research Institute, Lisbon Portugal) / Uniarq-Centre for Archaeology, University of Lisbon, Portugal) ana.c.martins@zonmail.pt*

Amongst studies on the History of Archaeology, colonialism has become one of the main topics. Although still recent in Portugal, the research concerning archaeological practices conducted in and about the former Portu-

guese colonies has brought to light, on one hand, the case of the Board of Geographical Missions and Colonial/Overseas Research (Junta das Missões Geográficas e de Investigações Coloniais/do Ultramar) (1936-1951/1952-1973), within which "Anthropological Missions" encompassed the knowledge of the remote past of those territories and, on the other hand, the surveys led by personal enterprises and local entities which contributed to the production and circulation of archaeological and prehistoric knowledge.

From the confluence of these two axes of analysis it also emerges a growing approach which bring new data and insights into this field of studies. That is the case of regional and international scientific networks that shaped ideas, terminologies and methodologies. Indeed, not unrelated to other colonial contexts and agendas in which Archaeology was becoming institutionalized within scientific research centers and museums, different protagonists and institutions, either from the Portuguese metropolis or its colonies, engaged in a wide dynamic that took shape in congresses and conferences, internships abroad and fieldwork conducted in collaboration with other leading figures of African Archaeology, often resulting in the publication of studies and reports.

In addition to these more noticeable features, correspondence between individuals and institutions from within the country and abroad comprises less detectable aspects regarding the diverse manners Archaeologists addressed questions about Africa's past, enclosing a wealth of information over a broad range of issues which provide a valuable frame to locate Archaeology in different political, economic, social, cultural and geographical contexts during colonialism in the twentieth century.

Under the scope of the Project *Archaeology and Portuguese colonial agenda*, funded by the Portuguese Foundation for Science and Technology, we intend to track and trace the multiplicity of international relations that emerge from the scrutiny of Archaeology conducted during Portuguese colonialism as well as its role in the History of Archaeology.

To discuss about the role and the many forms of international relations in the History of Archaeology that emerge from the scrutiny of Archaeology conducted during Portuguese colonialism we will practice an historical approach. In doing so, we will use mainly both written and iconographic primary sources from public and private archives, namely the documentation in the custody of the Tropical Research Institute (Instituto de Investigação Científica Tropical) (Portugal), the current

successor of the Board of Geographical Missions and Colonial/Overseas Research.

The tracking and tracing of regional and international scientific exchange related to Archaeological research conducted during Portuguese colonialism enables the mapping of a worldwide connection involving different contexts, actors and typologies.

The links between Archaeology and colonialism provide undeniable contributions to the historicization of the discipline. In this framework, we hold that a study on the History of Archaeology cannot fail to consider the many international scientific relations about African Archaeology and Prehistory that took place during the 20<sup>th</sup> colonialism.

ORAL

### **9. FUNDING INTERNATIONAL STUDY TRIPS IN EARLY TWENTIETH CENTURY EUROPE: THE JAE GRANTS AND THE PRESENCE OF SPANISH ARCHAEOLOGISTS IN ITALY (1907-1936)**

*Sánchez Salas, Francisco - (Universitat de Barcelona) francisspr@gmail.com*

The Junta para la Ampliación de Estudios e Investigaciones Científicas (JAE, Spanish Council for the Expansion of Study and Scientific Research) created in 1907. The purpose of this official institution was "to train the future teaching body and to give to the present one the means and facilities to follow closely the scientific and pedagogical movements of the most cultivated nations". Grants for study trips were one of the initiatives that the JAE had in order to reach its aim.

As a result, a large number of Spanish scholars were able to travel to different locations in Europe and also North America. There is information about the selection process and the activities of the grantees in the JAE annual reports. In addition, other type of documents such as reports that the grantees sent to the JAE are now stored in the archive of the Residencia de Estudiantes in Madrid.

This paper will focus on the archeologists who chose Italy as a destination country for their grants. This group was an important one because Italy was selected by more than 40% of archaeology grantees. This preference for Italy, and especially for Rome, can only be partly explained by the founding of the Spanish School of Rome for Archeology and History in 1910. In this paper the impact of these study trips will be analysed

ORAL

### **10. INTERNATIONAL GEOGRAPHIES OF ARCHAEOLOGICAL KNOWLEDGE ? RELATIONS BETWEEN SPANISH AND BRITISH ARCHAEOLOGISTS**

*Díaz-Andreu, Margarita - (ICREA-Universitat de Barcelona) m.diaz-andreu@ub.edu*

This paper will explore the impact of geography in the production, consumption and circulation of knowledge. The analysis will be divided into two major subjects: the geographies of production and reception. The questions to be asked are, on the one hand, whether it matters where archaeological knowledge is produced and whether the archaeologists' locations can influence the content and nature of their scientific production and have an effect on the national and international networks they form. On the other hand, an assessment will be made of the existing conditions and means by which the transmission of knowledge takes place and whether this affects reception.

These different approaches will lead us to a discussion about the perception of academic authority and credibility.

These issues will be discussed in the context of the relationship between Spanish and British archaeology in the twentieth century on the basis of the information found in the Fons Pericot.

ORAL

### **11. INTERNATIONAL RELATIONS IN THE HISTORY OF ARCHAEOLOGY WHEN THE MODERN IS TOO NEW – ON HANNA RYDH AND HER FRENCH CONTACTS.**

*Arwill-Nordbladh, Elisabeth (Department of Historical Studies, University of Gothenburg, Sweden) E.Nordbladh@archaeology.gu.se*

In the 1920ies the Swedish archaeologist Hanna Rydh (1891-1964) spent 6 months at Musée des Antiquités Nationales in St-Germain-en-Laye near Paris, to study Palaeolithic issues. Leader of the archaeological department was the prominent professor Henri Hubert, a disciple of Emile Durkheim and close friend and co-worker of Marcel Mauss. A few years after her French sojourn, Rydh published two articles, one on symbolism in mortuary practices and the other on seasonal fertility and death

cult in Scandinavia and China, themes that were not familiar in Scandinavian archaeology. Here I propose that Rydh was influenced by Durkheimian ideas. The reception of the articles was however very harsh, and a conclusion is that Swedish archaeology was not ready for these continental ideas.

ORAL

## 12. THE INTERNATIONALIZATION OF SWISS WETLAND ARCHAEOLOGY AFTER WWII

*Delley, Géraldine - (Université de Neuchâtel, Institut d'archéologie) geraldine.delley@unine.ch*

In the 1950s, the position of prehistoric research in Switzerland is very unstable. Wetland archaeology, a popular topic, appeared to be a very attractive domain for renewing and reinforcing the perspectives of Swiss prehistory. However wetland archaeology was also problematic: the nationalist dimension of this field of research – responsible of its great visibility at the end of the 19<sup>th</sup> and at the beginning of the 20<sup>th</sup> centuries – was no more bearable after WWII.

This research is based on the analysis of published and unpublished sources (correspondence between scientists, unpublished reports and interviews).

International collaborations in the domain of wetland archaeology during the 1950's brought an opportunity for Swiss archaeologists to renew and thus modernize their practices, reviving the traditional question of the prehistoric lake-dwellings in a methodological perspective. The competences of Scandinavian and Dutch specialists in the domain of natural sciences – sedimentology and palynology – applied to archaeology were particularly decisive.

International collaborations in the field of Swiss wetland archaeology after WWII yielded to the diffusion of innovative tools and new *savoir-faire*. The internationalist dimension of these collaborations was also a means for Swiss archaeologists to turn the debate of this traditional field of research onto new perspectives.

ORAL

## 13. PORTUGUESE ARCHAEOLOGY AND ITS INTERNATIONAL NETWORKS DURING THE 60IES: PROTAGONISTS AND PROJECTS

*Martins, Ana Cristina - (Tropical Research Institute / Uniarq-Center for Archaeology, University of Lisbon) ana.c.martins@zonmail.pt*

In 1958, Lisbon hosted the 1<sup>st</sup> National Congress of Archaeology. Postponed, in contrast to analogous meetings organized in other countries, it intersected generations of Portuguese archaeologists. Predominantly, between those born in late 19<sup>th</sup> century, and young ones looking for new theoretical models. But, to achieve this intention, it was essential to reduce the internal traditional proximity to Spanish and French academicism, in search of new archaeological and anthropological schools. This process became indispensable so as to find new paradigms, visions and synergies. That is why they were largely enthusiastic with the *Wheeler-Kenyon* stratigraphic method, while discovered and learned about *New Archaeology* (1958).

Nevertheless, geographical closeness, individual interests and friendships, alongside with institutional - public and private -, agendas and shared topics, justified a long-standing collaboration between Portuguese and Spanish archaeologists. Fact made clear by several individual and institutional correspondences kept in diverse archives, such as the ones belonged to the National Museum of Archaeology (1893) and the Association of Portuguese Archaeologists (1863).

It is, consequently, our intent within the Spanish research project *Archaeology without frontiers. The international contacts of 20th-century Spanish archaeology*, to reconstruct networks of Portuguese making, circulation, reception and dissemination of archaeological knowledge within international context, identifying head names, organizations, and research projects. Lastly, we will estimate their influence on the establishment of Portuguese archeology, from the late '50s to the early '70s.

To discuss about the ways and the many forms of international networks of Portuguese archaeology during the 60<sup>ies</sup>, we will practice an historical approach. In doing so, we will use mainly both written and iconographic primary sources from public and private archives, namely the documentation in the custody of the National Museum of Archaeologists and the Portuguese Association of Archaeologists, together with several secondary sources

published by Portuguese archaeologists between the end of the 50ies and the beginning of the 70ies.

Evaluating the many ways and forms of international networks of Portuguese archaeology during the 60<sup>ies</sup>, we will be able to understand the relevance of these connections on the establishment and development of scientific projects inspired in *New Archaeology*, institutions and university courses, when comparing to coeval examples, naming protagonists, institutions, outcomes and outputs.

The links between particularities of Portuguese archaeology and the many ways and forms of international networks of Portuguese archaeology during the 60<sup>ies</sup> *New Archaeology* in the country, provide undeniable contributes to the historicization of the discipline. In this framework, we hold that a study on the History of Archaeology cannot fail to consider the significant role of international scientific networks in the establishment and development of archaeology.

whose practicans had be in a more narrow contact with improvements in the north of the continent.

The late arrival of the processual archaeology advances to our country contributed to these improvements coming somewhat weakened and already affected by the radical critique of 'post-processual' or 'post-modern' archaeology in the anglo-saxon realm. As a result, its effect was less important than expected and this fact could possibly explain that a great part of spanish archaeology nowadays still follows, only with a light 'scientific' bar-nish, culture-historial paradigms.

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#### ORAL

### 14. LEARNING TO BE SCIENTIFIC: THE INTRODUCTION OF THE 'NEW ARCHAEOLOGY' IN SPAIN, 1975-1990

*Fernández, Victor M. - (Universidad Complutense De Madrid) victormf@ucm.es*

Around 1975, in coincidence with the end of Franco dictatorship and the renewal of Spanish culture and politics, archaeology began to receive influences from abroad, the most important being that from the then called 'new archaeology' in USA and great britain. Up to that moment, spanish archaeology was mainly descriptive and had an culture-history orientation that hampered any attempt of theoretical or methodological advances.

The paper consists of a survey of the publications between 1975 and 1990 in the most important archaeological journals of the country, combined with personal interviews with some of the key actors at the moment, now approaching retirement and whose information requires to be collected before it is too late.

The novelties of the new archaeology were two-sided, methodological and theoretical. The first were easily and fastly adopted among us, especially those related to 'spatial archaeology' implemented from the Teruel congresses on this topic since 1984. The second had a far less impact, mainly confined to the field of americanist archaeology



# A9a The origins of Upper Palaeolithic in Eurasia

Commission on Upper Palaeolithic of the Western Eurasia  
(Organisers: Federico Bernaldo de Quiros, Sergey Lev)

Tuesday 2nd (9:00-13:30 to 14:30-19:30)  
Meeting Room A03



2014 burgos  
1-7 sept.

**uispp**

Union International  
de Sciences Préhistoriques  
et Protohistoriques



XVII World UISPP Congress  
XVIIe Congrès Mondial de l'UISPP  
XVII Congreso Mundial de UISPP

ORAL CONTRIBUTIONS

ORAL

## 1. LE MAMMOUTH DANS TOUS SES ÉTATS

*Vercoutère, Carole - (Département Préhistoire du MNHN / CNRS UMR 7194) cvercout@mnhn.fr*

*Patou-Mathis, Marylène - Département Préhistoire du MNHN / CNRS UMR 7194) patmath@mnhn.fr*

*Demay, Laëtitia - (Service d'archéologie préhistorique de l'Université de Liège / Département Préhistoire du MNHN / CNRS UMR 7194) laetitia.demay@student.ulg.ac.be / ldemay@mnhn.fr*

*Le mammouth dans tous ses états* est une réflexion sur le statut du mammouth laineux (*Mammuthus primigenius*) au sein des sociétés de chasseurs-cueilleurs du Paléolithique supérieur.

Présent à la fois dans la sphère domestique (consommé, source de matières premières), le domaine symbolique et l'imaginaire collectif, ce proboscidiien demeure pourtant peu visible dans les études archéozoologiques *s.l.* des sites d'Europes occidentale. Ce constat est-il en lien avec des questions d'ordre méthodologique? Cette faible représentation du mammouth dans les listes fauniques est-elle une réalité archéologique? Si oui, signifie-t-elle pour autant que les Hommes ont peu interagit avec cet animal? En d'autres termes, les caractéristiques propres au mammouth (*e.g.* très grande taille) et les pratiques de chasse et de boucherie qui lui sont spécifiques sont-elles les seules causes de la rareté de ses ossements dans les sites anthropisés? Cette sous-représentation, particulièrement effective en Europe occidentale, ne pourrait-elle pas s'expliquer par une position à la marge de l'aire d'expansion du mammouth ou/et par des traditions culturelles tournées préférentiellement vers d'autres espèces/matériaux (*e.g.* renne/bois)?

L'étude comparative des résultats d'analyses archéozoologiques menées sur des matériels issus de sites contemporains, mais de contextes environnementaux différents, nous permettra d'apporter des éléments de réponses à ces questions et également d'engager une réflexion naturaliste approfondie sur le statut du matériau ivoire. Par exemple, le choix d'utiliser l'ivoire se fait-il en fonction de la destination de l'objet ou/et du statut accordé à l'«animal ressource»? Quant à l'examen typotechnologique des pièces en ivoire, qui permet de restituer les savoir-faire techniques des artisans, autant que la fonction des objets, il définira la place de l'ivoire non

seulement dans l'économie, mais aussi dans l'imaginaire collectif des sociétés paléolithiques.

ORAL

## 2. LEVALLOIS POINT PRODUCTION IN SOUTHERN SIBERIA AND EASTERN PART OF CENTRAL ASIA: TECHNOLOGICAL VARIABILITY, GEOGRAPHICAL DISPERSAL AND CHRONOLOGY

*Rybin, Evgeny - (Institute of Archaeology&Ethnography, Russian Academy of Sciences, Siberian Branch, Novosibirsk, Russia) rybep@yandex.ru*

*Slavinskiy, Vyacheslav - (Institute of Archaeology&Ethnography, Russian Academy of Sciences, Siberian Branch, Novosibirsk, Russia) slavinski@yandex.ru*

Occurrences of Levallois reduction technology in Siberian assemblages has been widely considered as an integral part of Middle and Early Upper Paleolithic of this region. This paper draws on the results of the studying of data about distribution of characteristic features of Levallois reduction strategy – predetermined triangular and subtriangular spalls, examined through the studies of typical and atypical Levallois pointed artifacts and refits founded in assemblages from Altai Mountains throughout Southern Siberia towards Mongolia determined as the easternmost region of distribution of Levallois point technology. Resulting discussion allows underlining the similarities and differences in the Levallois methods variability in the Middle and Early Upper Paleolithic and giving a broader picture of continuity and/or discontinuity during the “transition” between these epochs.

ORAL

## 3. UPPER PALEOLITHIC OF CENTRAL ASIA: KULBULAK CULTURE

*Kolobova, Kseniya - (Institute of Archaeology & Ethnography SB RAS) kolobovak@yandex.ru*

*Krivoshapkin, Andrey - (Institute of Archaeology & Ethnography SB RAS) krivoshapkin@mail.ru*

The paper focuses on the descriptions and analyses of the lithic industries recovered from the Upper Paleolithic strata at the Kulbulak site in Uzbekistan, one of the most important sites in western Central Asia. Archaeological studies at this site along with the studies of Kyzyl-Alma-2, Dodekatym-2 and Shugnou in the western and north-western parts of the Pamir –Tien Shan Mountain Range

allows us to propose the identification of Kulbulak cultural-technical tradition. It is characterized by the bladelet technique and represents an original technocomplex of small tools including backed artifacts and triangular microliths. The established trend in the lithic tradition development, the stages of emergence, development, flourishing and replacement of the artifacts fashioned through the carinated technology. The noted features of this technical tradition are typical for the Upper Paleolithic technocomplexes of this region.

ORAL

#### 4. ZOOARCHAEOLOGICAL INVESTIGATIONS AT OBI-RAKHMAT (UZBEKISTAN): INSIGHTS FOR THE PEOPLING OF EURASIA

*Patou-Mathis, Marylène - (Department of Prehistory of National Museum of Natural History, UMR 7194, IPH 1 rue René Panhard, 75013, Paris, France) patmath@mnhn.fr*

*Julien, Marie-Anne - (Archaeology Department, University of Southampton, Avenue Campus, Southampton SO17 1BF, UK) m.julien@soton.ac.uk*

*Crépin, Laurent - (Department of Prehistory of National Museum of Natural History, UMR 7194, IPH 1 rue René Panhard, 75013, Paris, France) l.crepin@mnhn.fr*

*Krivoshapkin, Andrei - (Institute of Archaeology & Ethnography, Russian Academy of Sciences, Siberian Branch, Lavrentieva Ave., 17, 630090, Novosibirsk, Russia - Novosibirsk State University, Faculty of Humanities, Department of Archaeology & Ethnography, Pirogova str., 2, 630 ) krivoshapkin@mail.ru*

Obi-Rakhmat (Uzbekistan) is one of the most important paleolithic archaeological site in Central Asia. Located in the Tien-Shan Mountains, over 1.000 m of elevation, the important 10 meters thick stratigraphical sequence of Obi-Rakhmat delivered rich archaeological deposits from the Middle Palaeolithic to the Upper Palaeolithic. The lithic industry presents original features characteristics of Laminar Middle Palaeolithic. Furthermore, this site yielded 156 human remains with a datation around 70 ky.

In this paper, we present the results of the zooarchaeological study of the 22 archaeological layers of this site, which totalize more than 80,000 skeletal remains.

The behavior of the earliest human occupations attributed to Neanderthals will be compared to the occupations attributed to anatomically modern humans from the upper layer.

Finally, we will discuss the involvement of Obi-Rakhmat site in the understanding of the peopling of Central Asia.

ORAL

#### 5. THE ROSTAMIAN, AN EARLY UPPER PALEOLITHIC BLADELET INDUSTRY OF THE SOUTHERN ZAGROS MOUNTAINS OF IRAN

*Ghasidian, Elham - (Department of Early Prehistory and Quaternary Ecology, University of Tuebingen, Germany) elham.ghasidian@uni-tuebingen.de*

*Conard, Nicholas - (Department of Early Prehistory and Quaternary Ecology, University of Tuebingen, Germany) nicholas.conard@uni-tuebingen.de*

Fieldwork in the Dasht-e Rostam-Basht Region at the southern Zagros Mountains of Iran provides key record of cultural evolution during the Late Pleistocene. The 41,000 cal. BP. radiocarbon dates obtained from Ghar-e Boof Cave, associated with Rostamian tradition place this industry within the Upper Paleolithic. This tradition stone knapping was widely spread in Ghar-e Boof and the other caves and rockshelters of the Dasht-e Rostam-Basht Region. There are several features that distinguish the Rostamian as one of the cultural entities of the Upper Paleolithic. The main characteristic is the focus on unidirectional bladelet production, from both cores and flakes, and the production of the main tool types on these bladelets, including Rostam bladelet. This concentration on bladelet production distinguishes the Rostamian from the other Upper Paleolithic industries, the Baradostian and the Zagros Aurignacian. The Rostamian documents an innovative cultural tradition of restricted spatial distribution. Understanding the situation of the innovative Rostamian tradition during the beginning of the Upper Paleolithic underlines the applicability of the *mosaic polycentric modernity* model. In the Zagros Mountains the patterns of cultural and behavioral evolution during the early Upper Paleolithic appear to be more mosaic in nature and include different cultural entities within distinct ecological zones of the Zagros.

ORAL

#### 6. NEW DATA ON THE EARLY UPPER PALEOLITHIC OF WESTERN UKRAINE: CHRONOLOGY, ENVIRONMENT AND HUMAN BEHAVIOR AT THE AURIGNACIAN SITE OF BEREGOVO I

*Usik, Vitaly - (Museum of Archaeology, Institute of Archae-*

ology, Ukrainian Academy of Sciences, Kiev, Ukraine) [vitaly.i.usik@gmail.com](mailto:vitaly.i.usik@gmail.com)

Nigst, Philip (Division of Archaeology, University of Cambridge, UK, and Department of Human Evolution, MPI EVA, Leipzig, Germany) [prn25@cam.ac.uk](mailto:prn25@cam.ac.uk)

Haesaerts, Paul (Department of Palaeontology, Royal Belgium Institute of Natural Sciences, Brussels, Belgium) [Paul.Haesaerts@naturalsciences.be](mailto:Paul.Haesaerts@naturalsciences.be)

Gerasimenko, Natalia (Department of Earth Sciences and Geomorphology, University of Kyiv, Ukraine) [natadykan@mail.ru](mailto:natadykan@mail.ru)

Koulakovska, Larissa (Museum of Archaeology, Institute of Archaeology, Ukrainian Academy of Sciences, Kiev, Ukraine) [larissa.kulakovska@gmail.com](mailto:larissa.kulakovska@gmail.com)

Béla, Rácz (Department of History and Social Sciences, Transcarpathian Hungarian College Named After Ferenc Rakóczi II Berehove, Ukraine) [raczb@kmf.uz.ua](mailto:raczb@kmf.uz.ua)

Kromer, Bernd (Klaus-Tschira-Laboratory for Scientific Dating, Curt-Engelhorn-Zentrum Archäometrie, Mannheim, Germany) [bernd.kromer@cez-archaeometrie.de](mailto:bernd.kromer@cez-archaeometrie.de)

Hublin, Jean-Jacques (Department of Human Evolution, MPI EVA, Leipzig, Germany) [hublin@eva.mpg.de](mailto:hublin@eva.mpg.de)

The Early Upper Palaeolithic (EUP) of Europe is often equated with the appearance of symbolic behaviour in Europe and the dispersal of anatomically and behaviourally modern humans into and within Western Eurasia. These historical processes are heavily debated in the palaeoanthropological and archaeological research communities. In order to contribute to a better understanding of the chronology and environmental context as well as of human behaviour during this critical time period, we present here first results of our new fieldwork at the EUP site of Beregovo I (Transcarpathian Ukraine).

Beregovo I is located approx. 1 km south of the town of Beregovo. In the regional record of the EUP (e.g., Korolevo I and II, Sokirnitsa I-A) the stratigraphic sequence of Beregovo I is of key importance because its upper part covers deposits absent on other EUP sites in Transcarpathia. Previous fieldwork (1969 and 1975) at Beregovo I has classified the archaeology as late/developed Aurignacian and placed it around 26/23 ka uncal BP.

Our research at the site includes fieldwork and archaeological, geological palynological and chronological studies. Fieldwork includes piece-plotting of all objects (lithics, charcoal, tuff) >10mm using a totalstation and wet-sieving of all excavated sediment. The total collection including the small fraction recovered during wet-sieving accounts for more than 28,000 objects.

In our fieldwork we documented two archaeological horizons at Beregovo I. Here we present archaeological horizon (AH) I, which represents the vast majority of the material excavated so far. The AH I is located 2.10-2.45m below the surface in geological units C2 to C4. The majority of the lithics is located in geological unit C3; the overlying unit C2 and the underlying unit C4 contain only a smaller number of artifacts. The main distribution of AH I in unit C3 is overlain by a paleosol (unit C2) rich in conifer charcoals. Several pieces of charcoal have been AMS dated to 27/26.6 ka uncal BP, providing a minimum age for the AH I.

A special focus of our analysis is the study of lithic technology. For lithic reduction different raw material types including flint, local silicified tuff, Carpathian obsidian (3 types), andesite, quartzite, etc. were utilized. An interesting feature is the bladelet/microblade production from specific cores, including double-platform cores and cores with narrow working surface. The cores show that the bladelet/microblade reduction was separated from unidirectional blade production. The retouched tools are dominated by Dufour bladelets subtype Dufour (more than 40 samples made on microblades) with alternate retouch. Other tools include carinated and nosed end-scrapers and Aurignacian retouch on blades. Taking technological and typological observations together, the assemblage can be classified as Proto-Aurignacian. Further, lithic refitting analysis has connected artifacts of our recent excavations with those of 1969 and 1975 suggesting that they belong to the same archaeological horizon.

The identification of a Proto-Aurignacian at Beregovo I, AH I, opens a new discussion of the EUP of the Western Ukraine. Potentially, Beregovo I overlap chronologically with the EUP horizons at Korolevo I, Korolevo II and Sokirnitsa.

## ORAL

### 7. SUNGIR: SZELETIAN OR AURIGNACIAN?

Gavrilov, Konstantin - (The Institute of Archaeology, Russian Academy of Sciences) [k\\_gavrilov.68@mail.ru](mailto:k_gavrilov.68@mail.ru)

The stone industry of Sungir traditionally associates with thin bifaces – triangular and leaf points. This feature pulls together Sungir with final szeletian sites of the Central Europe. Nevertheless, G.P. Grigoryev and M.V. Anikovich stated the point of view about orinyakoid character of the Sungir industry. The problem consists in, whether so

radical revision of cultural specifics of Sungir is possible. How the ratio of Sungir and sites of streletskaya culture can be characterized?

The Sungir collection of flint products which was analysed, consists of 2403 items, including – 1624 tools and 779 flakes with an irregular retouch. This communication is devoted to typology of morphologically expressed tools. Besides, the database on spatial distribution of flint tools was made. The archival materials and field documentation of Sungir excavation contain information about the location of items in squares and the horizons of cultural layer. Unfortunately, exact information on a ratio of these horizons and the real stratigraphy of the buried soil in these materials is absent. The obtained data on spatial distribution of stone tools of Sungir were compared with results of their typological analysis.

Typological features of the Sungir stone tools are connected with several indicators. First of all, it is thin bifaces. Secondly, the Sungir industry differs from the classical streletskian by a number of signs. There are a considerable share of the pieces ecaille, large number of burins, prevalence of the items with the subparallel not retouched edges among scrapers, and presence of the aurignacian types of tools. There are core-burins and core-scrapers, retouched points on micro-blades and asymmetric notched Aurignacian blades among the last ones. Sungir collection contains edge-faceted cores for micro-blades and the numerous micro-blades. The percentage of the tools made on blades is quite high (30,7 %).

The analysis of spatial distribution of stone tools of Sungir allows to conclude that the cultural layer of this site was formed in some stages. The most ancient of it is connected with the lower part of the buried soil (28000-25000 BC). The latest stage associates with the basis of the loams blocking this soil. It is necessary to emphasize rather late stratigraphical position of the points made on micro-blades. However thin biface – triangular point of streletskaya-sungir type, and also asymmetric notched Aurignacian blade were recorded already at the earliest level on the layer.

Thin bifaces, series of the side-scrapers, convergent scrapers and transverse scrapers, mainly flakes splitting testify in favor of szeletoid character of Sungir complex. This conclusion isn't contradicted by existence of aurignacian types of tools. The same feature is also typical for final szeletian sites of the Central Europe, and for some sites in Russia (Zaozer'e, Kostenki XII-1) and Ukraine (Mira, Stinka, Vis).

At the same time, it should be noted well expressed specific features both streletskaya culture and Sungir. The regional specifics of streletskaya culture are shown most brightly in morphology of triangular bifacial points. It differs from the morphology of bifacial points of Central European sites.

ORAL

## 8. NEANDERTHALS, MODERN HUMANS, AND THE ARCHAEOLOGICAL RECORD OF EASTERN EUROPE

*Hoffecker, John - (University of Colorado) John.Hoffecker@colorado.edu*

Across Europe, it is widely assumed that Neanderthals produced all artifact assemblages classified as Middle Paleolithic, as well as some early or "transitional" Upper Paleolithic assemblages. Although the majority of Middle Paleolithic assemblages lack associated human skeletal remains, archaeologists believe that there are a sufficient number of sites with identifiable Neanderthal remains to extend the observed pattern to all of them. There is reason, however, to question the attribution of some European assemblages classified as Middle Paleolithic to the Neanderthals, and this applies especially to Eastern Europe, where a significant proportion of Middle Paleolithic sites may have been occupied by *Homo sapiens*.

There is growing evidence that modern humans developed a Levallois blade and point industry in the Near East roughly 50,000 years ago. The appearance of similar assemblages in Central Europe (i.e., Bohunician) may represent an archaeological proxy for modern human movement into Europe at this time. Eastern Europe contains a large number of assemblages with Levallois blade technology, and most of them appear to date to 50,000 years ago or less. Unlike the Bohunician sites, most of these assemblages contain few typical Upper Paleolithic tools, ensuring their classification as Middle Paleolithic. They are widely distributed across Eastern Europe, including the southwest plain (e.g., Molodova 5), central and southern plain (e.g., Khotylëvo 1, Shlyakh), Crimea (e.g., Shaitan-Koba), and northern Caucasus (Monasheskaya Cave). Most may be firmly or tentatively dated to MIS 3, and—where they are found in an archaeologically stratified context—they consistently occur at the top of the Middle Paleolithic sequence. Until Neanderthal authorship of these assemblages can be confirmed with diagnostic skeletal material or aDNA, they must be considered problematic.

Many archaeologists doubt that the assemblage at Byzovaya in northern Russia—despite the lack of blade technology and typical Upper Paleolithic tools—was produced by Neanderthals, because it appears to post-date their presence in Europe. The same logic might apply to Betovo on the Desna River and there are other sites that: (a) yield independent evidence for activities that could account for the absence of blade production and typical Upper Paleolithic tool forms (i.e., taphonomic evidence for the killing and butchery of large mammals); and (b) may postdate the first appearance of modern humans in Europe. Two examples are Starosel'e, Layer III (Crimea) and Il'skaya 1 (northern Caucasus).

Some or all of the sites mentioned above might have been occupied by modern humans rather than Neanderthals, and this alternative possibility has the potential to alter significantly the perceived pattern of human settlement in Eastern Europe during the late Pleistocene. The Neanderthals might not have occupied the East European Plain during MIS 3 (and might never have occupied the central plain) offering modern humans an empty niche. Modern humans might have rapidly colonized Eastern Europe roughly 50,000 years ago during a period of pronounced and sustained warmth (i.e., GI 12) and without some of the complex and innovative technology that is associated with later movements into higher latitudes (e.g., tailored clothing).

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#### ORAL

### 9. CULTURAL AND ENVIRONMENTAL CONTEXT FOR THE EAST EUROPEAN UPPER PALAEOOLITHIC FORMATION: KOSTENKI SCENARIO AND EXPLANATORY MODELS.

*Sinitsyn, Andrei - (Inst.for the History of Material Culture RAS) andrei.sinitsyn@gmail.com*

Cultural and environmental context for the East European Upper Palaeolithic formation: Kostenki scenario and explanatory models.

The problem of the Upper Palaeolithic, more ancient than Aurignacian and than local East European "transitional" Streletskian arose in Kostenki due to field works of last decade.

Principal argument in favor of this hypothesis has Kostenki 14 (Markina gora) where three cultural layers of non-Aurignacian and non-Streletskian attribution were put in evidence under Aurignacian layer connected with

CI-Y5 tephra. Most ancient of them (IVb) provided a numerous and various archaeological materials included rich lithic and bone assemblages together with personal ornaments and of art objects.

Aurignacian and Streletskian in Kostenki are dated by 35-36 ka (~40 cal) that put them inside Greenland Interstadial (GI) 9, according to stratigraphic position, connections with CI volcanic ash, and series of radiocarbon dates, including obtained with modern methods of pre-treatments.

Available radiocarbon dates for more ancient cultural layers provide a much closed series at 36-37 ka (~41 cal). Stratigraphic basis for its more ancient age is the position of cultural layers under (Kostenki 14-IVb) and at (Kostenki 17-II) the level of Lashamp magnetic excursion.

The archaeological basis for their separation as a distinct periodization unit is:

- impossibility to be classified both as Aurignacian and as "transitional";
- both assemblages have no recognized predecessors in a more ancient (mid.palaeolithic) stage nor do they have successors in more recent stages;
- distinguished as IUP-stratum they appear to be the manifestation of very variable cultural tradition or a number of cultural entities.

The most probable they existed in the framework of relatively short times.

Supposed model based on Kostenki materials seems to be useful for the large territory owing to including in IUP-stratum such sites as: Sokirnitsa in trans-Carpathians, Zaozerie1 in Mid-Ural, Buran-Kaya 3-C in Crimea. The reason is the same: they are the most ancient manifestation of Upper Palaeolithic at their areas, and cannot be identified nor Aurignacian neither "transitional".

IUP-stratum for the moment appears to be real East European very variable sub-cultural entity; the most probable existed at the frame of Greenland Interstadial (GI) 10 or a bit more ancient times.

Three explanatory models for the IUP phenomenon may be considered:

- a pioneering pre-Aurignacian wave, as suggested by W. Davies, on the basis of some isolated Aurignacian features in each IUP assemblage;
- the initial (starting) point of new cultural unities, the

development of which was interrupted by the Aurignacian expansion;  
- the undeservedly forgotten theory of the syntheotype of G. Laplace.

The last explanatory model seems the most probable at present, as it accords well with the archaeological data and does not require postulated migrations.

In any case, the IUP seems to be a real entity, at least in Eastern Europe, with uncertain temporal and spatial boundaries.

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ORAL

## 10. KOSTENKIAN - THE PROLONGATED STORY OF EASTERN GRAVETTIAN OF THE RUSSIAN PLANE.

*Lev, Sergey - (Institute of Archaeology RAS) zaraysk@yandex.ru*

For a long time Kostenkian considered to be a short episode of so called "Eastern Gravettian" presence on the Russian plane. As a part of this wide cultural unity Kostenki-Avdeevoo archaeological culture was limited in time and area. The sites were mostly dated between 23 000 – 21 000 BP.

After Zaraysk site was discovered, the distance between the main sites has increased to 500 km. And what happened to dating? The answer is tightly linked to methodological approach that has been applied to investigations of the cultural deposits by prof. H. Amirkhanov and the crew. It became clear that it is not one but a few sites placed nearby and sometime overlaying each other. Under the term of "archaeological site" we consider the area of continuous distribution of cultural deposits containing a more or less continuous distribution of artefacts and features of similar typological character within a given stratigraphic unit.

Zaraysk actually represents a complex of closely related inter-stratified sites. Four sites, titled Zaraysk A, B, C and D may be identified with total area excavated about 500 sq.m. On Zaraysk A the cultural remains are contained in a sequence of four stratified occupation levels deposited in two geologic units – the upper buried soil and an underlying sandy loam. Zaraysk B located 50 meters to the north of the first site. At this locus, the cultural remains

are deposited only in the upper buried soil and at the contact between this soil and an underlying loam. The layer of sandy loam is absent. It corresponds well by stratigraphy with the upper layer of Zaraysk A. This one-level site gives a perfect opportunity for spatial analysis. Locations C and D are slightly investigated.

Cultural layer is considered as the structural unity of artefacts, features and other remnants of human activity occurred in geological context. Micro- and cryostratigraphic method, pollen and geomorphologic analysis allowed dividing occupation loci usually having no sterile layers on Zaraysk A. The main difference of cultural layers (well divided by frost structures and interstratification) is in a global change of living structure organization strategy. Typical Kostenki settlement with line of big hearths, earth-dwellings around and deep storage pits doesn't exist on the two upper layers (19 000, 16 000 years B.P.). Types of all features, including dwellings, hearths and pits changed as well as inter spatial distribution.

Zaraysk A gives the most important information about the evolution of cultural traditions. Though living structures, types of dwellings and other features changed, material culture and lithic technology stays without any global changes and distinctive for kostenki-avdeevoo culture. Zaraysk B is a short stay camp site with clear spatial distribution. It is related to the upper buried soil and correlated to the layer 4 on Zaraysk A. Both of them as well as the soil humus horizon are dated about 16 000 years B.P. This fact makes real a prolonged chronology of "Gravettian episode" on the Russian plane. And its origins could be searched to the West in the Central Europe.

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ORAL

## 11. NORTH BY NORTHWEST: LAST GLACIAL PALAEOGEOGRAPHY AND ARCHAEOLOGY OF THE BANAT AND THE BALKAN PENINSULA

*Chu, Wei - (University of Cologne) wchu@uni-koeln.de*  
*Hauck, Thomas - (University of Cologne) Thomas.Hauck@uni-koeln.de*  
*Leonard, Ine - (University of Cologne) ileonard@uni-koeln.de*  
*Richter, Jürgen - (University of Cologne) j.richter@uni-koeln.de*

The initial settlement of Europe by anatomically modern humans from an African source population is now well-acknowledged, but the timing, trajectory and conditions of this migration is still poorly understood. Current paradigms suggest that anatomically modern human migra-

tions likely started in the Levant and may have occurred along two discrete routes, either following a costal path along the Mediterranean basin and/or an inland route through the Danube River valleys. Here, we investigate the importance of the second route for the migration of Palaeolithic populations by focusing particularly on the Timi catchment of the Middle Danube in the Banat regions of Hungary, Romania, and Serbia.

Preliminary results of our investigation suggest that the Banat and indeed the larger Balkan region played an important role in the expansion of anatomically modern humans into the Eurasian continent and may constitute a "Contextual Area," a region where adaptive relationships between natural and socio-cultural factors formed a discreet human habitat.

Understanding how these early settlers exploited this landscape has important implications for the spatial patterns of early anatomically modern human populations in Europe. In addition, this research may shed light on various "transitional industries" of the area (i.e. the Szeletian) and on the impact of this initial colonization on local Neandertal populations.

ORAL

## 12. NEW INSIGHT INTO MIDDLE TO UPPER PALAEO-LITHIC TRANSITION IN THE BALKANS

*Mihailović, Dušan (Faculty of Philosophy, University of Belgrade) dmihailo@gmail.com*

Balkan Peninsula was in the direction of spreading of anatomically modern human toward Europe and is one of the regions where various interactions of the Neanderthals and anatomically modern humans could be expected. In order to comprehend even better the role of the Balkans in the transition period many international projects have been started recently. The investigations continued in northern Serbia at Aurignacian site Crvenka-At near Vršac and of Aurignacian layers in Šalitrena cave, while early Upper Palaeolithic has been confirmed at many sites (Tabula Traiana Cave, Baranica) in the Carpathian Mountains. Aurignacian sites on the other hand have not been encountered in the areas of central Balkans and in the Adriatic zone, while late Mousterian has been confirmed at Pesturina, Hadzi Prodanova cave, Bioe and Crvena Stijena.

Preliminary results of those investigations indicate, beside already known facts, that Upper Palaeolithic spread

from east toward west of the peninsula simultaneously with the withdrawal of the Middle Palaeolithic groups. The Danube valley obviously had an important role as the earliest Upper Paleolithic sites have been confirmed just in that area and the Aurignacian actually has not been ascertained to the south of the Sava-Danube corridor. There is for the time being no reliable evidence for settling of Adriatic-Ionian zone between 40<sup>th</sup> and 30<sup>th</sup> millennium BP. Therefore, the question arises how much that could be explained as result of Campagnian Ignimbrite eruption and how much as result of insufficiently investigated region.

ORAL

## 13. LEVELS OF FLINT KNAPPING EXPERTISE AND APPRENTICESHIP DURING THE EARLY AND MIDDLE UPPER PALAEO-LITHIC: SEVERAL ILLUSTRATIVE EXAMPLES FROM THE EARLY AND LATE AURIGNACIAN AND MIDDLE GRAVETTIAN

*Klaric, Laurent - (CNRS, UMR-7055, PRETEC, Université de Paris-Ouest-Nanterre-La Défense, 21 allée de l'Université, 92023, Nanterre) laurent.klaric@mae.u-paris10.fr*

Excavations at the site of Picardie (Indre-et-Loire) was the starting point for a revision of industries assigned to the second half of the Middle Gravettian. Continued work with material recovered from this site has reveal several indications of knapping apprenticeship, particularly the acquisition of an original bladelet production system – the Raysse method.

Support from the Fyssen Fondation made it possible to develop a research method focused on differing skill levels evident in bladelet production during certain phases of the Early and Late Aurignacian at Corbiac-Vignoble II and Tercis, respectively, and the Middle Gravettian with Raysse burins from the sites of Picardie and Solvieux.

Here, we present a communication focusing on recognising varying skill levels for the different types of bladelet production (*carinated* versus *Raysse*) typical of these periods. Moreover, on at least three of these sites, other indications of apprenticeship are evident, primarily independent attempts at bladelet production or the unskilled or clumsy reuse of abandoned cores. These elements represent a body of corroborating evidence reinforcing conclusions drawn from the bladelet production. In addition, the 'visibility' of these different lines of evidence for apprenticeship are discussed in contextual terms.



Finally, this study provides us a better understanding and a more accurate techno-cultural diagnosis of lithic assemblages of Early and Mid-Upper Palaeolithic. It also brings interesting paleosociological perspective to think about technical knowledge and know-how transmission modes on a large timespan.

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ORAL

#### **14. LE PALÉOLITHIQUE SUPÉRIEUR ANCIEN DE LA GROTTÉ BOCCARD (CÔTE D'OR) DANS LE CONTEXTE DES PREMIERS PEUPELEMENTS DU PALÉOLITHIQUE SUPÉRIEUR DE CÔTE D'OR EN BOURGOGNE (FRANCE)**

*Djindjian, François - (Université de Paris 1 Panthéon Sorbonne & CNRS UMR7041 Arscan) francois.djindjian@wanadoo.fr*

La grotte Boccard à Créancey (Côte d'Or) est un site en grotte de réseau karstique et terrasse s'ouvrant dans une falaise de calcaire bajocien à 500 mètres d'altitude. Le site est situé sur la ligne de partage des eaux entre la vallée de l'Armançon (bassin de la Seine) et la vallée de l'Ouche (bassin de la Saône).

La grotte est profonde d'une douzaine de mètres dans une orientation plein Sud. Les fouilles programmées ont été conduites par l'auteur de 1974 à 1980 et ont concerné les restes de remplissage sur environ 2m<sup>2</sup> à l'intérieur de la grotte et 10 m<sup>2</sup> sur la terrasse.

Un remplissage karstique lacunaire de deux mètres de puissance a été trouvé à l'intérieur de la grotte décrit par une douzaine d'unités stratigraphiques. Il a été vidangé sur la terrasse.

- les couches supérieures post-glaciaires qui ont livré des vestiges remaniés d'occupations ponctuelles et de foyers établis sur un plancher d'effondrement qui a scellé le remplissage sous-jacent,

- un niveau gravettien dans les couches 5/1 et 5/2, bouleversé par l'occupation des ours de cavernes,

- un niveau de paléolithique supérieur ancien, qui a livré un fragment de pierre gravée, dans la lentille 6/2,

- un niveau moustérien ayant livré plusieurs dents néanderthaliennes qui témoigne d'une occupation sur le plancher de la grotte, enrobé dans la couche 6/5

La faune contient le mammouth, le cheval, le renne, le bovidé. Elle est dominée par la faune de cavernes, l'ours dominant, l'hyène, le loup, le renard polaire. La marmotte, le lièvre et l'hermine sont présents.

L'industrie du Gravettien est caractérisée par l'abondance de l'industrie en matière dure animale (bois de renne, ivoire) et la rareté de l'industrie lithique composée essentiellement d'outils abandonnés, de nucléus intacts et d'esquilles de retouche.

L'occupation de la grotte est un bivouac occupé occasionnellement et périodiquement lors des déplacements des chasseurs entre Seine et Saône. La grotte Boccard fait partie des rares sites de Bourgogne attribuable au paléolithique supérieur ancien en Côte d'Or (grotte de la Garenne, Genay, Poron des Cuèches) entre Côtes chalonaises (Saint-Aubin, Saint Martin sous Montaigu, Germolles) et Yonne (Arcy-sur-Cure).

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ORAL

#### **15. LA TRANSICIÓN EN EL BERGERACOIS: DATOS PARA UNA REFLEXIÓN SISTÉMICA.**

*Ortega, Iluminada - (Inrap) iluminada.ortega@inrap.fr*  
*Rios, Joseba - (CENIEH) jorios76@gmail.com*  
*Bourguignon, Laurence - (Inrap) laurence.bourguignon@inrap.fr*

En primer lugar queremos remarcar el hecho que las poblaciones humanas del paleolítico medio y superior, forman sociedades sujetas a los fenómenos típicos del cambio histórico, la idea de que la organización de las sociedades y sus cambios depende de la gestión social que define y satisface las necesidades y que la tecnología de las sociedades, en nuestro caso de la industria lítica, refleja aspectos importantes de esta gestión social de las necesidades. Este planteamiento es importante cuando se abordan los presupuestos teóricos de un periodo como el fin del Paleolítico medio y el principio del Paleolítico superior en el que las explicaciones pueden estar influidas por planteamientos de tipo Biológico.

El proceso de Transición entre el Paleolítico Medio y el Superior debe entenderse por tanto como un proceso histórico en el que las relaciones entre grupos humanos, las relaciones con el medio y las dinámicas propias de cada sociedad son las que provocan las transformaciones que observamos en el registro arqueológico. Por consecuencia, los procesos de cambio se traducen en

variaciones en la forma en la que las sociedades se organizan económica y socialmente.

La industria lítica es la principal evidencia disponible para la comprensión de estas sociedades. Es especialmente informativa porque además de las informaciones de orden técnico y territorial, interacciona con otras esferas de la sociedad paleolítica.

Además de esta complejidad material cronológicamente podemos percibir si observamos las diferentes regiones, un solapamiento más o menos significativo entre el Paleolítico medio y Paleolítico superior inicial. Esto nos incita a centrarnos en un marco más regional para poder más tarde emitir hipótesis de orden histórico.

La región seleccionada, el Bergeracois en su parte central, es un territorio rico en ocupaciones situadas en este momento de cronológico (5 ocupaciones Musteriense finales, 8 Auriñaciense y 4 Chatelperroniense, sin contar con un número importante de incidencias. Este territorio cuenta con un marco geográfico excepcional: región rica en sílex (de gran calidad y tamaños excepcionales), recursos hídricos, entre otros.

Se trata por tanto de un marco ideal para tratar de comprender los cambios en la organización social a finales del Paleolítico Medio y a inicios del Paleolítico Superior a partir del estudio de la industria lítica.

En este contexto, bien particular, nos ofrece nuevas perspectivas para establecer la existencia durante este periodo de la Prehistoria de procesos de imitación, emulación, transferencia de conocimientos, invención y/o rupturas.

## ORAL

### **16. THE SUBSISTENCE OF THE GRAVETTIAN HUMAN GROUPS IN THE CENTRAL AREA OF THE IBERIAN MEDITERRANEAN. NEW DATA FROM COVA DE LES CENDRES (TEULADA-MORAIRA, VALENCIA, SPAIN)**

*Valentín Villaverde Bonilla - Universitat de València) valentin.villaverde@uv.es (*

*Dídac Roman Monroig - Université de Toulouse-Le Mirail didac.roman@uv.es (*

*Cristina Real Margalef - (Universitat de València) cristina.real@uv.es*

*Manuel Pérez Ripoll - (Universitat de València) manuel.perez@uv.es*

*Ricard Marlasca Martín - ricard.marlasca@hotmail.com (Posidònia S.L.)*

The central area of the Iberian Mediterranean has a high concentration of sites linked to Gravettian. Sites as Parpalló, Les Malladetes, Barranc Blanc or Ratlla of Bubo, have provided information about the technological complex, as well as an approach to its economy. However, data from some of these or other sites are limited both by the nature of the collections and the age of the excavations, and the absence of specific taphonomic studies.

Nevertheless, among them, Cova de les Cendres (Teulada-Moraire, Valencia, Spain) provides a fairly complete sequence that from the available datings can be placed between 25,850 and 20,800 BP. It has a rich Gravettian industry and a taphonomic study of the bone remains. Now we present here a larger sample that defines better the occupations of this settlement.

The material of the sample comes from fieldwork in 2010 and 2013 where the original survey of 2m<sup>2</sup> was extended. In this years a surface of about 2 m<sup>2</sup> with a depth of 30 cm, was excavated by natural levels, corresponding to the top of the Gravettian filler, specifically to level XVIIA with two dating of 23929 ± 100 and 23860 ± 100 Bpa. We have analysed both bone remains through a taxonomic, anatomical and taphonomic study, and the lithic and bone industry, defining their techno-typological characteristics.

The lithic and bone industry provides useful information for the characterization of the end of the Gravettian on the Mediterranean side. The component is laminar and backed points and marginal retouches are presented. In relation to the bone tools it has been documented some double point of bone. Also highlights some ornaments using both teeth and molluscs remains.

In relation to the fauna analysis, has been determined taxonomic and/or anatomical 1143 remains, which correspond to a wide range of preys: herbivore such as red deer (NR 404), Spanish ibex (NR 71), horse (NR 13) and aurochs (8); carnivores like lynx, wild cat and monk seal (NR 64); and small prey such as leporids (NR 2462), various birds (NR 187), and a species of tortoise (NR 16). The study of skeletal representation, mortality patterns, morphology fracture, and bone surface modifications (cut and dental marks and fire alterations) allow us to relate the sample to human activities.

Moreover, the mollusc remains both terrestrial and marine, and its high spatial concentration suggests a human consumption. This circumstance had not been observed so clearly in the sequence of the site until now.

Cova de les Cendres is one of the few Gravettian sites that not only provide information on the industrial characteristics of the occupations, but a considerable amount of data regarding subsistence. Available materials also suggest that in the central part of the level, which has the highest density of remains, the Gravettian occupations present subsistence patterns that differ from other sites so far known. It is characterized by a wide range of prey, not just in relation to terrestrial mammals, but aquatic resources such as turtles, fish, or both terrestrial and marine molluscs.

ORAL

### 17. THE TRANSITION FROM MIDDLE TO UPPER PALAEOLITHIC AT LA VIÑA ROCK SHELTER (ASTURIAS, SPAIN)

*Santamaría Álvarez, David - (Universidad de Oviedo) santamariadavid@uniovi.es*  
*de la Rasilla Vives, Marco - (Universidad de Oviedo) mrasilla@uniovi.es*

The Cantabrian region has recently become a key scenario to understand some important questions related with the transition from Middle to Upper Palaeolithic in Europe, such as the appearance of Anatomically Modern Humans, the emergence of human cognition and rock art, the coexistence of neanderthals and *sapiens* populations and the extinction of *Homo neanderthalensis*: when, where, how and why?

La Viña rock shelter is located in the middle valley of the Nalón river in the western cantabrian region. It was excavated by J. Fortea between 1980 and 1996. The excavation took place in two different sectors (western and central) and they unearthed an important cultural sequence ranging from Middle Palaeolithic to Holocene. The stratigraphic sequence of the western sector includes several Mousterian and Aurignacian levels related with the demise of Mousterian populations and the emergence of Upper Palaeolithic cultures.

Water erosions were common in this sector involving all Mousterian levels and the first Aurignacian one. The last erosive event occurred after the formation of XIII basal that constitutes the last Mousterian unit and before the deposition of the first Aurignacian level (XIII inf.). This erosion was very important because it removed part of the Mousterian layers reaching the bedrock in some places. The gap between the Mousterian and Aurignacian levels has been radiocarbon dated in more than 20.000 years old. Consequently, Aurignacian people settled on a very

irregular floor formed by patches of all previous Mousterian levels, well after of the disappearance of the last Mousterian populations.

As a result of these erosions the interstratigraphic movements of archaeological items occurred frequently in the site, generating a gradual transition from Mousterian to Aurignacian whose origin is instead postdepositional and unanthropic.

The analysis of the lithic artifacts has enabled to determine some archaeological contaminations between both cultural complexes: carinated and nosed scrapers, Dufour bladelets, sidescrapers and some handaxes.

After discarding these contaminations the technological traits of each complex agree with previously assumed: a Mousterian without "modern cultural traits" and Aurignacian fully formed from the basal levels. What we observe between Mousterian and Aurignacian complexes is a stratigraphic, chronological, and cultural rupture.

ORAL

### 18. THE EARLY UPPER PALAEOLITHIC IN NORTHERN SPAIN REAPPRAISED

*Arrizabalaga, Alvaro - (Universidad del País Vasco) alvaro.arrizabalaga@ehu.es*  
*Iriarte-Chiapusso, María-José - (IKERBASQUE/ Universidad del País Vasco) mariajose.iriarte@ehu.es*

The topic of the EUP in northern Spain has become a matter of great interest in Archaeology, at least since the late 1980s, when the dates obtained for Level 18 at El Castillo Cave suggested a very old chronology. In the 25 years since then, a large number of studies, analyses, dates and papers have been published about the Middle to Upper Palaeolithic transition in the region. New paradigms and interpretative models have been proposed and, in unprecedented activity, numerous interdisciplinary teams have been involved in answering the main questions that have been posed. Our understanding of the period now is significantly better than in 1989 and some problems have been solved (at the cost of excavating practically all the good sequences in the region with relevant levels). This communication will reappraise the current situation in the interpretation of the Early Upper Palaeolithic in northern Spain, while taking into account the different variables and the explanatory effects of the human factor in this process, as in any important historiographic milestone.

ORAL

**19. CHRONOLOGY OF THE EARLIEST UPPER PALEOLITHIC IN CENTRAL PORTUGAL: OLIVAL GRANDE AND RESOLVING THE OPEN-AIR "AURIGNACIAN"**

*Thacker, Paul (Department of Anthropology, Wake Forest University) thackep@wfu.edu*

For over two decades, the archaeological assemblage from the Vale de Porcos site in central Portugal has been an anomaly. The presence of very large blades (for the UP in Portugal) coupled with an EUP toolkit without backed elements led to a controversial Aurignacian designation. The lack of absolute dates for the deposits as well as significant historical assemblage recovery biases by Heleno's team including discard of most debitage added to contemporary interpretive difficulty.

The recently discovered site of Olival Grande in the lower Rio Maior drainage resolves most of the controversies attached to the Vale de Porcos assemblage. A very large lithic assemblage has been recovered from the locale with marked technological and typological similarities to Vale de Porcos. The site has yielded absolute dates that demonstrate the assemblages (and by extension Vale de Porcos) are greater than 30,000 years old. This paper details the depositional history of Olival Grande and explores the technological organization of recovered EUP lithic assemblages. The resolution of the dating of these industries has significance for understanding the technological discontinuity that is evident between late Middle Paleolithic and earliest Upper Paleolithic adaptations in Portugal.

ORAL

**20. L'APPORT SCIENTIFIQUE DE LA COMMISSION 8 DE L'UISPP (PALÉOLITHIQUE SUPÉRIEUR DE L'EURASIE) À LA CONNAISSANCE DU PALÉOLITHIQUE SUPÉRIEUR EUROPÉEN (DE 1976 À 2014)**

*Iakovleva, Lioudmila (1 Institut d'archéologie NAS Ukraine (Kiev, Ukraine) et CNRS UMR7041 Arscan) - i.iakovleva@wanadoo.fr*

*Desbrosse, René - CNRS), Janusz Kozłowski (Université Jagellon de Cracovie, Pologne) rene.desbrosse@wanadoo.fr (*

La commission 8 de l'UISPP fut fondée en 1976 à l'occasion du IX<sup>e</sup> congrès UISPP de Nice (France). Elle a rapidement regroupé en quelques années un panel représentatif des spécialistes du paléolithique supérieur européen,

originaires quasiment de tous les pays européens. En 39 ans d'activités, elle a organisé des colloques sur un rythme quasi annuel dans le cadre des congrès mondiaux de l'UISPP, de Nice (1976) à Burgos (2014), et aussi entre les congrès. Ces colloques ont tous été publiés en langue française principalement dans les actes des congrès, dans les BAR et dans la collection ERAUL (Liège). Elle a également publié sept bilans quinquennaux des fouilles et des recherches sur le Paléolithique supérieur européen, pays par pays. Les travaux de la commission ont permis de réaliser en moins de trente ans une synthèse sur le paléolithique supérieur européen unique dans le cadre de l'UISPP. Le propos de cette communication est de parcourir depuis 1976 et de les illustrer les temps forts de ces travaux.

POSTER SESSION

POSTER

**21. THE BEGINNING OF THE UPPER PALAEO-LITHIC IN NORTH-WEST EUROPE**

*Flas, Damien (F.R.S.-FNRS/University of Liege) damienflas@yahoo.com*

The Middle to Upper Palaeolithic transition is still a highly debated topic as it concerns several important questions: the timing and cause of the disappearance of the Neanderthal population/dispersal of anatomically modern humans, the cause of the appearance or widespread adoption of certain technical and symbolic behaviours, the role of "transitional industries" during this period and their association with the different biological populations.

In recent years, reappraisal of old collections, new discoveries and up-to-date radiocarbon dates enabled a more precise interpretation of the Middle to Upper Palaeolithic transition in North-West Europe. These new data are notably related to human remains that permit to tackle the issue of the last Neanderthals (Goyet and Spy Cave) and earliest *Homo sapiens sapiens* (Kent's Cavern) in the region. These recent works also permit to have a new look on the different industries present during the Middle to Upper Palaeolithic transition (various late Middle Palaeolithic industries, Lincombian-Ranisian-Jerzmanowician, Aurignacian) and their chronology.

This talk will thus provide an up-to-date synthesis for the beginning of the Upper Palaeolithic in North-West Europe, even if this region remains still poorly known compared to other European areas.

POSTER

**22. THE ORIGIN OF THE ULUZZIAN: THE UPSETTING OF A PARADIGM?**

*Moroni, Adriana - (Department of Physical Sciences, Earth and Environment - R.U. Prehistory and Anthropology - University of Siena, Italy) adriana.moroni@unisi.it*

*Boscato, Paolo - (Department of Physical Sciences, Earth and Environment - R.U. Prehistory and Anthropology - University of Siena, Italy) paolo.boscato@unisi.it*

*Ronchitelli, Annamaria - (Department of Physical Sciences, Earth and Environment - R.U. Prehistory and Anthropology - University of Siena, Italy) annamaria.ronchitelli@unisi.it*

In the past few years one of the issues of greater interest and debate among Prehistorians has been the shifting from the Middle to the Upper Palaeolithic in Europe, namely the replacement of Neanderthals by Anatomically Modern Humans. In order to define this extremely complex phase, the nature of the makers of the so-called transitional techno-complexes plays a pivotal key-role. Recently, scholars' attention has been focused, in particular, on the French Châtelperronian and on the Italian Uluzzian as these two techno-complexes, previously considered as the evidence of Neanderthals' trend towards "modern behaviour", have been the core of a reconsideration which has generated (and is still generating) new hypotheses, data and debate. While the attribution of the Châtelperronian to Neanderthals has been questioned on the grounds of a possible stratigraphical contamination at Châtelperronian sites such as Arcy-sur-Cure and La Roche-à-Pierrot, in the case of the Uluzzian the results of recent analyses on the two deciduous teeth from the undisturbed Uluzzian layers of Grotta del Cavallo have supported the involvement of *Homo sapiens*. Meanwhile a new set of dates from the same site (45-43 ka BP) allowed to infer that the Uluzzians were the early AMHs who reached Italy (and perhaps Europe). The Uluzzian lithic tool kit is primarily featured by the occurrence of a specific tool: the lunate which is connected to the introduction of the innovative concept of composite implement. Moreover a techno-functional revision of lithic assemblages from the main Uluzzian sites (still in progress), is highlighting that no connections can be detected between the final Mousterian production systems and the Uluzzian ones, confirming the allochthonous origin of this latter techno-complex. On the basis of the strong similarities with the transitional techno-complexes of the African Continent, we suggest a possible early origin of the Uluzzian from Eastern Sub-Saharan Africa. A hypothetical southern route across the Bab-el-Mandeb straits to Arabia, mov-

ing northward into the Near East and then along the Adriatic coast is proposed.

POSTER

**23. PRELIMINARY RESULTS FROM ONGOING EXCAVATIONS AT LA ROCHE À PIERROT, SAINT-CÉSAIRE**

*Bachelier, François - (PACEA, UMR-5199, Université de Bordeaux) bachelier.francois@gmail.com*

*Caux, Solène (PACEA, UMR-5199, Université de Bordeaux) solene.caux@u-bordeaux1.fr*

*Crèvecoeur, Isabelle (PACEA, UMR-5199, Université de Bordeaux) isabelle.crevecoeur@u-bordeaux1.fr*

*Gravina, Brad (PACEA, UMR-5199, Université de Bordeaux) isabelle.crevecoeur@u-bordeaux1.fr*

*Mallol, Carolina (Universidad de La Laguna) cmallol@ull.es*

*Maureille, Bruno (PACEA, UMR-5199, Université de Bordeaux) b.maureille@anthropologie.u-bordeaux1.fr*

*Michel, Alexandre (PACEA, UMR-5199, Université de Bordeaux) alex.michel10@laposte.net*

*Rougier, Hélène (California State University, Northridge) helene.rougier@csun.edu*

*Tartar, Elise (Maison de l'Archéologie et de l'Ethnologie à Nanterre - UMR 7041, Ethnologie Préhistorique) elise.tartar@gmail.com*

*Teyssandier, Nicolas (TRACES, UMR-5608, Université de Toulouse 2 - Le Mirail) teyssandier@univ-tlse2.fr*

*Bordes, Jean-Guillaume (PACEA, UMR-5199, Université de Bordeaux) jg.bordes@pacea.u-bordeaux1.fr*

*Morin, Eugene (Trent University) eugenemorin@trentu.ca*

Debates surrounding possible mechanisms underlying the mosaic of bio-cultural changes implicated in the so-called 'Middle to Upper Paleolithic' transition' and their possible connection with the emergence of 'behavioral modernity' in Western Europe remain at the forefront of research concerning modern human origins and the fate of the Neanderthals. The small rockshelter of La Roche à Pierrot, St. Césaire in the Charente-Maritime department of Southwestern France has played a central role in these discussions given the 1979 discovery of a partial Neandertal skeleton in one of the site's Châtelperronian levels. Twenty-five years after Francois Lévêque's initial work, we began new multi-disciplinary excavations at this important site following a substantial project of re-conditioning the original archaeological collections. Here we provide some preliminary results from our ongoing work at the site, including new human remains, investigations of site formation processes, raw material use, new micromorphological analyses, and topographic models.

**Important: at the end of this session will be project the video "Gontsy: 20 years" present by François Djindjian and Ludmila Iakovleva (realized for the commemoration of the 20 years of excavation at the archeological site of Gontsy in Ukraine - 1993-2013)**

# A9b The Study of the Environment and the Landscape in the Reconstruction of the Economic and Social Activities during the Upper Paleolithic. Methodological Approaches and Case of study

Commission on Upper Palaeolithic of the Western Eurasia  
(Organisers: C. Cacho, P. Ortega, Liudmila Iakovleva)

Friday 5th (9:00 to 13:30)  
B24 Meeting Room



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XVII World UISPP Congress  
XVIIe Congrès Mondial de l'UISPP  
XVII Congreso Mundial de UISPP

ORAL

**1. THE MAGDALENIAN OCCUPATION OF LEVEL IX OF LAS CALDAS CAVE (ASTURIAS, SPAIN): A SPATIAL APPROACH**

*Corchón Rodríguez, M<sup>o</sup> Soledad - (Universidad de Salamanca) scorchon@usal.es*

*Ortega Martínez, Paula - (Universidad de Salamanca) ortegap@usal.es*

*Rivero Vila, Olivia - (CREAP- TRACES UMR 6508) oliviariver@hotmail.com*

Las Caldas Cave is located in the middle valley of the Nalón river, in a setting widely occupied from the end of the Pleistocene until the Late Glacial Maximum.

The mouth of the Cave opens onto the bottom of a sheltered valley, lateral to the main valley of the Nalón River. The Nalón River Valley and its network of tributaries constituted a shelter-context during the Upper Palaeolithic, favoured by the many streams of thermal waters and the variety of ecosystems near the cave, including high mountains, medium-sized hills, plains and valley areas. This landscape brought together ideal territorial conditions that explain the repeated occupation of the cave, even during the Glacial Maximum (UMG). For this reason Las Caldas Cave shows one of the broadest series of stratigraphic sequences in the Cantabrian region. It includes a total of 19 Solutrean levels in *Sala I*, and 14 Magdalenian levels in *Sala II*, with a time bracket that ranges from ca. 21600 to 12900 cal BC.

Level IX, which has been preserved in *Sala II*, constitutes the first occupation of the Middle Magdalenian, in a very cold and humid phase of the climate at the end of the Older Dryas, with datings from 14347±436 cal BC. These extremely hard climatic conditions can be seen in the material register, explicitly in the presence of reindeer among the fauna consumed, and in representations of fauna typical of the cold steppes in the movable art, the most outstanding being a series of engraved *plaquettes* of sandstone or limestone with representations of reindeer, mammoths, and woolly rhinoceros. In addition, on this same level approximately two hundred engraved *plaquettes* have been recovered showing representations of anthropomorphs, as well as different herbivores (horses, deer, goats, bison and aurochs, among others), with a large variety of morphotypes and a technical quality that is special. The bone industry that accompanies the mobile art shows similarities with other levels of the early middle Magdalenian (levels IX to VI), the presence of Pyrenean elements standing out, such as *contour découpée*,

decorated bone discs and sculptures, as well as engraved protoharpoons, half rod, and antler point. The lithic industry, massively carved in flint, shows a high number of burins, higher than that of the grattoirs, numerous retouched blades, and a high percentage of backed bladelets.

The random distribution of the material register over the surface of the excavated area (H2-G2, H3-G3, H4-G4, G5), as well as the wealth and relevance of the materials recovered, require analysis of the floor of occupation from a spatial perspective in order to reveal the interrelations among the different elements comprising the whole archaeological floor. In addition, a study was made of the lithic and bone industries from a techno-functional perspective, with a view to approximation of the activities carried out by the hunter-gatherer groups of the Cantabrian middle Magdalenian.

ORAL

**2. ASSESSING EXPECTATIONS AND LIMITS OF INTRA-SITE ANALYSIS: FROM THEORY TO PRACTICE (AND VICE-VERSA) IN THE PALEOLITHIC SITES OF LA GARMA CAVE (OMOÑO, CANTABRIA, SPAIN)**

*Maximiano, Alfredo - (IIIPC. University of Cantabria.) maximianoam@unican.es*

*Arias, Pablo (IIIPC. University of Cantabria.) pablo.arias@unican.es*

*Ontañón, Roberto (Museo de Prehistoria y Arqueología de Cantabria. IIIPC. University of Cantabria.) ontanon\_r@cantabria.es*

*Bárcia, Camilo (IIIPC. University of Cantabria.) camilobarciagarcia@gmail.com*

This communication introduces a comparative study of two cases which are so close in *space* (distance each other no more than 200m), and *time* (both were calibrated in Magdalenian: approx 14.4k BP), but are radically different in archaeological formative processes in the way it has been able to preserve/modify the material evidence of social and natural actions: Archaeological remains.

So, in the first of these sites - *Garma A*- numerous episodes of occupation are stratified in continuity succession of sedimentary layers (Arias *et al.* 2005). The second case, in the *Lower Gallery* -ZoneIV- (Ontañón. 2003; Arias *et al.* 2011) where the original cave access was collapsed and cut off all natural and anthropogenic interactions (no sedimentation process). This fact caused that archaeological remains and structures *ante quem* Magdalenian time are on surface, which it would represent an arche-



type of *living occupation floors*.

Since empirical perspective, these two cases is a great opportunity because we have two archaeological records which respond us to the same casuistic/social dynamics, but far away from archaeological formation process. Consequently, the first intra-site issue we must consider is: *How could affect the differential formation process in terms of interpretation spatial distributions?*

As a solution, we characterize a wide range of spatial trends (i.e. inside-outside of structures, segregation and specialization areas...) with it, we'll analyze each other distribution and compare spatial tendencies at inter-site level (*Garma A v. Zone IV*) base upon:

Robust archaeological data collections and information levels, which draw statistically significant trends around:

1. Spatial structure of each observed distributions, and
2. Analyze the type of spatial relationship between distributions to establish an interpretive discourse about spatial variability.

Engage a holistic and integrative perspective sidewalk phenomenology under study: *the social organization of space*. Understanding occupation floors as a dynamic system in which both, the principle of *equifinality* (i.e. same final state from different initial conditions and continuing different routes) (Von Bertalanffy 1968:137); and the *multifinality* (i.e. similar condition states, can lead to different final states) (Buckley 1967:98). These are plausible solutions but different significantly and implications in understanding *how* managed/organized the space, it was modified by social and natural agents.

Thus, characterizing certain sets of special attributes of each archaeological site, and assessing the degree of affinity and/or dissimilarity of these sets between the two sites, - taking into consideration that these were the result of very different formative contexts (and preservation) - we could be closer to the potential implications of *equifinality* and *multifinality* in these archaeological record, which it would leads us to calibrate expectations and limits of *intra-site* analysis.

ORAL

### 3. AN APPROACH TO SOCIAL BEHAVIOUR IN THE MAGDALENIAN AT LA PEÑA DE ESTEBANVELA (AYLLÓN, SEGOVIA, SPAIN)

*Ortega, Paula - (Universidad de Salamanca) ortegap@usal.es*

*Cacho, Carmen - (Museo Arqueológico Nacional) carmen.cacho@mecd.es*

*Martos, Juan Antonio - (Museo Arqueológico Nacional) juanantonio.martos@mecd.es*

*Yravedra, José - (Universidad Complutense de Madrid) joyravedra@hotmail.com*

*Martín, Ignacio - (Universidad de Murcia) ignacio.martin@um.es*

The Rock-shelter of La Peña de Estebanvela, in the south-east of the River Douro basin, is located in a montane environment, bounded to the south by the foothills of the Central Range and to the north-east by the southern edge of the Iberian Range. It contains a sequence dated at the end of the late Upper Pleistocene, where six levels have been differentiated, attributed chrono-culturally, from bottom to top, to the Middle Magdalenian (Levels VI and V), Upper Magdalenian (IV and III) and Late Magdalenian (II and I). Radiocarbon determinations situate these stratigraphic units in three main spans of time, between the dates of 17,700 and 17,190 cal BP; 15,150 and 13,890 cal BP; and 13,720 and 12,610 cal BP. The association of micromammal and herpetological samples indicate a temperate humid climate, similar to modern conditions. They are the characteristic taxa of an environment with a water-course and dense vegetation, with woodland and areas of transition towards more open terrain with shrubs on the edge of the woodland, and dry and humid pastures. The archaeozoological study has determined the exploitation of several ecological niches: open areas (*Equus ferus*, *Equus hydruntinus*), woodland (*Capreolus capreolus*, *Cervus elaphus*) and mountain areas (*Rupicapra pyrenaica*). The consumption of these ungulates was complemented by fishing, evidenced by finds of vertebrae of *Salmo trutta*.

This paper presents the spatial study of Stratigraphic Unit III, carried out with the assistance of a Geographical Information System.

This study has detected accumulations and dispersions of materials that, together with the detailed techno-typological, traceological and taxonomic analysis of the archaeological record, reveal the presence of activity areas (for lithic reduction, butchery and hide-working).

These results are eloquent of the social behaviour of the magdalenian groups living at La Peña de Estebanvela.

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ORAL

#### 4. CREATING MOBILE PATCHES: LOWER MAGDALENIAN LITHIC CONVEYANCE SYSTEMS IN CANTABRIA (SPAIN)

*Lisa M. Fontes - (University of New Mexico) fontes.lisa.marie@gmail.com*

Vasco-Cantabrian Spain is an ecologically diverse coastal region with gradationally distributed lithic raw materials: the highest quality flints are located in the eastern Basque provinces, while coarser grained materials are prevalent in Asturias and western Cantabria. Numerous lithic studies have demonstrated the varying effects of raw material availability on human settlement, assemblage composition, and technological organization. This paper contributes to archaeological landscape studies by evaluating lithic conveyance during the Lower Magdalenian (c. 20.5-17.5 kya cal BP) in central and eastern Cantabria and demonstrating that scalar differentiation in tool stone transport was used during this period to safeguard lithic assemblages as stable, yet mobile, resource patches.

Lithic debris and tools from seven Lower Cantabrian Magdalenian (LCM) contexts at four sites (Altamira, El Juyo, El Mirón, and El Rascaño) were analyzed. A lithic raw material collection was populated with samples from the four sites and used for inter-assemblage comparisons.

Each LCM lithic assemblage contained: 3-5 high to very high-quality flint materials that represented the majority of lithic artifacts at the site; numerous flints in trace amounts; and lower quality mudstones, limestones, quartzes, and/or quartzites. Analyses indicate three principal lithic conveyance systems: local, extra-local, and distant. Local conveyance at El Mirón was of principally lime- and mudstone materials, while at central Cantabrian site low-quality flints were reduced using bipolar techniques. Both behaviors were supplementary, employing poorer quality resources in a lithic assemblage through different means, and conserving the highest quality tool stones. Extra-local conveyance occurred among the four sites: trace flints of various--usually medium to high--qualities were found in all contexts. Some

trace flints were used for blade(let) production. The overlaps in minor flints indicate that strategic material transport kept assemblage patches stable, especially for armature manufacture. Finally, while high-quality Basque region flints appreciated varying amounts of each assemblage--decreasing in quantity as outcrop distance increased--they remained consistent among blade(let) tool assemblages regardless of site location (~30% of raw material), indicating these sources' importance in manufacture of weapons technology. Evidence of tool rejuvenation increased in assemblages located further from Basque country sources. Local and distant conveyance strategies were complimentary, amplified in central Cantabria where Basque flint outcrops were further distant, and diminished at Mirón (c.50-70 km from the outcrops), where these flints were a principal raw material group. The distribution of high quality materials and corresponding supplementation of low quality stones show the importance of flint quality on economic strategies, and that strategies co-varied with resource distribution.

Raw material availability played a significant role in LCM lithic strategies. LCM raw material conveyance was part of a scalar system that combined procurement tactics (direct, embedded, exchange) to furnish lithic assemblages that were portable, stable resource patches with sufficient tool stone suitable to the myriad tasks completed using reductive technology. This systemic combination would have allowed LCM hunter-gatherers access to a variety of lithic resources and informed their ability to maintain adaptively stable toolkits as mobile stone resource patches in the diverse Cantabrian environment.

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ORAL

#### 5. PALAEOOLITHIC SITES IN THEIR LANDSCAPE: TWO CASE STUDIES FROM NORTHERN SPAIN

*Fano, Miguel Ángel - (Universidad de La Rioja) miguel-angel.fano@unirioja.es*

*García, Alejandro - (Monrepos Archaeological Research Centre and Museum for Human Behavioural Evolution, RGZM & IIIIPC, University of Cantabria) garcia@rgzm.de*

Research on Palaeolithic societies has traditionally been based on the study of archaeological deposits. This paper stresses the importance of information related to the location and characteristics of the sites containing these deposits. If an understanding of a site involves knowing its local and regional context, as the mobile nature of

hunter-gatherer societies requires, it is obviously necessary to obtain precise knowledge about the places where archaeological deposits are preserved. This will strengthen our hypotheses about the role played by the different sites. However, a study of this kind is necessary not only within the framework of a materialistic approach, as the choice of a certain place may be influenced by much more subtle factors, connected with the significance or symbolism of certain elements in the landscape, or with the archaeological sites themselves. For example, the potential amount of information that Palaeolithic rock art sites are capable of providing is evident.

This paper presents the preliminary results of our work in the Asón and Nalón River basins (northern Spain) to illustrate the type of observations that can be made through the application of a particular methodology, and their relevance within a regional approach to the study of Late Magdalenian societies in Cantabrian Spain. Eight sites from each valley are considered. The methodology applied is based on the definition of a series of indicators that describe the area where they are situated. These indicators can be divided into *Parameters*, which are obtained by direct observation and measurements in the field (absolute and relative altitude, topography...) and *Variables*, which require the use of a GIS to be modelled and quantified (viewshed, slope of terrain...). This methodology allows a comparative study of the sites being studied.

The sample of Magdalenian sites shows significant similarities and differences regarding their location. For instance some of them are situated in relatively similar locations: valley bottoms, with a very low relative altitude allowing more direct access to their surrounding areas and in general with limited visibility (El Valle, El Horno, Sofoxó...). Other sites are located on hillsides, in prominent positions within the landscape (El Mirón, La Viña, Peña de Candamo...), and their viewsheds are in general much larger than those of the sites in the valley bottoms. Probably these similarities and differences must have been significant in connection with the role played by each site in its social context. However for a real understanding of the meaning of these data the integration of all the archaeological information is required. Only then will the type of analysis being proposed be fully applicable in terms of inference.

ORAL

## 6. TERRITORY AND ABIOTIC ECONOMY BETWEEN 33 AND 15,6 KA AT VALE BOI (SW PORTUGAL)

*Pereira, Telmo - (ICArEHB) telmojrperreira@gmail.com*

*Bicho, Nuno - (ICArEHB) nbicho@ualg.pt*

*Cascalheira, Joao - (ICArEHB) jmcascalheira@ualg.pt*

*Infantini, Leandro - (ICArEHB) leandroinfantini@gmail.com*

*Marreiros, Joao - (ICArEHB) jmmarreiros@ualg.pt*

*Paixao, Eduardo - (ICArEHB) eduardo.paixao88@gmail.com*

The environmental shifts occurred during the Late Pleistocene had major influence in the landscape and, consequently, in the available resources. This had direct impact on human behavior and ecology, demanding from people to constantly adjust to new economical conditions. In coastal areas, this impact tended to be even greater since along with continental transformations, coastal populations had also to deal with the retreat of marine resources during the harsher times.

However, such retreat might have made available former underwater rich cobble and bolder beaches, especially in areas with rocky cliffs eventually making it easier to gather lithic raw materials.

In this paper we present our preliminary results on the diachronic variability of raw materials in Vale Boi. Vale Boi is a coastal site, located at 2,5 km from the present coast line, in the margins of a freshwater stream, has three different loci, all rich in lithics, fauna (including marine), bone tool, adornments, charcoal and ocher and has a continuous human occupation from 33 to 15,6 ka. Such chronostratigraphic record makes it a perfect study case for the understanding of coastal populations behavior and economy throughout the Upper Paleolithic.

Our objective is to infer territory of resources exploitation, landscape, economic patterns and social networks. Raw material sources are usually fixed points on the landscape (by opposite to other resources such as fauna and flora) and, therefore, are one of the best ways of understand how people moved in the landscape and, consequently, to infer past human behavior. We used a set of methods to approach both the archaeological and the geological record in order to correlate sources and artifacts. Our results show that the hunter-gatherers that occupied Vale Boi during the Upper Paleolithic not only used several raw materials but also a variety of sources for the same raw material. This happened both diachronically and synchronically, showing that the sequence as well as each archaeological layer is very complex.

ORAL

**7. NEW SUBSISTENCE EVIDENCE ABOUT HUMAN ADAPTATIONS DURING THE MAXIMUM OF UPPER PLENIGLACIAL IN UKRAINE FROM ZOOARCHAEOLOGICAL STUDIES.**

*Demay, Laëticia (University of Liège (Belgium)/ National Museum of Natural History (France) laetitia.demay@student.ulg.ac.be / ldemay@mnhn.fr*

*Belyaeva, Valentina I. (St.-Petersburg State University (Russia) vibel@list.ru*

*Kulakovksa, Larissa V. - (Archaeology Institute, National Academy of Sciences of Ukraine) laros5@ukr.net Patou-Mathis, Marylène - (National Museum of Natural History (France) patmath@mnhn.fr*

*UMR 7194 CNRS Histoire Naturelle de l'Homme Préhistorique)*

*Péan, Stéphane - (National Museum of Natural History (France), UMR 7194 CNRS Histoire Naturelle de l'Homme Préhistorique) stpean@mnhn.fr*

*Stupak, Dmytro V. - (Institute of Archaeology (Kiev) mit-ja17@list.ru*

*Pavel Vasil'ev - (Museum of archaeology Archaeology Institute, National Academy of Sciences of Ukraine) pavelvas@i.ua*

*Otte, Marcel - (Centre interfacultaire de recherches archéologiques (CIRA), University of Liège) marcel.otte@ulg.ac.be*

The Upper Pleniglacial, between 23 000-20 000 BP, is characterized by the intensification of cold climate and the maximum extent of ice sheets. There is a little information about the human activities during this period. New archaeological excavations in Ukraine permit to evidence data about behavioural human adaptations. These sites are on the one hand Doroshivtsy III in the Dniester valley and on the other hand Pushkari I (excavations VII), Pogon and Obollonia in the Desna valley.

In order to better understand the subsistence strategy we carried out zooarchaeological studies, including paleontology, taphonomy and palethnography, which allow us to reveal the strategy of fauna exploitation by the human groups.

These sites are distinguished by atypical lithic industries made on local flint related to the Gravettian but containing Epigravettian or Aurignacoid elements. All these sites are characterized by a restricted faunal spectrum with the presence of reindeer, horse, mammoth and carnivores (fox [*Vulpes vulpes* and *Alopex lagopus*] and wolf). The settlements are recurrent camps with little de-

velopment occupied during varied seasons oriented to hunting and butchering activities. The particular status of woolly mammoth is noticeable in Doroshivtsy III (layer 6), Pushkari I, Pogon and Obollonia. Indeed it was used as food resource, as raw material to make tools and as artistic support. Ivory was used to make grooved points; this is the oldest occurrence of this kind of artefacts in these regions. Moreover two engraved tusks presenting more or less figurative pictures were found in Doroshivtsy III/6 and Obollonia. The other large herbivores were also consumed. The reindeer is predominant in the layers 5, 4, and 3 of Doroshivtsy III. Carnivores were exploited for their pelts in all these sites.

Some similarities can be noticed between the Dniester and Desna valleys through the use of ivory artefacts which tend to decrease thereafter. These sites demonstrate the continuity of human occupations within the Eastern European plain, with the persistence of hunting methods and the relative diversity of animal exploitation, during the Upper Pleniglacial.

ORAL

**8. GESTION DU TERRITOIRE DANS LE BASSIN MOYEN ET SUPÉRIEUR DU DNIÉPR PENDANT LE MÉZINIEN (15 000 - 14 000 BP)**

*Iakovleva, Lioudmila - (Institute of Archaeology NAS Ukraine (Kiev) and CNRS UMR 7041 Arscan) l.iakovleva@wanadoo.fr*

*Résumé*

Entre 15 000 et 14 000 BP, dans le bassin moyen et supérieur du Dniepr, en Europe orientale, les groupes de chasseurs-cueilleurs du Mézinien ont peuplé un territoire d'environ 500 000 km<sup>2</sup>.

Les sites archéologiques découverts et fouillés depuis la fin du XIX<sup>e</sup> siècle sont :

1) des habitats résidentiels de longue durée dans le cycle annuel avec des cabanes construites en ossements de mammoths, provenant principalement de grandes accumulations d'ossements de mammoths situés à proximité des habitats et largement exploités par le groupe humain.

2) des sites de passage, d'occupation courte, dédiés à des chasses spécialisées, ou des bivouacs à l'occasion de déplacements à la recherche de matières premières

3) des sites de matière première (coquillages fossiles du Sarmatien, coquillages de la mer noire, silex, ambre fossile), exploités systématiquement par le groupe humain.

4) Des accumulations d'ossements de mammoths, ex-

exploités de façon variable par le groupe humain.

Les fouilles de sites résidentiels du bassin moyen et supérieur du Dniepr (Méziine, Gontsy, Mejiriche, loudinovo, Timonovka, Elisseevichi, Kiev-Kirilovskaia) et des sites de passage (Semenivka, Jouravka, Fastiv, etc.) permettent de reconstituer une économie du mammoth, qui pourvoit aux ressources alimentaires (avec le renfort ponctuel du renne et du cheval), au combustible (os frais pour l'alimentation des foyers), à la matière première des outils (ivoire, os) et comme éléments de constructions des cabanes. La chasse aux animaux à fourrure (carnivores, lièvre, marmotte) joue également un rôle important. Les approvisionnements des coquillages, des silex et de l'ambre permettent de reconstituer des circulations jusqu'à près de 600 km.

#### Abstract

Between 15 000 and 14 000 BP, in the middle and upper Dnepr basin, in Eastern Europe, hunter-gatherer groups of the Mezinien have peopled a territory of about 500,000 km<sup>2</sup>. The archaeological sites discovered and excavated since the end of the 19th century are:

- 1) Residential settlement, long-term lived in the annual cycle, with mammoth bone huts, mainly built from large accumulations of mammoth bones located near the settlement and widely exploited by the human group.
- 2) circulation sites, having a short occupation, dedicated to specialized hunts, or bivouacs at the occasion of travel for raw material sites (Sarmatian fossil shells, Black Sea shells, flints, fossil amber), systematically exploited by the human group.
- 3) Accumulations of mammoth bones, exploited in a variable manner by the human group.

Excavations of residential sites in the middle and upper Dnepr basin (Meziine, Gontsy, Mejiriche, loudinovo, Timonovka, Elisseevichi, Kiev-Kirilovskaia) and circulation sites (Semenivka, Jouravka, Fastiv, etc.) allow to reconstruct an economy of the mammoth, which provides food resources (with punctual reinforcement of reindeer and horse), fuel (fresh bone for hearths), raw material for tools and weapons (ivory, bone) and as elements of constructions of the huts. The hunting of fur (carnivores, hares and marmots) also plays an important role. The procurements of shells, flints and amber allow reconstructing travels up to nearly 600 km.

ORAL

## 9. BOTTLENECK AND CORRIDORS AND THEIR IMPACT ON PALEOLITHIC SUBSISTENCE AND LANDUSE IN THE COMPLEX TOPOGRAPHY OF THE ZAGROS MOUNTAINS OF IRAN

*Heydari-Guran, Saman - (Department of Early Prehistory and Quaternary Ecology, University of Tuebingen, Germany) saman.heydari@ifu.uni-tuebingen.de*

*Märker, Michael (Heidelberger Akademie der Wissenschaften Forschungsstelle: The role of culture in the early expansions of humans) michael.maerker@geographie.uni-tuebingen.de*

*Conard, Nicholas (Department of Early Prehistory and Quaternary Ecology, University of Tuebingen, Germany) nicholas.conard@uni-tuebingen.de*

Intensive survey conducted by the Tuebingen-Iranian Stone Age Research Project (TISARP) team in the Dasht-e Rostam-Basht Region of the Southern Zagros Mountains resulted in the identification of 111 caves, rockshelters and open air sites, mainly associated with Upper Paleolithic lithic artifacts. Based on the complex topographical situation of the Dasht-e Rostam-Basht habitat area, this region is classified into 13 microhabitats. The analysis of lithic artifacts from each microhabitat demonstrates variation in the quality and quantity of the assemblages, which reflect specific patterns of landuse. This new method of quantifying landscape structure, site topographical positions and archaeological data permits the assessment of terrain features in facilitating Paleolithic landuse, including hunting, gathering, mobility and resource acquisition. Our work at the Dasht-e Rostam-Basht Region and comparisons with other areas within the Zagros Mountains suggest that the complex topography of this vast geological zone provides many bottleneck corridors which facilitate early human monitoring the movements of animals. These features in the landscape also provide places to camp and easy access to the prey and other resources during Late Pleistocene.

ORAL

## 10. TERRITORIALITÉ ET MOBILITÉ DES GROUPES DE CHASSEURS CUEILLEURS PENDANT LE DERNIER MAXIMUM GLACIAIRE EN EUROPE OCCIDENTALE, CENTRALE ET ORIENTALE

*Djindjian, François - (Université de Paris 1 Panthéon Sorbonne & CNRS UMR7041 Arscan) francois.djindjian@wanadoo.fr*

### Résumé

Au dernier maximum glaciaire, les groupes humains du Gravettien refluent vers le sud de l'Europe dans les péninsules : ibérique, italienne, balkanique et dans les golfes : tyrrhénien, adriatique, égéen et autour de la mer Noire. Ils s'y différencient : Solutréen en Europe occidentale, Epigravettien en Europe centrale et en Europe orientale. Les groupes humains, contraints dans leur nouveau territoires méridionaux, vont revenir à des territoires petits et une mobilité faible, qui les oblige à changer à la fois de système de ressources alimentaires (chasse aux mammifères grégaires remplaçant celle aux troupeaux migrants), de sources d'approvisionnement en matières premières (réutilisation des quartzites), et en conséquence de technologie (retour au débitage d'éclats, importance du débitage lamellaire) et d'outillages. Nous avons appelé ceci, la *stratégie opportuniste locale*, avec des territoires de moins de 1000 km<sup>2</sup> et une mobilité faible à l'intérieur de celui-ci. Les variations climatiques du dernier maximum glaciaire, font apparaître deux épisodes plus humides, bien visibles dans les séquences de loess d'Europe centrale et orientale et dans les enregistrements non anthropiques vers 20-19 000 BP et vers 18,5-17 000 BP. Durant ces deux épisodes, les groupes humains vont se déplacer vers le Nord pendant l'été, système que nous avons appelé *stratégie de mobilité saisonnière*, où ils vont retrouver la chasse aux animaux migrants et les gîtes de bon silex. L'objet de cette communication est de montrer que ces deux systèmes ont existé pendant le dernier maximum glaciaire à la fois en Europe occidentale, centrale et orientale, où, malgré des différences typologiques dans les assemblages, des caractéristiques communes peuvent être soulignées.

### Abstract

At the last glacial maximum, the Gravettian human groups flow back to southern Europe in the Peninsulas: Iberian, Italian, Balkan and the gulfs: Tyrrhenian, Adriatic, Aegean and around the Black Sea. There, they differentiate: Solutrean in Western Europe, Epigravettian in Central Europe and in Eastern Europe. Human groups, constrained in their new southern territories, go back to a system of small territories and low mobility, which requires them to change both of food resource system (gregarious mammals hunting replacing migratory herd hunting), of sources of raw materials procurement (reuse of quartzite), and, as a result, of technology (return to the flake knapping, importance of the lamellar knapping) and of industry. We called this, the *local opportunistic strategy*, involving territories of less than 1000 km<sup>2</sup> and a low mobility within it. The climate variations of the last glacial maximum, reveal two wetter episodes, clearly visible in the sequences of loess of Central and Eastern

Europe and in non-anthropogenic records around 20-19 000 BP and 18,5-17 000 BP. During these two episodes, human groups will move northward during the summer, system we called *seasonal mobility strategy*, where they will find again the hunting of migratory animals and outcrops of good flint. The purpose of this communication is to show that these two systems have existed during the last glacial maximum both in Western, Central and Eastern Europe, where, despite typological differences in assemblages, common characteristics may be highlighted.

### POSTER

#### 11. LANDSCAPE AND HABITAT - THE CÔTE CHALONNAISE (BUGUNDY, FRANCE), A PALAEOOLITHIC MICRO REGIONAL CASE STUDY

Hoyer, Christian Th. - (Universität Tübingen) christian.hoyer@uni-tuebingen.de

Herkert, Klaus - (Universität Tübingen) klaus.herkert@student.uni-tuebingen.de

Frick Jens Axel - (Universität Tübingen) jens-axel.frick@ifu.uni-tuebingen.de

Siegeris, Markus - (Universität Tübingen) markus.siegeris@student.uni-tuebingen.de

Floss, Harald - (Universität Tübingen) harald.floss@uni-tuebingen.de

Since the second half of the 19th century, Southern Burgundy has constituted as an important region for the transition from Middle to Upper Palaeolithic in France. Containing remains from the Middle Palaeolithic, the Châtelperronien, the Aurignacian and the Gravettian, the position of this region is strengthened not only diachronically but also geographically for the overlap of these different complexes in time and space compared to neighbouring regions.

Beginning in the middle of the 1990s, a research team from Tübingen University directed by H. Floss has been investigating this area, building on a research tradition started by A. Arcelin and H. Breuil and carried on by J. Combier and H. Delporte. In spite of the long history of research in this region, it is clear that more detailed information in the form of absolute dates, chronostratigraphic studies, and technological reassessments of the different assemblages are required. Through ongoing excavation, survey, and collection analysis of different cave and open-air sites and surface collections, the Tübingen research team is attempting to fill gaps in the current knowledge of the region as palaeolithic habitat.

As basic parameters for the Côte Chalonnaise region, which is geographically situated in the Jurassic mountain chain bordering the Saône-river-plain in the west, the availability of main resources (game, water, silex) in very proximity of all of the major archaeological sites is attested.

The reconstruction of the Palaeolithic relief helps to understand Palaeolithic procurement patterns as well as the visibility of the landscape and the sites in the environment might play an important role in the organisation of the habitat and the space occupied.

The aims of the current projects are, among others, building up an occupation model for the early and middle Upper Palaeolithic in the area. GIS based mapping and modeling, datings, supported by raw material provenience-analyses, as well as chaîne opératoire studies and especially technological comparisons of the lithic and organic industries will provide a deeper insight in the complex long-term settlement patterns and resource economy strategies in the Côte Chalonnaise in the years to come.

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## POSTER

### 12. FIRST EUROPEAN ANATOMICALLY MODERN HUMANS AND THE ROUTE OF SHELLS: CHRONOLOGICAL AND QUALITATIVE EVIDENCE FROM THE VENETO PLAIN REGION SITES

Romandini, Matteo - (Università di Ferrara) [matteo.romandini@unife.it](mailto:matteo.romandini@unife.it)

Falcucci, Armando - (Università di Ferrara) [armando.falcucci@student.unife.it](mailto:armando.falcucci@student.unife.it)

Gurioli, Fabio - (Università di Ferrara) [fabio.gurioli@unife.it](mailto:fabio.gurioli@unife.it)

Broglio, Alberto - (Università di Ferrara) [alberto.broglio@unife.it](mailto:alberto.broglio@unife.it)

The use of marine shells as ornamental and symbolic objects is widespread among early AMH. This practice is also attested in those areas that are located at great distance from the sea (Taborin, 2004; White, 2004). Sometimes the lack of sea shells was compensated by the collection in freshwater (Romandini, 2012). Even if a few species can be surely associated to a particular environment, the collection areas can be supposed through the geographical distribution of the finds. In this work we take particular attention to two Northeastern Italian sites, Grotta di Fumane (Monti Lessini, Verona) and Riparo del Broion (Colli Berici, Vicenza).

Taphonomic microscopic analyses of the shells surfaces were carried out using Leica S6D Green Ough (L.A.T. of Ferrara) stereomicroscopes with 20-220 magnification range.

The assemblage from Fumane plays an important role as for the great number of shells (838 samples) as for the variability of the taxa represented (around 60). Furthermore the 3 *Dentalium inaequicostatum* and the *Theodoxus danubialis* found in Broion are both attested in Fumane.

It is difficult to circumscribe the ecological area of the species: some of them are typical of rocky substrates, other of sandy bottoms. Some specimens are now exclusive of the south-eastern part of the Mediterranean Sea (*Nassarius circumcinctus*), while others (*Gibbula pennanti*, *Gibbula cineraria*, *Littorina obtusata*) are particularly common along the coasts of the Atlantic Ocean and scarce in the Mediterranean Sea. Many of the species found in Fumane are also attested in the Italian Aurignacian sites close to the French Mediterranean coast.

The taxa present in these two sites represent a rare example of the little known fauna of the Mediterranean during the Würm Interpleniglacial, both the Tirrenian and the Adriatic Sea, when the sea level was 80-90 metres (Djindjian *et al.*, 1999) lower than today and the coastlines were about 200 kilometers southwest and 400 kilometers south-east from them. Although the paleoecological

studies of the shells are still in progress it can be brought an hypothesis of the possible collection areas based on the inter-site analysis and landscape reconstruction.

The two important sites considered, Grotta di Fumane and Riparo del Broion, have yielded striking archaeozoological and taphonomical bodies of evidence that reveal special attention to some species of marine shells that could have been carried from the beaches to the caves through apposite expedition or through exchanges between different groups.

Within the current studies is reasonable to hypothesize that the species of both sites have a Mediterranean origin and that the links between the chronological data and the hypothetical line passing through Fumane and Broion, compared with others guidelines coming from the Ligurian sites (Riparo Bombrini and Riparo Mochi), may represent a rare proof of the movements and/or exchange networks of the early Aurignacians in Europe.

# A9C The initial Cantabrian Magdalenian & the question of Magdalenian origins

Comission on Upper Palaeolithic of the Western Eurasia  
(Organisers: Lawrence G. Straus, Manuel R. González Morales)

Thursday 4th (9:00 to 14:00)  
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ORAL

**QUESTIONING THE SOLUTREAN-BADEGOULIAN TRANSITION. A MULTIDISCIPLINARY APPROACH BASED ON DATA FROM SOUTHWEST FRANCE**

*Sylvain Ducasse (CNRS laboratoire PACEA UMR 5199, université de Bordeaux) s.ducasse@pacea.u-bordeaux1.fr*

*Renard, Caroline (CNRS laboratoire TRACES UMR 5608, université de Toulouse 2) caroline.renard@univ-tlse2.fr*

*Baumann, Malvina (Doctorante université Paris I, ARSCAN UMR 7041) malvina.baumann@gmail.com*

*Bourdier, Camille (Université Toulouse 2, TRACES UMR 5608, université de Toulouse 2) camille.bourdier@univ-tlse2.fr*

*Castel, Jean-Christophe (Muséum d'Histoire Naturelle, Genève, Suisse et laboratoire PACEA UMR 5199, université de Bordeaux) jean-christophe.Castel@ville-ge.ch*

*Chalard, Pierre (SRA Midi-Pyrénées, laboratoire TRACES, Université de Toulouse 2) pierre.chalard-biberson@culture.gouv.fr*

*Chauvière, François-Xavier (Laténium, Neuchâtel, Suisse et chargé d'enseignement, université de Lyon 3) francois-xavier.chauviere@ne.ch*

*Peschoux, Caroline (Doctorante université Paris I, ARSCAN UMR 7041) caroline.peschoux@mae.u-paris10.fr*

*Pétillon, Jean-Marc (CNRS laboratoire TRACES UMR 5608, université de Toulouse 2) petillon@univ-tlse2.fr*

In southwest France, from the Late Solutrean to the Badegoulian, lithic industries witness deep technical and economical changes. Between 23.5 and 20.5 ky cal BP, a general reconfiguration of the lithic technical system occurs, and might be evidence of a broader reorganization of the society.

The "SaM" collective research project builds upon this evidence and aims at a better characterization and quantification of these changes, by putting together data from different technical and symbolic domains. This paper will present the work undertaken within this project, which includes researchers from different disciplines. This diversity and complementarity allow project members to go beyond mere typological and technological approaches and address technoeconomic and socioeconomic issues – especially group organization on the spatial and temporal levels, territory management, and hunting practices.

Our first results show that these technoeconomic evolutions are likely accompanied by changes on a broader scale ("sociological overhaul"). However, the impact of environmental changes on these groups living at the beginning of the Last Glacial Maximum remains to be evaluated. In this perspective, this paper will offer an at-

tempt at correlating our results with the available environmental data, thanks to a radiocarbon dataset that has been partly renewed within the "SaM" project.

ORAL

**2. THE EARLY TIMES OF THE MAGDALENIAN AS SEEN THROUGH LITHIC AND BONE EQUIPMENT. NEW DATA (ARCHAEO-STRATIGRAPHIC, HISTORICAL AND TECHNO-ECONOMIC) IN THE SOUTHWEST OF FRANCE**

*Sécher, Anthony - (UMR5199 PACEA) anthony.secher@hotmail.fr*

*Langlais, Mathieu - (UMR5199 PACEA) mathieu.langlais@u-bordeaux.fr*

*Pétillon, Jean-Marc - (UMR 5608 TRACES) petillon@univ-tlse2.fr*

*Chauvière, François-Xavier - (Office du patrimoine et de l'archéologie de Neuchâtel, section archéologie. Laténium) francois-xavier.chauviere@ne.ch*

In South-West of France, new analyses of lithic and bone equipment and a series of <sup>14</sup>C dates allow us to address the question of the genesis of the Magdalenian.

For the Lower Magdalenian, the re-examination of lithic and bone assemblages of the lower levels of Saint-Germain-la-Rivière (Trécolle excavation), Gironde, clarifies the techno-economic behavior of these groups. Comparisons are made with other sites such as Gandil shelter in Bruniquel or Scilles cave in Lespugue.

This "first" Magdalenian is dated between about 21 and 19 ky calBP. New results in the MAGDATIS project also clarified the definition of an "Early Middle Magdalenian" in Gironde, dated between 19 and 18 ky calBP. Assemblages from this period include Roc-de-Marcamps and Moulin-Neuf (Gironde) but also the upper levels of Saint-Germain-la-Rivière (Trécolle excavations) and those of the ongoing excavations at Petit Cloup Barrat (Lot; Castel and Chauvière excavations). Data from these sites shed a new light on the early days of the Classic Magdalenian, including the so-called "facies" with Lussac-Angles points, antler "shuttles" or scalene bladelets.

Between Lower and Early Middle Magdalenian, techno-economic characterization of antler working, direct dating of diagnostic objects and research on lithic equipment all show technical changes. These data lead to specify the rhythms of transformation of the Lower Magdalenian and the slow genesis of Classic Magdale-

nian through new behaviors, both technical, economic and symbolic.

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ORAL

### 3. EL ORIGEN DEL MAGDALENIENSE: UNA CUESTIÓN CONTROVERTIDA. EL REGISTRO DE LA CUEVA DE LAS CALDAS (ASTURIAS, NORTE DE ESPAÑA)

*Corchón Rodríguez, M<sup>o</sup> Soledad - (Universidad de Salamanca) scorchon@usal.es*

*Ortega Martínez, Paula - (Universidad de Salamanca) ortegap@usal.es*

La cueva de Las Caldas está situada en un entorno de pequeños valles, aledaños al curso principal del río Nalón, en el tramo medio de la cuenca. El lugar, intensamente habitado a finales del Pleistoceno, constituye un lugar privilegiado para la habitabilidad humana en el Paleolítico. El valle alberga una veintena de cavidades y abrigos con ocupaciones que se extienden desde el Auriñaciense al Aziliense, muchas de ellas con grabados y pinturas parietales. Aunque no es una cueva de grandes dimensiones, conserva uno de los registros estratigráficos más importantes del Suroeste de Europa, en lo que se refiere al Solutrense y Magdalenense. En Las Caldas, las características orográficas determinan la existencia de una amplia variedad de ecosistemas, tanto de alta montaña, cerros y planicies a media altura, como en valles abrigados. Esta variedad de recursos disponibles, unido a la abundancia de fuentes termales y minero-medicinales en el entorno de la cueva, determinaron que el lugar constituyera un entorno-refugio para los grupos sociales que ocuparon el valle.

El yacimiento muestra una amplia secuencia estratigráfica, con una horquilla temporal que abarca unos 10.000 años ( $24185 \pm 370$  calBP, nivel 15, sala I;  $14936 \pm 342$  calBP, nivel I, sala II). La sala I conserva un depósito arqueológico de 17 niveles solutrenses, que representan la secuencia completa del Solutrense cantábrico. La Sala II, en cambio, sólo ofrece un nivel, Solutrense final, reposando sobre el piso calizo y subyaciendo a un extenso depósito de 16 niveles magdalenenses. En esta sala II también está representada la secuencia magdalenense completa (inferior, medio antiguo y medio reciente, superior y final), que se extiende desde la Oscilación de Lascaux al Alleröd. Para la datación de estas series de niveles, se dispone de 26 dataciones  $^{14}\text{C}$ .

Este trabajo se centra en el estudio de los depósitos del final del Solutrense, y su relación con los más antiguos

niveles magdalenenses. Se presta especial atención a la secuencia de niveles XIII y XIV de la Sala II, con materiales del Magdalenense inferior y Solutrense final, respectivamente. Y se analizan las características de otras ocupaciones del Magdalenense inferior, así como la distribución espacial de los restos arqueológicos con metodología SIG.

Por otra parte, algunos de los niveles de Las Caldas han sido objeto de diferentes interpretaciones culturales, en relación con el final del Solutrense cantábrico y su sustitución por los primeros grupos sociales magdalenenses. Por ello, se estima que un examen crítico y comparativo de los diferentes tipos de restos materiales recuperados en los niveles, objeto de controversia, puede arrojar algo de luz en relación con el origen del Magdalenense en la Región cantábrica.

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ORAL

### 4. NEW DATES FOR THE IBERIAN BADEGOULIAN: DATA FROM CANTABRIAN AND MEDITERRANEAN REGIONS

*Aura Tortosa, J. Emili - (Universitat de València. Dept. de Prehistòria i Arqueologia) jeaura@uv.es*

*de la Rasilla Vives, Marco - (Área de Prehistoria. Universidad de Oviedo) mrasilla.vives@gmail.com*

*Santamaría, David (Área de Prehistoria. Universidad de Oviedo) santamariadavid@uniovi.es*

*Duarte Matías, Elsa (Área de Prehistoria. Universidad de Oviedo) eduarda@gmail.com*

*Jordá Pardo, Jesús F. - (Lab. de Estudios Paleolíticos. Facultad de Geografía e Historia, UNED Madrid) jjorda@geo.uned.es*

*Pérez Ripoll, Manuel - (Universitat de València. Dept. de Prehistòria i Arqueologia) Manuel.perez@uv.es*

*Sanchís Serra, Alfred - (Museu de Prehistòria-SIP, València), Yolanda Carrión Marco (UNED, Valencia) alfredsanchis@gmail.com*

*Wood, Rachel - (The Australian National University, Canberra (Australia) rachel.wood@anu.edu.au*

In the first proposals of H. Breuil the “plus vieux Magdalénien” is identified in the Cantabrian (cf. Castillo) and Mediterranean regions (cf. Parpalló), whilst F. Jordá suggested that the Solutrean persisted in Iberia longer than elsewhere. Both have had a profound effect on the analysis of the final Iberian Upper Palaeolithic. Excavations during the second half of the twentieth century and the first radiocarbon dates ratified these relationships, limiting one chronostratigraphic framework and archaeological items marked regional characterization (cantabrian “de-solutreanized” process and mediterranean solutreo-

gravettian). This background led the Peninsular data to lie outside the “Badegoulian issue”. However, it is clear that the Archaic Cantabrian Magdalenian and the Ancient Mediterranean Magdalenian (Badegoulian facies) need to be incorporated into this discussion.

The aim of this presentation is to assess whether archaeological contexts available for analysis of “Solutreo-Badegoulian chronological transition” in Cantabrian and Mediterranean regions. This information will allow us to reconsider the Solutrean persistence and the beginnings of the “plus vieux Magdalénein” in Iberia from an evaluation of the stratigraphic, radiocarbon and archaeological data.

As the Badegoulian in Iberia is poorly-dated, we obtain new radiocarbon dates have become available, from Cueva Llonín (Asturias) and Cova del Parpalló (Valencia). After the consideration of the archaeological-stratigraphic data, the dates have been incorporated into Bayesian models using OxCal calibration.

The “Solutreo-Badegoulian-Magdalenian Transition” appears to coincide with the end of the Late Glacial Maximum, with high energy sedimentary episodes that have affected its conservation in most lithostratigraphic sequences and may have disturbed a significant part of the available dates. Finally, the dates and archaeological contexts that offer greater resolution pose different scenarios in approaching the study of this process.

Analysis of the radiocarbon dates shows that the taphonomic processes linked to LGM, coincide with regional features. The discussion on the chronological convergence requires a comprehensive assessment of the archaeological contexts to advance the construction of explanatory hypotheses. Our goal is to encourage reflection on one of the significant processes for the understanding the Iberian Final Palaeolithic.

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ORAL

## 5. THE ARCHAIC MAGDALENIAN (A. K. A. BADEGOULIAN) IN SPAIN

*Utrilla, Pilar - (University of Zaragoza) utrilla@unizar.es*

This communication studies lithic and osseous industries from the sites attributed to the Archaic Magdalenian in the Cantabrian Coast (Rascaño, Castillo, Río-Lloseta, Cueva de la Mina, Riera, Llonín, Cova Rosa, Mirón, Caldas and Aitzbitarte) and compares them to others belonging to

the Mediterranean basins (Parpalló, Volcán de Faro, Gato-2). We meditate about its diffusion East-North through the Ebro Valley if we consider the C14 dates. We argue the existence of different *facies* based on the presence or not of some significant tools such as raclettes, single-bevelled sagaies decorated with spikes patterns, pseudoexcise engraving in curve motifs... We also propose some chronological phases, such as the classic Magdalenian 0 characterised by coarse tools that precedes Magdalenian I and appears well documented in some Cantabrian sites (i. e. Mirón cave). We will discuss the opportunity of adopting the term “Badegoulian” for what we have been calling early phases of the Magdalenian and, if so, if we must apply it in a restricted or an ample way.

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ORAL

## 6. THE SETTLEMENT IN EASTERN ASTURIAS AFTER THE LGM. THE BADEGOULIAN LEVEL OF LLONIN CAVE (ASTURIAS, SPAIN)

*de la Rasilla Vives, Marco - (Área de Prehistoria. Universidad de Oviedo) mrasilla.vives@gmail.com*

*Duarte Matías, Elsa (Área de Prehistoria. Universidad de Oviedo) eduardma@gmail.com*

*Rodríguez Otero, Vicente (Arqueólogo. Villaviciosa. Asturias) vicente.correo@gmail.com*

The Llonin cave has an important archaeological sequence accompanied with a varied chronologically long rock art. It is represented the Mousterian, Gravettian, Solutrean, Badegoulian, Middle and Upper Magdalenian and some remains from the Azilian and Bronze Age. In rock art we have figurative (deer -mainly females-, bison, goat, horse, reindeer, aurochs, bear, feminine antropomorphic) and nonfigurative (rectangular or meanderlike signs, groups of points and lines) using different techniques: painting (black or red colour, few of them using the tampon technique), and engraving (simple or multiple lines with modelling striate technique). This cave is the best example in the rock art of the Spanish and French geography of the last engraving technique mentioned.

We have studied a statistically significant sample of level III archaeological records (Galería Area) from a technological and typological point of view.

In that level we have found an unusually associated lithic and bone collection: raclettes, Placard type bone points, the pseudo-excise carving technique and the use of local raw materials. In addition, we have a broad number of notches, denticulates, splintered pieces, a low blade-

let production, and a noted quantity of lithic artifacts made in quartzite and in local flint.

New <sup>14</sup>CAMS datations that will be exposed and analysed in other paper in this Congress situate the Llonin level III around 18.000 years BP (uncalibrated). This will be compared with dates of similar levels and with the immediate Solutrean data just to see the quality of the transition between Solutrean and Magdalenian.

Finally, we also propose to include this level in the Badegoulian because it adapts better with the characteristics offered in those named sites in France and in the Iberian peninsula.

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ORAL

## 7. THE END OF THE SOLUTREAN IN THE EASTERN CANTABRIAN REGION. FEW DATA FOR A COMPLEX PROBLEM

Rios-Garaizar, Joseba - (CENIEH) joseba.rios@cenieh.es  
San Emeterio Gómez, Aixa - (III PC) aixitaseg@gmail.com  
Garate Maidagan, Diego - (Université de Toulouse le Mirail) garatemaïdagandiego@gmail.com

Investigations about the Solutrean-Magdalenian transition are highly dependent on the radiometric chronologies and on the cultural classifications of archaeological assemblages. The situation in SW France seems quite ordered with a Badegoulian technocomplex (ca. 23.6-20.5 kyr Cal BP) situated between recent Solutrean and Lower Magdalenian (Ducasse, 2012). Some authors have claimed the presence of Badegoulian assemblages in the Cantabrian Region (Aura et al., 2012) but, by now, there is no clear proof for that (Rios-Garaizar et al., 2013). On the contrary, in the Cantabrian region there is a characteristic late Solutrean with rare foliates, high percentages of backed bladelets and some raclettes, which extends until ca. 20.0 kyr cal BP. This represents a probable local transition to Lower Magdalenian, which, from a technological point of view, is mainly characterized by the use of multicomposite hunting weapons. Despite this situation could be an artifact of archaeological research development in both sides of Pyrenees, we propose that it could be the result of the coexistence of more or less permeable cultural traditions (Badegoulian and Late Solutrean) in SW France and N Spain. We will discuss these hypothesis taking in account the available environmental and archaeological information for the Late Solutrean in Eastern Cantabrian Region and Western Pyrenees.

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ORAL

## 8. THE INITIAL MAGDALENIAN OCCUPATIONS OF EL MIRON CAVE (RAMALES DE LA VICTORIA, CANTABRIA, SPAIN)

Straus, Lawrence Guy - lstraus@unm.edu (Department of Anthropology, University of New Mexico, Albuquerque, NM 87131 USA)

González Morales, Manuel R. - moralesm@unm.edu (Instituto Internacional de Investigaciones Prehistóricas, Universidad de Cantabria, 39005 Santander, Spain)

Our excavations since 1996 in El Mirón Cave on the northern edge of the Cantabrian Cordillera, between Santander and Bilbao, have revealed a sequence of Initial, Lower, Middle, Upper and Epi- (i.e., Azilian) Magdalenian occupations of varying degrees of intensity. The Initial Magdalenian levels overly a series of Solutrean ones and represent a change in the nature of human use of the cave, from short-term, limited-function Solutrean visits (probably by warm-season hunting parties) to massive, organic matter- and artifact-rich layers, whose character as palimpsest deposits from major, repeated, long-term, multi-purpose, residential episodes continues throughout the overlying Lower Magdalenian levels.

Radiocarbon assays for the Initial Magdalenian levels (119.3-117) range between ca. 17.6 – 17.0 uncal. BP (ca. 20.7-20.3 cal. kya), with considerable continuity in the lithic (non-projectile point) and osseous artifact assemblages and the presence of a few Solutrean point fragments in the Initial Magdalenian assemblages. The Initial Magdalenian assemblages are devoid of classic Badegoulian lithic artifact types (*raclettes*, transversal burins), but are characterized by large numbers of large flakes, tools on flakes of “archaic”/Mousteroid aspect (denticulates, notches, sidescrapers) made on local non-flint raw materials (mudstone, quartzite, limestone). However, there are also numerous unretouched and backed bladelets made on excellent-quality flint from coastal *flysch* outcrops of Upper Cretaceous age (40-60 km from the site), continuing a “bifocal” kind of composition typical of many Solutrean and Magdalenian assemblages in Cantabrian Spain. There are mainly undecorated antlers *sagaies* of diverse cross-sections, but most characteristic seem to be very large (robust), round-section points.

The pattern of fundamental technology continuity, but with the gradual replacement of one class of weapon tips (Solutrean foliate and shouldered points) by another (antler points armed with bladelet elements), seems to be the chief characteristic of the Solutrean-Magdalenian transition in this site, though it is acknowledged that, while similar in some aspects to other early Magdalenian

assemblages from the region (e.g., El Rascaño, La Riera), there were diverse kinds of assemblages in both the Cantabrian region (e.g., Las Caldas) and throughout Iberia (e.g., El Parpalló in Valencia) in general, some indeed with *raclettes*, although generally centuries more recent than the origins of the Badegoulian culture in France.

Subsistence evidence, still very preliminary, suggests that El Mirón inhabitants (like those throughout the region) continued the Solutrean pattern of heavy dependence on hunting red deer and ibex in this montane setting within a very open landscape dotted only by a few scattered pines and junipers. Late survival of Solutrean technology and essential technological, settlement and subsistence continuity were the hallmarks of human adaptations as the environment slowly and tentatively moved from the conditions of the LGM into those of early Oldest Dryas (GS2a).

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ORAL

## 9. EARLY MAGDALENIAN PALEOECONOMIC BEHAVIOR IN THE CANTABRIAN REGION, NORTHERN SPAIN

*Geiling, J.M. - (Instituto Internacional de Investigaciones Prehistóricas de Cantabria-Universidad de Cantabria) jeanmarie.geiling@unican.es*

*Marín-Arroyo, A.B. (Instituto Internacional de Investigaciones Prehistóricas de Cantabria-Universidad de Cantabria) anabelen.marin@unican.es*

*González-Morales, Manuel R. (Instituto Internacional de Investigaciones Prehistóricas de Cantabria-Universidad de Cantabria) moralesm@unican.es*

*Straus, Lawrence Guy (Department of Anthropology, University of New Mexico; Instituto Internacional de Investigaciones Prehistóricas de Cantabria-Universidad de Cantabria) lstraus@unm.edu*

This research aims to recognize the driving factors of human behavioral change on subsistence in Upper Paleolithic hunter-gatherers during the Last Glacial, a period of rapid climate fluctuations. Throughout the Last Glacial Maximum advancing ice-sheets substantially reduced hunting territories. In this scenario, northern Iberia acted as a refugium. Evidence of the refugium is shown in recent aDNA studies and the increase on archaeological sites, especially during the Solutrean. These factors may indicate an influx of migrants in southern European refugia resulting in a population expansion across northern Iberia. By studying subsistence strategies carried out during and after the Last Glacial Maximum we have identified

two periods of major changes: one during the transition from Solutrean to Early Magdalenian and the other during the Early to Middle Magdalenian. The current study focuses on the Early Cantabrian Magdalenian (17-14,5 ka BP), using an extraordinary rich archaeological deposit from El Mirón cave, located in the upper Ason valley at the eastern Cantabrian Cordillera. The archaeozoological results from Level 15 and 16, date around 15-15,2 ka BP, are presented here.

The palaeoeconomic behavior achieved for those hunter-gatherers is reconstructed based on identification of taxa consumed, age of the individuals, carcass transportation, variety of butchering process, extent of logistic mobility and site use. The taphonomic modifications were classified to identify the accumulating agents and the diagenetic processes affecting the assemblage.

The results show how the Early Magdalenian economy at El Mirón cave was mainly based on red deer and ibex, which were hunted seasonally. According to the taphonomic results, the archaeological levels studied were formed under warmer and more humid climatic conditions.

Comparisons between the Early Magdalenian faunal assemblage and the Middle Magdalenian assemblage at El Mirón indicates continuity in selected hunted species, seasonality of occupation at the site and of butchering activities practiced. However, a decrease in animal bone density in the later levels indicates a change in site occupation.

The archeozoological data presented throughout this study suggests that paleoeconomic behavior in the Cantabrian region during Magdalenian was intrinsically affected by climate changes. These had a great effect on the settlement pattern and economic decisions of Iberian Late Glacial human populations.

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ORAL

## 10. INITIAL MAGDALENIAN PENDANTS BELONGING TO LEVEL 17 MIRON CAVE (CANTABRIA): ANALYSIS AND EXPERIMENTATION.

*Varela Neila, Ángela - (Instituto Internacional de Investigaciones Prehistóricas de Cantabria) angelavarelaneila6@hotmail.com*

*González Morales, Manuel R. - (Instituto Internacional de Investigaciones Prehistóricas de Cantabria) moralesm@uni-*

*can.es*

*Straus, Lawrence G. - (University of New Mexico) lstraus@unm.edu*

Miron Cave is a cavity located in the valley of Asón, located in Monte Pando, which also Covalanas cave is. The entrance to the cave faces west, converging slightly below it the Gándara, Calera rivers and Asón.

It is 20 km away from the present coastline, and 260 meters above sea level. The proportions of the site are quite impressive, as the hall is 30 meters deep, between 6 and 14 wide and about 13 high. Within an upward jutting slope about 100 meters to the heart of Monte Pando is. The chronology covers the field is wide, from the Mousterian to the Bronze Age, and is divided into three distinct areas : cabin , barnyard and trench.

The present case is the so-called cottage, where all traces in this set were extracted .

The level 17 has been chronologically classified as belonging to the lower Magdalenian, with some dating to about 17,000 years.

This is a stratigraphic level characterized by intense chocolate color in which a large amount of lithic and bone industry were found. Associated with this chronological time was found in 2010 the first Magdalenian burial of the Iberian Peninsula as a secondary burial. Furthermore, these residues linked to a block schematic with deep engravings are found.

The material in this study is based on two groups: the teeth and marine molluscs.

On one side are two teeth of deer with different types of drilling or suspension, an atrophic canine and incisor. Conversely, the number of punched molluscs is quite superior. Seventeen seafood items are divided into two subgroups: scaphopods and gastropods.

The analysis of the parts has been made with binocular magnifier, while experimentation was made from existing marine mollusks.

In some human action parts are observed regarding boreholes or manipulations.

The comparison between the parts of the archaeological record and the experimental objects sheds some similarity, it just looks blurred by poor maintenance of some hanging by depositional processes.

As far as possible it has been observed that some of the pieces have marks from the use in necklaces or clothing. Conducting suspension and using these as decorative object is a fact level 17 Miron Cave. On one hand a variety of drilling techniques based on different types of molluscs and dental pieces obtained by these groups of checks. Thus, the techniques of making pendants are adapted to the characteristics of each object.

# A9d The Human settlement of Western Europe during the last glacial maximum

Comission on Upper Palaeolithic of the Western Eurasia  
(Organisers: Lawrence G. Straus proposed joint UISPP/INQUA)

Thursday 4th (14:00 to 19:30)  
Meeting Room B22



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XVII World UISPP Congress  
XVIIe Congrès Mondial de l'UISPP  
XVII Congreso Mundial de UISPP

ORAL CONTRIBUTIONS

ORAL

## 1. PINIONS TO EAT?. AGAIN?

Badal García, Ernestina - (Universidad de Valencia) Ernestina.badal@uv.es

Vidal Matutano, Paloma - (Universidad de Valencia) Paloma.vidal@uv.es

Sanchidrián Tortí, José Luis - (Universidad de Córdoba) gt-1satoj@uco.es

Jordá Pardo, Jesús Francisco - (UNED) jjorda@geo.uned.es

Aura tortosa, Emili Juan - (Universidad de Valencia) Emilio.aura@uv.es

There are known accurately the faunal resources consumed during the European Upper Paleolithic, but the plants resources are virtually unknown. This may be due to its nature, conservation features and archaeological methods employed in their recovery. Even today archaeological excavations are made where systematic sampling is not done looking for plant resources. Precisely because of the fragility of the plants and the lack of archaeobotanical results efforts should be made at all sampling sites.

Southern Iberia has provided some of the earliest references to the use of plants during the Middle and Upper Paleolithic European (cf. Gorham's and Nerja caves). Recent data indicate that plant resources had a significant place in the human diet long before the "broad spectrum revolution" proposed by Flannery. Ohalo II is perhaps the best example for the Eastern Mediterranean (Weiss et al., 2004). Our communication tries to demonstrate that a systematical and sustainable management of the vegetable resources during the Upper Paleolithic has taken place in the Western Mediterranean too, from the archaeobotanical results of a Solutrean level Cueva de Nerja (Málaga, Spain).

In the "Sala del Vestíbulo" at Nerja's Cave, a domestic fire was brought to light in A7 square, belonging to the level NV 8s. In this paper we present the botanical identification of over 5000 plant remains from the fireplace and the level that encompasses. The methods of analysis are purely mechanical. We used a Nikon Optiphot-100 dark/bright field incident light microscope for taxonomic identification of wood charcoal and Hitachi 4100 Scanning Electronic Microscope. Later, the material was selected for radiometric datation.

Two kinds of remains are presented: processed vegetables for human consumption and the charcoal used as

firewood. From the total of charred remains, 96% are from *Pinus pinea* cones and only 4% are wood charcoals. This ratio indicates the hearth's specificity in the pine-cones processing with the aim to obtain the pine nuts.

1 - Results of this fireplace show the importance of plant resources in the communities of the Upper Paleolithic in southern Europe. Moreover, these resources were also consumed in other regional sites even in earlier periods (Badal 1998, Mestcalfe 1950).

2 During the LGM umbrella pine (*Pinus pinea*) remained in the south of the Iberian Peninsula and was managed sustainably by hunter-gatherers owing to its firewood scarcity. Their presence in this context indicates warm climatic conditions in southern Iberia.

3. The wood used for fuel comes from other taxa that have not nutritional value as *Pinus nigra* / *P. sylvestris*, *Fabaceae*, *Cistus*, etc.

POSTER

## 2. UPPER PLEISTOCENE - HOLOCENE VEGETATION CHANGES IN NAVALMAILLO ROCKSHELTER (PINILLA DEL VALLE, MADRID, SPAIN)

Ruiz-Zapata, Maria Blanca - (UAH) blanca.ruiz@uah.es

Gil García, María José - (UAH), Enrique Baquedano (MAR) mjose.gil@uah.es

Arsuaga, Juan Luis (UCM-ISCI) jlsuaga@isciii.es

Pérez-González, Alfredo (CENIEH) alfredo.perez@cenieh.es

Navalmaillo Rockshelter pollen data are presented, in order to know de vegetation and climate changes during Upper Pleistocene (levels: NVP-fluvial, NVP-H, NVP-F and levels  $\beta$ ,  $\alpha$ ), dated in  $71.685 \pm 5.082$  -  $77.230 \pm 6.016$ ), and Holocene (NVH), formed previously  $3690 \pm 60$  BP ( $4.170$ - $3.860$  cal BP) (Fig.1). The site is located at 1.114 mns, in the center of the high Lozoya valley; was formed by fluvial action (Lontaneres and Navalmaillo, tributarios of Lozoya river) that eroded Late Cretaceous dolomite outcrops. Vegetation point of view (Peinado Lorca y Rivas Martínez, 1987), the area is located in Guadarramense section, Supramediterraneo bioclimatic level, in *Luzulo forsteri-Querceto pyrenaicae* range (Fernández, 1988) with deciduous forest (*Quercus pyrenaica*) development under supramediterranea climate, subhumid continental. The pollen extraction followed the standard established protocols (acids and alkalis). The residuals were pollen-enriched through flotation in the Thoulet's dense liquor being later preserved in glycerin in eppendorf tubes. The



number of pollen grains in the samples oscillates between 300 pollen grain number; when the number was low (10-20) that they are figured in the pollen diagram as "presences". The statistics was made using TILIA® and TILIA-GRAPH®. In the samples with statistically significant number of pollen grains the AP/NAP logs were built as well as the rarefaction analysis, to determine the vegetation diversity. In order to make easier the data reading a synthetic pollinic diagram has been built including the most significant taxa (Fig.2).

Pollen data show a vegetation, from Pleistocene formed under climate conditions dry Mediterranean (NVP-river), which pass through a phase with a more moderate climate, with variations in the rate of moisture (NVP-H); progressively are installed more dry conditions (NVP-F) ending in other more severe and with lower temperatures ( $\beta$  levels and  $\alpha$ ). During the Holocene, the trend observed, within a Mediterranean climate, is toward the installation of conditions with increasing water scarcity, which define the progressive increase of excellence in the study area. The development of nitrophilous taxa and of the NPM coproflora affinity, show the existence of fauna in the territory, which alter the conditions food webs of the east. The relationship between AP and the NPM type 207 (cf. *Glomus fasciculatum*) curves, show the processes of deforestation of the territory, which favoring the reactivation of the erosive processes (*Concentricistes* or *Pseudoeschizaea circura*), especially on the basis of the 860 BP (910-690 cal BP).

Six-phase have been detected as a response to climate change, which, in general, express the transit towards the installation of cooler conditions during the upper Pleistocene. During the Holocene, the vegetation is defining the Mediterranean increased in the study area (Fig.2)

ORAL

### 3. THE LAST GLACIAL MAXIMUM CHARACTERIZED BY THE SMALL-MAMMAL ASSEMBLAGES IN SOUTHWESTERN EUROPE

López-García, Juan Manuel - (Università degli Studi di Ferrara) [lpzjmn@unife.it](mailto:lpzjmn@unife.it)

Bañuls-Cardona, Sandra - (Università degli Studi di Ferrara) [sandra.banulscardona@unife.it](mailto:sandra.banulscardona@unife.it)

Blain, Hugues-Alexandre - (IPHES, Institut Català de Paleocologia Humana i Evolució Social) [hablain@iphes.cat](mailto:hablain@iphes.cat)

Lozano-Fernández, Iván - (IPHES, Institut Català de Paleocologia Humana i Evolució Social) [ivanlozano@gmail.com](mailto:ivanlozano@gmail.com)

Cuenca-Bescós, Gloria - (Universidad de Zaragoza) [cuenca@unizar.es](mailto:cuenca@unizar.es)

We presents here a palaeoenvironmental and palaeoclimatic approach to the end of the Last Glacial Maximum (LGM) in the Iberian Peninsula on the basis of the small-mammal assemblages (insectivores, bats and rodents). The LGM is an important period in our climate history defined by the maximum extension of ice sheets between ca. 22 and 19 ka BP. In the Mediterranean region the LGM is characterized by humid conditions, which allow for the development of arboreal vegetation.

The small-mammal remains described in this study were recovered from five different archaeological sites within the Iberian Peninsula: El Mirón cave (Ramales de la Victoria, Cantabria), Valdavara-1 (Becerreá, Lugo), El Portalón (Sierra de Atapuerca, Burgos), l'Arbreda cave (Serinyà, Girona) and Sala de las Chimeneas (Maltravieso, Cáceres).

These studied sites shows a non-analogue association represented by species associated with mid-European climatic conditions, such as the voles *Chionomys nivalis*, *Microtus arvalis*, *Microtus agrestis* and *Microtus oeconomus*, together with species associated with Mediterranean requirements, such as *Iberomys cabreræ* and *Microtus (Terricola) duodecimcostatus*. These assemblages reveal that our ancestors lived in those moment under harsher climatic conditions than today in the vicinity of the studied sites, though not as rigorous as elsewhere in Europe, with mean annual temperatures lower than present and an environment dominated by wet open meadows.

Our results have been compared with other environmental and climatic proxies, such as, global isotope curves and palynological, anthracological and palaeoherpetological studies, showing that our data coincide with these previously published results, providing a scenario for the palaeoclimatic and palaeoenvironmental conditions that occurred during the LGM in the Iberian Peninsula.

ORAL

### 4. HUMAN SOCIO-NATURAL RELATIONS IN CENTRAL PORTUGAL AT THE LAST GLACIAL MAXIMUM

Haws, Jonathan (University of Louisville) <http://bit.ly/1rmDzmG>

During the Last Glacial Maximum, abrupt climate changes created highly variable paleoenvironments inhabited by human populations across the Iberian Peninsula. Pollen and sedimentary analyses from deep-sea cores off Portugal provide records of regional-scale paleoenvi-

ronmental responses to the climate shifts that punctuated the LGM. Archaeological assemblages from caves and rockshelters offer a more local-scale understanding of human-environment interactions during this period. One site in particular, Lapa do Picareiro, has yielded a continuous, stratified sedimentary sequence that provides a diachronic record for MIS 2 human occupation and environmental change.

Here I present data from the ongoing excavation including results of artifact, faunal, and sedimentological analyses of the Late Gravettian and Solutrean (Levels U-O). The taphonomic study of the faunal remains informs on local paleoenvironments and human diet choice during the LGM. Sedimentological analyses including magnetic susceptibility link the cave deposits with global scale records of LGM climate from the Greenland ice cores.

The mammalian taxa represented in the assemblage agree with those identified in other sites in the region. The large mammals represented show only very general changes through time due to their adaptive plasticity. The abundant and ubiquitous rabbit remains allow for quantitative comparisons with other sites for a more fine-grained analysis. In particular, they can be used as an independent test of Davis's (2007) "rabbit paleothermometer" hypothesis. The avian taxa are highly diverse, especially in Levels T and U. Amphibians are also well represented in these levels. The taphonomic analyses suggest inputs by humans, the Iberian lynx and raptorial and scavenging birds. Humans and lynx were likely responsible for most of the large mammal and rabbit as well as some birds. Raptorial birds likely preyed on the rodents, especially voles, amphibians and small birds. Vultures and carrion crows are present and also likely contributed many mammal remains. The fauna therefore derive from multiple sources and provide a balanced paleoenvironmental record. The magnetic susceptibility results agree with SST estimates derived from deep-sea records that suggest relatively warm, mild conditions during the LGM.

The results are used here to understand human responses to long-term environmental change in central Portugal. The spatial distribution of artifacts, animal bones and charcoal concentrations suggest sporadic, short term visits to the cave prior to and during the LGM. Inferences drawn from modern analogues of species ranges and habitat preferences of the faunal species suggest periods during which conditions may have been similar to the present, especially during the Late Gravettian.

ORAL

## 5. TECHNOLOGICAL ORGANIZATION AND SOCIAL NETWORKS DURING THE SOLUTREAN IN SOUTHERN AND WESTERN IBERIA

*Cascalheira, João - (Universidade do Algarve) jmcascalheira@ualg.pt*

*Bicho, Nuno - (Universidade do Algarve) nbicho@ualg.pt*

Geographically limited to the westernmost regions of Europe and with a relatively short chronological range when compared to other pan-european technocomplexes, the Solutrean has been traditionally regarded as one of the first examples of human refugia during the Late Pleistocene. Clusters of sites in particular regions of SW Europe seem to reveal that, similarly to what has been argued for animal and vegetal species, Solutrean settlement patterns form a scenario of isolated refugia that may have contracted and expanded their cultural influence as climate fluctuated.

In southern and western Iberia, during the later phases of the technocomplex, similarities between each of these niches have been long argued, based on the distribution of specific types of lithic weaponry, like shouldered and stemmed projectiles. However, these patterns of apparent cultural convergence have never been evaluated based on a detailed technological analysis of lithic assemblages that would permit to better understand between-region variability and, from a paleoanthropological perspective, shed some light on the systems of cultural transmission and the operation of hunter-gatherer information networks during the Last Glacial Maximum in Iberia.

This paper presents the results of a study of lithic technological organization during the final stages of the Solutrean in southern and western Iberia, drawing evidences from a total of five sites located between the Valencian region and the Portuguese Estremadura (Cova Parpalló, Cueva Ambrosio, Vale Boi, Vale Almoinha and Olival da Carneira). Statistical procedures are used to demonstrate patterns of variability across space and time, and help to define in which specific technological particularities the various eco-cultural niches were closer or further apart. Some similarities and dissimilarities between the contexts were identified which showed that: (1) when present, the similarities across regions are mostly visible in the size and type of the lithic blanks produced and, very rarely, in the specific technological attributes of their production; (2) some of these associations are supported by a solid chronometric framework, which shows on

one hand, that the industries that are similar from a typological point of view are contemporary and, secondly, that the traditional subdivision of the Mediterranean Solutrean in phases cannot be proven with the currently available data.

From a paleoanthropological standpoint, the results obtained show that the human adaptive system to the Last Glacial Maximum worked at two different, but complementary, scales. One that is essentially local, formed by several, well established eco-cultural niches, where communities have shared, and maintained, in the form of cultural traditions, techno-economic schemes that are best adapted to the particularities of the respective ecological contexts.

The other, suprarregional, related mainly with broad geographical social ties, maintained as an extra factor of the adaptive response to the impact of climate and landscape modifications, and functioning through sharing behaviors of stylistic concepts and typological elements.

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ORAL

## 6. A NEW OPEN AIR SOLUTREAN SITE IN DOURO BASIN. LEFT BANK OF TERRAÇO FOZ DO MEDAL

*Gaspar, Rita - (Baixo Sabor ACE) ritantunesgaspar@gmail.com*

*Molina, Francisco Javier (Baixo Sabor ACE)*

*García-Vallido, Francisco (Baixo Sabor ACE; EPPEX)*

*Ferreira, João (Baixo Sabor ACE)*

*Neto, Nuno (Neoépica) <http://www.neoepica.pt/index.php/quem-somos/a-equipa> - neoepica@gmail.com*

*Rebelo, Paulo (Neoépica) <http://www.neoepica.pt/index.php/quem-somos/a-equipa> - neoepica@gmail.com*

*Baptista, João (UTAD) jrbaptist@utad.pt*

The construction of a dam in the region of Trás-os-Montes, Northeastern Portugal, gave origin to a project of archaeological excavation and survey which began in 2008. The work done is now bringing to light important data about the settling of this territory during the upper Paleolithic, which was known until now in the Côa valley area only.

Here we present the archaeological results obtained through the study of the quaternary deposits of the left bank of the Medal stream, located in the Sabor river valley which is one of the main tributaries of the Douro (Duro) river.

The lithic assemblage proceeded from a trench of 16 m<sup>2</sup>, in two separated layers originated from the remains of the same moment of settling during the Upper Paleolithic. The technological and typological study revealed an intensive use of low-angle covering retouch applied to the reduction of blanks thickness on a numerous of raw-material like quartz or flint, probably in the making of leaf points as shown by the presence of a fragment of a laurel leaf point. The blanks are reduced through a variety of technological strategies using several types of raw materials. We have recognized an unidirectional on quartzite strategy with cores presenting use wear traces on difference surfaces, mainly in the edge between the platform and the front of the core, which proofs the multi-functionality of these cores. In another hand there is evidence of other more complex strategies using cherts (both sedimentary and hydrothermals) aiming the production of specific shaped bladelets from prismatic cores, carinated cores or through bipolar technique using anvil cores. The absence of backed barbs from the assemblage is also an important fact to note.

Not being yet in possession of absolute dating results which can give us more secure data about the chronology collection, from the technological and typological study we can predict and attribution to the Solutrean complex.

The importance of the solutrean occupation documented on the left bank of the Medal stream is high having in mind that the archaeological remains in this context are scarce in Northwest of Iberia, largely due to the geomorphological processes during the Last Glacial Maximum. The left bank of the Medal stream is subsequently one of the most relevant solutrean stratigraphical contexts known in this region.

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ORAL

## 7. UNRECOGNIZABLE: THE ICE AGE WORLD OF THE SOLUTREAN

*Straus, Lawrence Guy - lstraus@unm.edu (Department of Anthropology, University of New Mexico, Albuquerque, NM 87131 USA)*

The geographical success of the diverse Aurignacian cultures was consolidated by an apparently more unified network of Gravettian societies that stretched from Wales to Russia and that accomplished the repopulation of southern Iberia by *Homo sapiens sapiens*. Ironically, the appearance of characteristic Gravettian technologies to-

gether with iconic burial practices and (less widespread) "Venus" figurines, seems to have coincided with the climatic deterioration that marked the onset of MIS 2. This downturn became particularly sharp during the Heinrich 3 Event, which in turn was followed shortly by Heinrich 2 and the beginning of the Last Glacial Maximum. While humans were able to deal with conditions in the upper-middle latitudes of southern Britain, northern France, the Low Countries, Germany, southern Poland and the former Czechoslovakia in early MIS 2 by means of a creative cultural explosion ranging from mammoth bone houses to eyed needles to careful settlement choices and elaborate mobility strategies to an overarchingly cohesive belief system and network of social relations, this geographic success was not to last as conditions worsened. Cold and aridity south of the advancing ice sheets led to landscapes ranging from polar desert to steppe-like environments so poor in fodder as to become bereft of game and hence humans.

Although the ecological frontier between these glacial barren grounds and the far richer tundra-grasslands of the middle latitudes fluctuated during the course of the LGM (and with the fluctuations came brief, ephemeral northerly re-advances of human territories in unglaciated areas of Germany and Switzerland), fundamentally by the end of the Gravettian (ca. 24-25 cal kya) the human population of western Europe was reduced to unevenly distributed territories mainly in SW and SE France and peripheries of the Iberian Peninsula. Similarly, in central Europe, the progressive Gravettian abandonment of the North European Plain resulted in an LGM situation in which human populations survived in refugia in the Italian and Balkan peninsulas. Despite the pleniglacial cold, the amount of insolation at the middle latitudes provided a growing season long enough, especially in more humid coastal and near-coastal regions, for there to be ample and highly diverse game, which was the critical factor in human survival, although even some southern regions (Les Landes, the high *mesetas* Old Castile) were often largely unsuitable for human habitation and thus were empty. In SW Europe, the technologies of the human survivors of the LGM are known as "Solutrean" and, in Italy and the Balkans, as Early Epigravettian.

This paper will examine the environments in which the Solutrean technologies and adaptive strategies developed the indications for the selection of local settlement concentrations in the most favorable settings, the evidence for regional cultural identities, and hints of inter-regional social relations driven, no doubt, by demographic imperatives under possible population "bottle-neck" conditions.

ORAL

## 8. THE DAWN OF THE LAST GLACIAL MAXIMUM IN THE CANTABRIAN REGION (NORTHERN SPAIN): THE PALEOENVIRONMENTAL DATA IN ITS CHRONOLOGICAL AND CULTURAL CONTEXT

*Prieto, Alejandro - (Universidad del País Vasco) alejandro.prieto@ehu.es*

*Calvo, Aitor - (Universidad del País Vasco) aitor.calvo@ehu.es*

*García-Ibaibarriaga, Naroa - (Universidad del País Vasco) naroa.garcia@ehu.es*

*Iriarte, María-José - (Universidad del País Vasco) mariajose.iriarte@ehu.es*

*Castaños, Jone - (Universidad del País Vasco) jcastanosdlf@yahoo.es*

*Castaños, Pedro - (Aranzadi) pedrocastanos@yahoo.es*

The transition between the Gravettian and the solutrean in the Cantabrian Region still has several open questions of various kinds. Among them is particularly relevant the relationship between the beginning of the Last Glacial Maximum (c. 23 to 16 kyBP, between H2 and H1 events) and this important cultural change. This work aims to delve into this issue, building a multidisciplinary reference framework based on the interrelationship of paleoenvironmental, chronological and cultural data available for the period between 22.5 to 17.5 kyBP

For this work, we have used as a basis the chronological framework recently developed (Calvo and Prieto, in press) and based on the OxCal 4.2 software. From this, we have integrated the information available from paleoenvironmental proxies (microfauna, macrofauna, sedimentology and palynology) and various techno-complexes. This will allow us to approach to the paleoenvironmental evolution of the Cantabrian Region over this period and to observe his possible link with the technological changes that took place in it. Collaterally, also will allow us to reflect on the correspondences or differences between the paleoclimatic evolution of the Cantabrian coast and the global paleoclimatic framework based on marine isotopic stages. Finally, this work represent the continuity and combine different jobs presented in the II International Congress on the Solutrean (Velez Blanco, Almería, 25-28 June 2012)

ORAL

## 9. LIVING IN THE EDGE? COVA GRAN AND HUMAN PRESENCE IN THE SOUTHERN PYRENEES IN THE LGM

*Mora Torcal, Rafael - (Centre d'Estudis del Patrimoni Arqueològic de la Prehistoria. UAB) rafael.mora@uab.cat*

*Benito Calvo, Alfonso - (CENIEH) alfonso.benito@cenieh.es*

*Martínez Moreno, Jorge - (Centre d'Estudis del Patrimoni Arqueològic de la Prehistoria. UA) jorge.martinez@uab.cat*

*Vega Bolibar, Susana - (Centre d'Estudis del Patrimoni Arqueològic de la Prehistoria. UA) susana.vega@uab.cat*

Human presence in the southern Pyrenees during the Late Glacial Maximum (LGM) was poorly known until recent years, however this situation is changing rapidly. New sites excavated in the core and periphery of the Pyrenees are opening new perspectives to analyze human adaptations in this area along this critical climatic period. Cova Gran de Santa Linya (Southeastern Prepyrenees) contains large but fragmentary LGM sequence. Detailed analysis of contextual, techno-typological and radiometric data contributes to characterize hunter-gatherer lifestyle in the Southeastern Pyrenees.

We analyze the stratigraphy and LGM archaeological resolution in Cova Gran. The contextual attributes lead us to discuss the role of syn/post-depositional processes and their impact on the archaeological record. We also present technological and radiometric trends in the excavated areas.

Human presence in Cova Gran during MIS2 is documented in all excavated areas. Cova Gran confirms the presence of hunter-gatherers post-date the Maximum Late Glacial, but recent discoveries suggest previous human settlement during the LGM.

Syn/post depositional processes played an important role affecting the configuration of the archaeological record. These observations can help to understand the apparent scarce human presence during the LGM in the Southeastern Pyrenees.

Contextual discussion and their comparison of the archaeological data from other sites in the Southeastern Pyrenees, suggest that Cova Gran was repeatedly visited along the LGM. The identification of different techno-complexes in the site implies diverse cultural traditions over a long time scale in a landscape usually considered inhospitable, or with scarce human presence. These new data increase our knowledge of this process, opening

interesting perspectives for analyzing the human presence at the southern Pyrenees in the LGM.

ORAL

## 10. CENTRAL IBERIA AROUND THE LAST GLACIAL MAXIMUM: HOPES AND PROSPECTS

*Alcaraz-Castaño, Manuel - (Universidad de Alcalá) mac0088@hotmail.com*

Historically, the inner territories of the Iberian Peninsula, dominated by the upland regions of the Central Spanish plateau and the Central System range, have been depicted as a nearly depopulated area during the Late Pleniglacial or Marine Isotopic Stage 2, and especially during the Last Glacial Maximum. This is in contrast with the common consideration of the Iberian coastal areas as part of a southwestern European ecological refugium during the harshest periods of the last glacial cycle. This model has been affirmed in recent surveys, and only very recently has faced some important challenges, coming from new field data. Here we discuss these new data and propose new hypotheses and avenues of research on the human-environment interactions in Central Iberia around the LGM.

The aforementioned data come basically from 2 sites located in the Tagus River basin: (1) *Las Delicias*, a classic open-air site in the Manzanares valley (Madrid) that has been recently re-excavated, and (2) *Peña Capón*, a rock shelter close to the southern foothills of the Central System range (Sorbe valley, Guadalajara), where recent analyses of lithic and bone materials have been developed. Geoarchaeological, chronometric and palaeoecological information coming from these sites allow positioning preliminary hypotheses concerning the settlement of Central Iberia during MIS 2, and namely during Solutrean times.

Las Delicias hosts a Middle or Upper Solutrean lithic workshop, and the Peña Capón rock shelter functioned as a hunting camp during several moments within MIS 2, including at least Protosolutrean and Middle Solutrean times. These data, together with other Solutrean findings in the region, imply the existence of territorial organization, and hence some degree of stable settlement. Therefore, they call into question the classic model of the *Meseta* as a depopulated or crossing area during the Late Pleniglacial. In contrast, we hypothesize that the human occupation of Central Iberia during MIS 2 was more stable than previously thought, and probably included

the settlement of some areas during the LGM and other harsh climatic and environmental events of the last glacial cycle.

It is soon to conclude whether these human occupations (1) were related to relatively favorable episodes around or within the LGM, (2) were favored by the existence of ecological refugia, or (3) reflect the adaptability of hunter-gatherers to harsh environments. Although current data does not allow to decide on such possibilities, future field work, planned to be done very soon, will contribute to investigate these and other key topics related to human-environment interactions around the LGM. This research will focus on site formation processes, both at the macroscopic and microscopic level, and also on gaining more chronometric and palaeoecological data at Las Delicias and Peña Capón.

Current information is still insufficient for building solid models on human-environment interactions during the LGM in Central Iberia. However, it allows, for the first time in the discipline's history, to propose hypotheses based on valuable empirical data. Our imminent new field research on the Late Pleniglacial of this area will contribute to increase our knowledge of a long-standing underestimated archaeological record.

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ORAL

**11. THE SOLUTREAN SITE OF LA CUEVA DE AMBROSIO. NEW PERSPECTIVES OF THIS CULTURAL TECHNOCOMPLEX IN THE SOUTHEASTERN OF THE IBERIAN PENINSULA.**

*Ripoll López, Sergio - (UNED) sripoll@geo.uned.es*  
*Muñoz Ibáñez, Francisco Javier - (UNED) fjmunoz@geo.uned.es*  
*Jordá Pardo, Jesús Francisco - (UNED) jjorda@geo.uned.es*  
*Yraverdra Sainz de los Terreros, José - (Universidad Complutense) jyavedr@ghis.ucm.es*  
*Martín Lerma, Ignacio - (Universidad de Murcia) ignacio.martin@um.es*

The last investigations made during the excavation of the different levels at this important site to study the solutrean in the southeast of the Iberian Peninsula, have permitted us to make some precisions on its chronostratigraphic position in the Upper Pleistocene.

The calibration of a new radiocarbon date for the level IV (Upper Solutrean) and other six new dates (5 of them AMS) for the level II (Final Upper Solutrean) allows us to

place this two cultural phases between the Greenland Stadial GS3 (end of OIS 3) and the end of the Greenland Intersadial GI 2, with a greater occupation of level II after the Heinrich Event H2, agreeing with the intersadial that come just before the last glacial maximum (GS 2). This new data modify clearly the before existing dates, making the whole record very much older. On the other side, the discovery of decorated panels with engravings and paintings, recovered by Upper Solutrean sediments, allow us to place these representations, with great precision, in the Medium Solutrean (level VI) that must be placed between the GI 5 and the G 3. The excavation of the area that we call the microstratigraphy, included in level II (Final Upper Solutrean or Evolved Upper Solutrean), has provided 21 double layers of hearts, one of them with a stone structure and thousands of very typical solutrean flint implements that includes the characteristic barbed and tanged points, shouldered points and leaf points.

The investigations carried out in the Laboratorio de Estudios Paleolíticos with this arrowheads, shows that they must be thrown with a bow. The results show that are morphologically and metric well suited to be thrown by a bow. The replicas had a perfect ballistic behaviour, so we can think that the origin of bow can be earlier than traditionally thought.

Along all the solutrean levels the hunting strategies are kept stable enough: goat, horse, deer and rabbit. Provided that significant changes are observed neither in the received species nor in his percentage the appearance of new types of projectile points might be related to new systems of hafting and propulsion, which in turn they would be a part of an adaptive strategy to the new environmental conditions that believe themselves in western Europe with the LGM and that would have as aim assure or increase the possibilities of receiving the pieces of hunt.

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ORAL

**12. BEYOND SOLUTREAN POINT TYPES: TECHNOLOGICAL ORGANISATION AND BEHAVIOURAL IMPLICATIONS**

*Schmidt, Isabell - (Institute of Prehistoric Archaeology, University of Cologne) isabell.schmidt@uni-koeln.de*

Most researchers concerned with hunter-gatherers of the Last Glacial Maximum agree that the pace in which characteristic Solutrean technologies – bifacial shaping and pressure retouch as well as related heat treatment

of raw materials – appear in the record is well beyond the resolution of available archaeological data. Similarly, the observed appearance of regionally distinct Upper Solutrean point types on the Iberian Peninsula remains an unresolved phenomenon, although recent modelling of ecological and cultural data indicates that some geographical patterns correspond to environmental variables.

The present study intended to look at Solutrean points from a different perspective – that is the technological organisation and technological strategies involved in the production, design and use of these tools – to illuminate variability and reasons for the synchronic variability beyond the final tool design and point type distribution. More than 1200 points from almost 80 sites on the Iberian Peninsula were studied, covering all main settlement areas and point types dated to 25.-20.000 calibrated years BP. The analytical methods applied to the material were organized within a biography model and comprised the analysis of raw material, production sequences and technological strategies, morphometrics and shape as well as macroscopic fractures and use-wear. To trace and structure technological organisation of acquisition, production and use, the study draws from the conceptual framework of risk and cost in the study of lithic technological organisation. It explores technological strategies applied during individual life-histories of the functionally similar, but typologically distinct tools. They touch upon aspects of behaviour, technology and tool design. The results obtained by the multi-stranded set of analytical methods were summarised into point-type profiles and subsequently compared within and between environmentally distinct regions.

This comparative approach allowed identifying adaptive strategies within the processes of making, using and re-using these specific tools that clearly distinguish functionally similar tools from northern and southern Iberia. The obtained data suggest that synchronic variability of Solutrean points does not merely relates to stylistic variations in final tool design, but that regional differences are deeply rooted in distinct technological strategies of tool making and tool using behaviour, reflecting distinct subsistence- and mobility patterns among hunter-gatherer groups of the Last Glacial Maximum.

ORAL

### 13. HUMAN RESPONSE TO ENVIRONMENTAL RISK DURING THE LAST GLACIAL MAXIMUM

*Burke, Ariane - (Universite de Montreal) a.burke@umontreal.ca*

*James, Patrick - (Universite de Montreal) patrick.ma.james@umontreal.ca*

*Latombe, Guillaume - (Monash University) glatombe@gmail.com*

*Kageyama, Masa - (LSCE) masa.kageyama@lsce.ipsl.fr*

*Vrac, Mathieu - (LSCE) mathieu.vrac@lsce.ipsl.fr*

*Ramstein, Gilles - (LSCE), Team HDRG (FQRSC) gilles.ramstein@lsce.ipsl.fr*

This paper explores the impact of climate variability on the spatial behaviour of human populations. Climate variability is an important component of environmental risk and one of the most important challenges our species will face in the near future. We focus on the Last Glacial Maximum in Western Europe, examining how past populations reacted to this challenge.

High-resolution climate simulations are produced using outputs from the IPSL-CM5 and a downscaling method (GAM). The distribution of known archaeological sites is used as a proxy for the distribution of human populations.

The results help us better understand the spatial distribution of human population during the Last Glacial Maximum and demonstrates the rich potential offered by the archaeological record as a means of testing the sensitivity of human systems to different thresholds of environmental risk.

ORAL

### 14. POPULATION DYNAMICS IN WESTERN EUROPE DURING THE LAST GLACIAL MAXIMUM

*Maier, Andreas - (Friedrich-Alexander-Universität Erlangen-Nürnberg) and.maier@fau.de*

*Kretschmer, Inga - (State Office for Cultural Heritage Baden-Wuerttemberg) inga.kretschmer@rps.bwl.de*

*Schmidt, Isabell - (Institute of Prehistoric Archaeology, University of Cologne) isabell.schmidt@uni-koeln.de*

*Zimmermann, Andreas - (Institute of Prehistoric Archaeology, University of Cologne) a.zimmermann@uni-koeln.de*

Knowledge on demographic developments is vital for the understanding of social processes and cultural

change. To shed new light on this crucial aspect, we present current research – carried out within the framework of the CRC 806 “Our Way to Europe”, funded by the German Research Foundation (DFG) – on population dynamics in Western Europe during the Last Glacial Maximum. We use an upscaling approach based on site density and raw material catchments for our estimations. A consistent set of GIS-methods is used to delimit regions of intensive settlement activities against areas which were visited only in an ephemeral way or were avoided completely. Most important for the identification of these regions is the distance-based statistical analysis of site density and its visualisation by isolines. Information on raw material catchments is used to deduce foraging areas. Overlapping or mutually exclusive foraging areas and the collective or non-collective exploitation of raw material sources provide insights into interaction patterns of the people involved. Extensive overlaps of foraging areas indicate a joint exploitation of resources by the same group of people, whereas mutually exclusive foraging areas suggest exploitation by different groups. These foraging areas are – with regard to ethnographic observations – thought to represent annually aggregating groups consisting of several smaller groups living dispersed throughout a certain time of the year. Based on habitat and subsistence, several ethnographically known hunter-gatherer populations are selected and the median number of persons per aggregated and dispersed group is calculated. Applying these numbers to the case study at hand, population densities are calculated for different scale levels and for both the number of people only within the populated areas as well as within the whole of Western Europe. By doing so, we estimate regionally differentiated population densities and absolute numbers of people from a regional up to a continental scale. A spatial and diachronic comparison with equivalent data for the periods of the preceding Gravettian as well as for the succeeding Magdalenian allows identifying changes in the patterns of population dynamics. Based on these observations, we set up hypotheses about sources, trajectories and sink-areas of dispersal processes and discuss pull- and push-factors of migratory events in the context of the Last Glacial Maximum. Thereby this study contributes to our understanding of the social and cultural development as well as human-environment interactions during this period of cold climatic conditions in Europe.

POSTER

## 15. POSSIBLE CAUSES OF THE DISAPPEARANCE OF LARGE CARNIVORES IN THE IBERIAN PENINSULA, HUMANS VS CLIMATE

Sauqué, Víctor - (Universidad de Zaragoza)  
vsauque@gmail.com

Rabal-Garcés, Raquel - (Universidad de Zaragoza) rrabalg@gmail.com

Cuenca-Bescós, Gloria - (Universidad de Zaragoza)  
cuenca@unizar.es

The Iberian Peninsula (IP), due to its geographical configuration, displays two distinct climatic geographic ranges, the Eurosiberian and the Mediterranean (González-Sampéiz et al., 2010), this coupled with the rich paleontological record makes it an exceptional area for the study of Late Pleistocene. During this period the IP present a high number of climatic changes but only some climatic changes might have left signal in the archaeological and paleontological record. This is why we focus in the faunal changes during MIS3-MIS2, and also in the transition Middle to the Upper Paleolithic where IP plays an important role, as the southern part of the last refuge for Neanderthals with anatomically modern humans existing in the north. Through a comparative study of the fauna composition will be defined the causes which conducted to the disappearing of large carnivores.

We have built up a database collecting the faunal lists from 116 localities in the IP. For the present study, only sites with NISP greater than 100 and radiometric dates and/or archaeological record have been considered. We have divided the deposits by geographical and climatic situation and age. For age, we consider each of the following time periods of the Late Pleistocene: MIS3 (Middle Paleolithic) (60-40 ka), MIS3 (Early Upper Paleolithic), (c.40–26 ka), MIS2 LGM (Last Glacial Maximum) (c.26–16 ka), Gravettian–Solutrean and MIS2 post-glacial (c.16–11,5 ka), Magdalenian. Also we use NISP as abundance/scarceness indicator, and compare the percentages of NISP for each taxon and for each region and period.

In the Eurosiberian region *Ursus spelaeus* is the most abundant carnivore during MIS3. Large carnivores were not greatly affected by the change of humanity, from neandertals to early homo, during the transit MP–EUP and in this region the main change of carnivore composition was observed in the LGM when the *U. spelaeus* disappeared and *Crocuta crocuta*, *Panthera pardus*, and *Cuon alpinus* increased. In the Mediterranean region carnivores were common during MIS3 (MP) and they began



to decrease in the transition MP-EUP, this process continued and in the LGM the large carnivores were completely missed.

Large carnivores have a different story in each climatic region of IP and the change to UP affect the carnivores in a different way in each region. Eurosiberian region acted as a refugial for large carnivores until MIS2 Magdalenian.

**Important: at the end of this session will be a Meeting of the Commission on Upper Palaeolithic of the Western Eurasia (1 hour)**

# A10 The Neolithic from the Sahara to the Southern Mediterranean Coast: a review of the most Recent Research

Commission on Art and civilizations in the Sahara during Prehistoric times  
(Organisers: Barbara E. Barich, Giulio Lucarini)

Monday 1st (14:00 to 19:30)  
B01 Meeting Room



2014 burgos  
1-7 sept.

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XVII World UISPP Congress  
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XVII Congreso Mundial de UISPP

ORAL

## 1. ORIGINS AND SPREAD OF AGRICULTURE IN NORTH AFRICA: NEW ARCHAEOBOTANICAL EVIDENCE FROM MOROCCO

Morales, Jacob (*GI Arqueobiología. Centro de Ciencias Humanas y Sociales (CSIC). Albasanz 26-28. 28037 Madrid. Spain*) [jacobmoralesmateos@gmail.com](mailto:jacobmoralesmateos@gmail.com)

Peña-Chocarro, Leonor (*GI Arqueobiología. Centro de Ciencias Humanas y Sociales (CSIC). Albasanz 26-28. 28037 Madrid. Spain*) [leonor.chocarro@csic.it](mailto:leonor.chocarro@csic.it)

Pérez-Jordà, Guillem (*1. GI Arqueobiología. Centro de Ciencias Humanas y Sociales (CSIC). Albasanz 26-28. 28037 Madrid. Spain*) [guillem.perez@uv.es](mailto:guillem.perez@uv.es)

Zapata, María Lydia (*Depto. Geografía, Historia y Arqueología. Universidad del País Vasco. F. Tomás y Valiente s/n. 01006 Vitoria. Spain*) [lydia.zapata@ehu.es](mailto:lydia.zapata@ehu.es)

Bokbot, Youssef (*Institut National des Sciences de l'Archéologie et du Patrimoine (INSAP) Maroc, Angle Rues 5 et 7, Avenue Allal el Fassi, Madinat Al Irfane, Hay Riad, B.P: 6828 Rabat Instituts. Morocco*) [bokbotyoussef@yahoo.fr](mailto:bokbotyoussef@yahoo.fr)

Vera-Rodríguez, Juan Carlos (*5. Depto de Historia 1. Facultad Humanidades. Universidad de Huelva. Avenida de las Fuerzas Armadas, S/N. 21071 Huelva. Spain*) [juan.vera@dhis1.uhu.es](mailto:juan.vera@dhis1.uhu.es)

Linstädter, Jörg (*Institute of Prehistoric Archaeology, University of Cologne, Weyertal 125, 50923, Cologne, Germany*) [joerg.linstaedter@uni-koeln.de](mailto:joerg.linstaedter@uni-koeln.de)

Three Neolithic sites from Northern Morocco, Ifri Oudadane, Khil and Kaf Taht El-Ghar, have been studied as part of the AGRIWESTMED (ERC) project on the origins and spread of agriculture in the Western Mediterranean. The systematic recovery and flotation of sediments in these three sites has provided a broad assemblage of seed and pollen remains of domestic plants (both cereals and pulses) of Southwest Asian origin since Early Neolithic levels.

The plants that have been identified are: free threshing wheat (*Triticum aestivum/durum*), hard wheat (*T. durum*), einkorn (*T. monococcum*), emmer (*T. dicoccum*), naked barley (*Hordeum vulgare* var. *nudum*), hulled barley (*Hordeum vulgare* subsp. *vulgare*), broad bean (*Vicia faba*), lentil (*Lens culinaris*), pea (*Pisum sativum*) and grass pea (*Lathyrus* sp.). A set of radiocarbon dates on those seeds has allowed confirming the onset of agriculture in this region since at least the second half of the 6<sup>th</sup> millennium cal BC.

There are strong similarities with the Iberian Peninsula in both radiocarbon dates on seeds and the range of culti-

vated plants identified suggesting that both areas were probably part of the same process of agriculture spread.

ORAL

## 2. FAUNAL REMAINS FROM NEOLITHIC LEVELS AT GULDAMAN CAVE GLD1

Merzoug, Souhila (*CNRPAH, Algeria*) [merzoug@cnrpah.org](mailto:merzoug@cnrpah.org)  
Kherbouche, Farid (*CNRPAH, Algeria*)

Chelli, Razika (*CNRPAH, Algeria*) [thilelietlibert@yahoo.fr](mailto:thilelietlibert@yahoo.fr)

Sehil, Nana (*CNRPAH, Algeria*)

Benchernine, Redha (*CNRPAH, Algeria*)

Hachi, Slimane (*CNRPAH, Algeria*) [slimhachi@yahoo.fr](mailto:slimhachi@yahoo.fr)

GLD1 cave belongs to the large karst network of Adrar Gueldaman limestone ridges of the northwestern Babor Mountains of the Tellian region (Northern Algeria). Recent excavations conducted by the Centre National de Recherches Préhistoriques, Anthropologiques et Historiques, Algeria (CNRPAH), since 2010 have provided a rich archaeological material. Eight samples of wood charcoal from the excavated sectors were radiocarbon dated by AMS giving median dates ranging from 1484 cal BP to 17031 cal BP.

This paper presents the results of archaeozoological studies on the vertebrate remains from Neolithic levels situated around the VI and VII millennia BP. Morphological and biometric analyses reveal the presence of domestic mammals, such as sheep and goat, at VII millennia BP. This evidence is particularly important and will bring new insights into the emergence and development of the Neolithic in North Africa.

ORAL

## 3. L'ÉMERGENCE DE LA DOMESTICATION AU MAGHREB ORIENTAL : UN NOUVEAU MODÈLE POUR LA TUNISIE

Mulazzani, Simone (*UMR 7269 LAMPEA*) [simone.mulazzani@yahoo.fr](mailto:simone.mulazzani@yahoo.fr)

Belhouchet, Lotfi (*Institut National du Patrimoine, Tunis*) [lotfi\\_belhouchet@yahoo.fr](mailto:lotfi_belhouchet@yahoo.fr)

Salanova, Laure (*UMR 7055 Préhistoire et Technologie, CNRS*) [laure.salanova@mae.u-paris10.fr](mailto:laure.salanova@mae.u-paris10.fr)

Aouadi, Nabihah (*Institut National du Patrimoine, Tunis*) [aouadi73@yahoo.fr](mailto:aouadi73@yahoo.fr)

Dridi, Yosra (*UMR 7269 LAMPEA*) [youyouarcho@yahoo.fr](mailto:youyouarcho@yahoo.fr)

Dunne, Julie (*University of Bristol*) [julie.dunne@bristol.ac.uk](mailto:julie.dunne@bristol.ac.uk)

*Zoughlami, Jamel (Institut National du Patrimoine, Tunis)  
jamel.zoughlami@yahoo.fr*

Au Maghreb oriental, le développement des groupes de chasseurs-cueilleurs épipaléolithiques et le passage d'une économie de prédation à une économie de production commence à être mieux connu grâce aux recherches récentes acquises sur plusieurs sites tunisiens. La séquence d'occupations capsiniennes mise récemment en évidence à SHM-1, sur la côte orientale de la Tunisie, montre, au cours des trois derniers niveaux (première moitié du 6<sup>e</sup> millénaire cal BC), l'acquisition d'une série d'innovations techniques, généralement associés au Néolithique, avec le maintien d'une économie de prédation dans le cadre d'occupations sédentaires. Dans la dorsale tunisienne, plusieurs établissements localisés autour de Doukanet el Khoutifa (Makhtar) montrent l'émergence à partir de la deuxième moitié du 6<sup>ème</sup> millénaire cal BC d'une économie pastorale, avec des influences marquées, continentales et méridionales. Ces premières données préliminaires permettent de proposer des pistes de réflexion inédites pour la néolithisation de la Tunisie et de la Méditerranée centrale.

ORAL

#### **4. OXEN WITHOUT HERDSMEN. ANIMAL AND HUMAN BEINGS IN THE PREHISTORIC ROCK-ART OF THE WESTERN SAHARA**

*Soler, Joaquim (Universitat de Girona) joaquim.soler@udg.edu*

*Soler, Narcís (Universitat de Girona) narcis.soler@udg.edu*

Among the different periods defined in the Western Saharan rock-art it is hard to find a clearly pastoral stage. Although it is common to detect human beings in relation to animals, those are usually wild ones (giraffes, rhinoceros, elephants, antelopes...). Only a few examples represent scenes involving oxen and men, and not always in a pastoral way. Being generally admitted that all the Saharan rock-art begins in the Neolithic, the Western Sahara seems an intriguing place to test the real existence of an art of hunters followed by an art of herdsmen during the Holocene.

In 1995, after the cease-fire of 1992, the Universitat de Girona, in cooperation with the Ministry of Culture of the Sahrawi republic, started over the research on the Western Sahara. Because the research has been conducted in areas not well known during the colonial era, the materials can contribute with new data to the discussion. Hun-

dreds of painted rock-shelters and engraved slabs have been recorded and reproduced. The stylistic methods employed in the study have proved useful to define and order chronologically new regional styles, which now provide information about the technological, economical, ideological and ecological change on the western edge of the Sahara.

If we focus on the Western Sahara data, it not seems possible to clearly define an art of herdsmen because most of the scenes should be attributed to hunter-gatherer communities. On the other hand, our surveys and excavations show that abundant and old ceramic Neolithic traditions were present all along the Western Sahara. Therefore if we pretend to maintain such analytical categories, we should be also prepared to accept that some of the prehistoric Saharan rock-art could be older than what is generally believed. Or to accept that the Western Saharan rock-art, in contrast to some styles from Central Sahara, is not directly mirroring the daily life of their authors.

In our opinion in Western Saharan the iconographic evidence is not a solid argument to infer the economical basis of the authors. The characteristics and chronology of the Western Sahara Neolithic must be found through archaeological excavation.

ORAL

#### **5. DE L'ART AU CONTEXTE : FAUNE DOMESTIQUE DES REPRÉSENTATIONS RUPESTRES DE L'ATLAS SAHARIEN EN ALGÉRIE**

*Amara, Iddir (Université d'Alger) amara\_iddir@yahoo.fr*

*Roubet, Colette (MNHN-IPH) croubet@mnhn.fr*

En Algérie septentrionale, sur les parois gravées et peintes de l'Atlas saharien les faunes sauvages (éléphants, rhinocéros, carnivores, *Pelorovis*, équidés, mouflons, gazelles, antilopes, sangliers, autruches etc.) et domestiques (Caprinés : moutons, chèvres ; bovins) et sont présentent ensemble, durant la période pré-Holocène et Holocène. Les sites d'occupations ne sont que des haltes au pied des parois.

Les parois situées en plein air couvrent, d'est en ouest, les massifs atlasiques des Némencha, Aurès, Ouled Nail, du djebel Amour et des monts des Ksour. Des passages sud-nord et est-ouest isolent chacun de ces massifs et permettent de relier les régions sahariennes aux hautes plaines. L'eau y est partout abondante (sources,

oueds et plans d'eaux (douce et salée) L'analyse des représentations a consisté à isoler le bétail domestique des scènes de la vie sauvage. Les restes osseux résultant de consommation alimentaire ne sont actuellement connus que dans les grottes de la partie orientale atlasique.

Pour la faune sauvage, les scènes gravées signalent : l'agressivité, l'affrontement, la poursuite, la mobilité, etc. Pour la faune domestique on n'a relevé aucune scène de troupeau, pas d'isolement des caprinés par rapport aux bovinés, peu de chiens et pas de porcs, pas d'enclos et pas de rassemblement communautaire. L'attitude statique du bélier porteur d'un ornement sur la tête et d'un collier tressé au cou, précédé ou suivie d'un berger sert de trait d'union, d'est en ouest, entre ces massifs et la culture pastorale qui s'est répandue dans l'Atlas saharien. Ces représentations non datées, se singularisent de celles observées sur les massifs sahariens durant l'Holocène.

L'Atlas Saharien en Algérie porte des manifestations d'une faune sauvage et domestique, mal ou pas du tout attestée dans les sites de plein air. Elle est réduite à une faune domestique dans l'Aurès et les Nemencha. Le registre domestique est indissociable du registre sauvage. Et le pastoralisme primitif qui s'est répandu prend en compte l'incertitude et les dangers d'un milieu sauvage agressif. C'est durant cette période Holocène que se manifestent les remontées sahariennes des populations nomades atteintes comme les faunes par les modifications climatiques (aridité).

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ORAL

## 6. THE BONE INDUSTRY FROM THE CAPSIAN AND NEOLITHIC CONTEXTS OF EASTERN MAGHREB: A TECHNOLOGICAL AND FUNCTIONAL APPROACH

*Petrullo, Giacomina (Università degli studi di Roma La Sapienza e Université Paris X Nanterre La Defense) minapetrullo@libero.it*

The work I am going to present was carried out within the framework of my Ph.D. research. I have investigated the exploitation of hard faunal materials coming from some pre-pastoral and pastoral contexts of the Eastern Maghreb, defined as Capsian and Neolithic of Capsian Tradition. The specific focus of my analyses is on material from excavations carried out by J. Morel and T. Rivière during the first half of 20th century in the regions of Tébessa and Aurès. For the first time, these collections have been investigated from a technological and functional perspective.

The multidisciplinary approach I have applied involved the identification and characterisation of the technological scars on débitage and comparison with those visible on artefacts from an experimental reference collection.

Each element underwent a progressive scale of observation, from the naked eye up to 130X magnification under a stereomicroscope. This allowed the identification of specific manufacturing techniques, processes of matrix partition and manufacturing methods for the production of certain

morpho-types. In parallel, the study of the deformation of the tool's active edge and the observation, under reflected-light microscope, of the microwear allowed a better understanding of the types of materials with which some of the tools came in to contact.

The reconstruction of the *chaîne opératoire* and, more generally, of the production processes of hard faunal materials coming from the analysed contexts, yielded a new contribution to the definition of the Eastern Maghreb food-producing communities. The synchronic analysis of the pre-pastoral contexts highlighted a certain degree of homogeneity in the technical and economic choices of groups of people in the Eastern Maghreb. At the same time, the diachronic analysis has highlighted the element of continuity and discontinuity between pre-pastoral and pastoral contexts.

I believe that the application of this approach to other collections of worked bone artefacts coming from the Maghreb would provide new insights to the still-open debate about the relationship between groups of the pre-pastoral Capsian and the pastoral Neolithic of Capsian Tradition.

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POSTER

## 7. AAARC - AFRICAN ARCHAEOLOGY ARCHIVE COLOGNE, AN OPEN ACCESS ONLINE ARCHIVE ON THE ARCHAEOLOGY AND ENVIRONMENTAL HISTORY OF AFRICA

*Lenssen-Erz, Tilman (University of Cologne) lenssen.ertz@uni-koeln.de*

For more than 50 years the African Archaeology at the University of Cologne has conducted field research in various parts of Africa, particularly in the Eastern Sahara and in Namibia. The focus was on environmental history

and on rock art, with internationally renowned projects like B.O.S. (settlement history of eastern Sahara), ACACIA and "Rock Paintings of the Upper Brandberg". In the projects after 1990 there was close cooperation with the Heinrich-Barth-Institut (e.V.) which so far published six voluminous catalogues of rock art and 26 monographs on African archaeology.

Most of the materials accumulated in the research projects are not digital in origin and are now digitized and made openly accessible in the new digital online archive AAArC (African Archaeology Archive Cologne). Besides being a repository for tens of thousands of pictures, also whole documentations of excavation are made accessible here and the entire catalogue of the surveys in the Eastern Sahara by the pioneering project B.O.S. in the 1980s.

ORAL

## 8. THE EXPLOITATION OF WILD PLANTS IN THE MID HOLOCENE CONTEXTS OF NORTH AFRICA. USE-WEAR AND RESIDUE ANALYSIS ON GRINDING STONES FROM THE HAUA FTEAH CAVE, LIBYA

*Lucarini, Giulio (McDonald Institute for Archaeological Research - University of Cambridge) [gl374@cam.ac.uk](mailto:gl374@cam.ac.uk)  
Radini, Anita (University of York) [ar611@york.ac.uk](mailto:ar611@york.ac.uk)  
Barton, Huw (University of Leicester) [hjb15@le.ac.uk](mailto:hjb15@le.ac.uk)  
Morales, Jacob (independent scholar)*

The North African region offers up essential data for the study of the origins of the earliest forms of plant exploitation. Data available from several Saharan and coastal areas in the region have revealed that the arrival of domestic wheat and barley from the Levant during the Mid Holocene did not replace the exploitation of autochthonous wild plants, especially grasses. Studies have shown that only in rare cases did domesticated and wild plants integrate with each other. The Neolithic layers of the Haua Fteah cave, in Cyrenaica (Northern Libya), have so far produced archaeobotanical assemblages exclusively made up of wild species.

The appearance of grinding stones in the Neolithic layers of the cave may indicate a certain level of behavioural change and the adoption of new economic strategies, relying more strongly on plant exploitation. It is generally presumed that a direct link exists between stone tool morphology and its function, for example, plant processing in the case of grinding stones. However, this assumption still needs to be tested using the most innovative

methods for the functional analysis of stone tools. These methods may allow us to obtain significant new information as to how tools were originally used.

Traces of use-wear on the grinding stones from the Haua Fteah have been studied with low power microscopy to help clarify their function. Moreover, residue analysis, and in particular starch analysis, only rarely applied in North African contexts, was carried out on a sample of tools, in order to determine the types of plants processed by the Holocene communities in the cave.

The importance of wild plants in the economy of North African prehistoric groups has often been underestimated, especially after the Levantine domesticated crops were imported. Here we confirm their role as a primary food source in Cyrenaica during the Mid Holocene.

ORAL

## 9. THE NEOLITHIC OF CYRENAICA (NORTH-EAST LIBYA): NEW ENLIGHTENMENTS FROM RECENT RESEARCH

*de Faucamberge, Elodie (UMR 7041) [elodie.de-faucamberge@mae.u-paris10.fr](mailto:elodie.de-faucamberge@mae.u-paris10.fr)*

With the support of the Department of the Antiquities of Libya, the recent research undertaken in Cyrenaica these last years by the University of Cambridge (Cyrenaican Prehistory Project) on one hand, and by the French archaeological mission in Libya on the other hand, have substantially improved our knowledge of the beginning of food production in this north-eastern African region. Due to the lack of prehistoric research in the second half of the 20<sup>th</sup> century, little information on the Cyrenaican Neolithic is available (only two complete excavations with absolute datings) and restricted to a narrow area (the northern coast).

In the Haua Fteah cave, the first results obtained by C. McBurney in the 1950's have shown a Neolithic sequence starting around 6 800 uncalibrated BP with domesticated animals and pottery. Nearly fifty years later, the CPP reexamining McBurney's excavation has provided a new set of datings for the Holocene period and achieved unprecedented botanical studies. The rock shelter of Abu Tamsa, studied by a French team since 2006, has delivered another stratigraphic sequence for the Neolithic period.

If plant domestication up to now has not been re-

corded with certainty for prehistoric times, it remains highly probable owing to the huge agricultural potential of northern Cyrenaica. Abu Tamsa's assemblage has confirmed with the new data from Haua Fteah that ovicaprins husbandry started in the area during the first half of the 6<sup>th</sup> millennium cal BC therefore indicating a rapid diffusion of the Near-eastern flocks from Egypt to North-east Libya. Its sequence has also displayed a slightly earlier beginning of pottery production, i.e. in the second half of the 7<sup>th</sup> millennium cal BC, and similarities in the flint assemblage with western Egypt. This deeply contrasts with the position of C. McBurney who was convinced of strong links in the Haua Fteah's industries with the western Caspian culture.

As the Neolithic of Cyrenaica will have to be better documented and defined, the relationship between this zone and the neighboring areas (Egypt, Maghreb and the Sahara) will also have to be clarified by future field research.

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ORAL

### 10. THE PATTERN OF NEOLITHIZATION IN DAKHLEH OASIS IN THE EASTERN SAHARA

*McDonald, Mary M. A. (Dept. of Archaeology, University of Calgary) mmcdona@ucalgary.ca*

A review of the evidence from a large oasis in the Egyptian Western Desert concerning the origin and spread of Neolithic traits across North Africa. Relevant information from Dakhleh Oasis includes a pattern of increased sedentism starting in the Early Holocene, the degree of borrowing of artefact traits from the Near East, data from faunal and palaeobotanical remains, and from rock art. The evidence suggests that neolithization in Dakhleh was largely attributable not to migrants from the Near East, but to local groups selecting from the 'Neolithic Package' a few elements particularly suited to their needs, specifically cattle and caprines.

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ORAL

### 11. THE INTRODUCTION OF NEOLITHIC RESOURCES IN NORTH AFRICA ? A DISCUSSION IN LIGH OF THE LATEST HOLOCENE RESEARCH BETWEEN LIBYA AND EGYPT

*Barich, Barbara E. (ISMEO-International Ass. for the Mediterranean and Orient) barbara.barich@mclinknet.it*

The dynamics affecting coastal areas of North Africa,

especially the rise of Neolithic economies, remained largely unexplored until a few years ago. Hitherto all the Holocene sites cited in the literature, starting from the Neolithic layers of the Haua Fteah Cave in Cyrenaica and others in Tunisia etc., have been generically associated with the Caspian tradition through the "Neolithic of Caspian Tradition" affiliation.

There are no definitive answers for questions about how groups belonging to a very well-documented late Palaeolithic tradition developed locally, and if and how these changes resulted from outside influences that may have affected the region during the middle and late Holocene. This is especially true of the provenance and success of the main domesticates, in other words the plant (wheat, barley) and animal species (sheep/goat, cattle, pigs) which constitute the North African Neolithic complex.

Studies have so far shown a predominantly interest in the morpho-typological aspects of the different traditions thinking to deal with the theme of change through the analysis and the comparison with the previous Late-palaeolithic and Epipalaeolithic substrate. In this way, little interest has been addressed towards a more comprehensive interpretation of North African societies by first dealing with issues of changes in the economic and social development. In this respect, one recognizes a clear gap between the coastal area and the Saharan regions about which for a long time reconstructions and interpretation models based on firm chronologies and palaeobotanical and archaeozoological data have been available.

Based on this finding, the paper focuses in particular on what has recently emerged from important investigations in Egypt (Western Desert) and Libya (Jebel Gharbi plateau). The analysis of precise palaeoenvironmental reconstructions and, as regards Egypt, secure archaeozoological data, make us confident in defining the paths of penetration and diffusion of the animal and botanical species underlying the Neolithic transformation of these areas.

On the other hand we cannot ignore the relationship with the southern regions in the Sahara, where ceramic societies of the Saharo-Sudanese tradition with an initial form of food production are well attested from the earliest phases of the Holocene. Although there are some parallels between the two spheres in terms of the type of relationship established with the environment and the adaptations preceding food production, it is clear that the coast of North Africa followed an independent path,

separate from that of the transaharan area between the Sahara and the Nile.

The paper puts an emphasis on these themes and takes into account especially the areas that have allowed palaeoclimatic and geo-archaeological reconstruction in a broader perspective which includes changes in the settlement pattern and in the economic system.



# A11a The chronology of Palaeo-lithic cave art: new data, new debates

Commission on Prehistoric art

Commission on Upper Palaeolithic of the Western Eurasia

Commission on Archaeological Methods and Theory: Formalization, Quantification, Mathematics and Computerization

(Organisers: Roberto Ontañón, Pilar Utrilla, Marcel Otte, Tom Higham.)

Monday 1st (14:00 to 19:30)  
B02 Meeting Room



2014 burgos  
1-7 sept.

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Union International  
de Sciences Préhistoriques  
et Protohistoriques



XVII World UISPP Congress  
XVIIe Congrès Mondial de l'UISPP  
XVII Congreso Mundial de UISPP

ORAL

## 1. THE CHRONOLOGY OF PALAEOOLITHIC CAVE ART: NEW DATA, NEW DEBATES

*Ontañón, Roberto - (Museo de Prehistoria y Arqueología de Cantabria/Cuevas Prehistóricas de Cantabria) ontanon\_r@cantabria.es*

*Utrilla Pilar - (Universidad de Zaragoza) utrilla@unizar.es*

After several decades in which the evolution of Palaeolithic art seemed a settled scientific matter, new findings have called into question the soundness of this construction apparently well founded. Obtained by increasingly refined and precise radiometric dating techniques, new data have shaken the interpretive building constructed on the postulates of A. Leroi-Gourhan and which had stood, virtually unchanged, over the last quarter century.

Indeed, by accepting in a generalized way the proposals of stylistic evolution from H. Breuil to Leroi-Gourhan and his followers, most of the researchers involved in this specialty have tried to situate the parietal evidence within the established cultural-historical sequence. The dissonant events ("aberrant" dates, some "rare" old and new sites) were relocated within the broad outline or have been relegated to the limbo of the data difficult to interpret. However, from the 90s of the XXth century, new evidence with a robust probative capacity has come to light, generating strong reactions and a deep controversy within the research of Palaeolithic art.

The first major debate is about the discovery, study and dating of the Grotte Chauvet, with an astounding parietal ensemble whose Aurignacian ascription clashes against the waterline of Leroi-Gourhan's stylistic evolution. In the present day, several scholars discuss the acceptance of that attribution, including criticism on the dating method.

The second main impact on the prevailing paradigm has arrived a little bit after, in what some call the "post-stylistic era". The recent developments of radiocarbon dating with the introduction of the ultrafiltration techniques and, moreover, several results of indirect dating of rock art by means of the U-Series method, would permit to backdate the beginning of cave art even beyond Aurignacian times. This has allowed some colleagues to claim the possibility of a Neanderthal cave art that could deprive our first ancestors of what until recently was thought one of his most significant hallmarks.

This paper aims to recapitulate the latest developments in this field and has as its main objective to constitute

an introduction to what we expect shall be a good discussion both on the methodological aspects and their historical and anthropological implications, considering radiochronological data obtained on rock art but also gathering information from the archaeological sites where these representations are situated, that can provide interesting information for proper contextualization of the graphic evidences.

ORAL

## 2. NOUVEAUX ÉLÉMENTS DE CHRONOLOGIE RELATIVE ET RADIONUMÉRIQUE À CUSSAC (DORDOGNE, FRANCE)

*Jaubert, Jacques (Université Bordeaux - PACEA) - j.jaubert@pacea.u-bordeaux1.fr*

*Fourment, Nathalie - (SRA Aquitaine et Université Bordeaux / PACEA) nathalie.fourment@culture.gouv.fr*

*Valladas, Hélène - (LSCE/IPSL Gif sur Yvette) helene.valladas@lsce.ipsl.fr*

*Genty, Dominique - (LSCE/IPSL Gif sur Yvette) DDominique.Genty@lsce.ipsl.fr*

*Bourdier, Camille - (Université Toulouse - TRACES) ca.bourdier@laposte.net*

*Camus, Hubert - (Protée) protee.expert@gmail.com*

*Costamagno, Sandrine - (Université Toulouse - TRACES) costamag@univ-tlse2.fr*

*Courtaud, Patrice - (Université Bordeaux - PACEA) Patrice.courtaud@u-bordeaux.fr*

*Delluc, Marc - (Spéléoclub de Bergerac) marc.delluc@sfr.fr*

*Ferrier, Catherine - (Université Bordeaux - PACEA) catherine.ferrier@u-bordeaux1.fr*

*Feruglio, Valérie - feruglio@free.fr*

*Goutas, Nejma - (ArScAn Université Paris Ouest la Défense) nejma.goutas@mae.u-paris10.fr*

*Henry-Gambier, Dominique - (Université Bordeaux - PACEA) Domind.gambier@pacea.u-bordeaux1.fr*

*Katnecker, Évelyne (LSCE/IPSL Gif sur Yvette) evelyne.katnecker@lsce.ipsl.fr*

*Klaric, Laurent - (Préhistoire et Technologie - Université Paris Ouest La Défense) laurent.klaric@mae.u-paris10.fr*

*Konik, Stéphane - (CNP Périgueux et Université Bordeaux - PACEA) stephane.konik@culture.gouv.fr*

*Mallye, Jean-Baptiste - (Université Bordeaux - PACEA) jb.mallye@pacea.u-bordeaux1.fr*

*Portais, Jean-Christophe (CRMH DRAC Aquitaine Bordeaux) - jean-christophe.portais@culture.gouv.fr*

*Régnier, Édouard - (LSCE/IPSL Gif sur Yvette) edouard.regnier@lsce.ipsl.fr*

*Théry-Parisot, Isabelle - (CEPAM - université de Nice) isabelle.thery@cepam.cnrs.fr*

Villotte, Sébastien - (Université Bordeaux - PACEA) s.villotte@pacea.u-bordeaux1.fr

Suite à la découverte de la grotte ornée et à restes humains (dépôts mortuaires probablement sépulcraux) de Cussac (Dordogne) en 2000, une des premières questions posées par Norbert Aujoulat et collaborateurs était la contemporanéité entre l'art pariétal et le dépôt de corps humains. Plusieurs échantillons avaient été prélevés et datés. L'un des trois restes humains échantillonnés (locus 1) a permis d'avancer un âge  $^{14}\text{C}$  contemporain du Gravettien.

Depuis la mise en place d'un programme collectif et pluridisciplinaire fin 2008, nous avançons progressivement vers un questionnement plus ambitieux et la confrontation de différentes approches et méthodes de datations, relatives ou numériques. Les principaux points de problématiques ou disciplines impliquées sont : la mise en place et l'âge des formations sédimentaires et des spéléothèmes scellant soit des vestiges (restes humains) soit le secteur d'entrée, les restes humains, les charbons en paroi ou au sol, les rares silex taillés, les éléments de bois de renne travaillés, les vestiges de faune et, bien sûr, l'art pariétal ce dernier presque uniquement représentés par différents types de gravures.

Nous présenterons les premiers résultats obtenus par champs disciplinaires (datations numériques et âges relatifs).

S'ils ne permettent pas de répondre à toutes les interrogations (par exemple la question de l'entrée et l'âge de la fermeture du porche) confirment jusqu'à présent, toutes disciplines confondues, une fréquentation probablement très resserrée dans le temps, centrée sur le Pléistocène supérieur et le seul Gravettien.

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#### ORAL

### 3. ABOUT THE SIMULTANEOUS PRESENCE OF THE MEGALOCEROS AND THE REINDEER ON THE WALLS OF THE CHAUVET'S CAVE

Martin, Michel - mic.martin586@orange.fr

We take the census of the art of ornate caves in the superior Paleolithic, called "Reindeer age" between 32000 BP and 11000 BP, 49 Megaloceros (13 in Spain, 36 in France) and 165 Reindeers (30 in Spain, 130 in France). Among these figures, Chauvet cave contains 7 Megaloceros and 12 Reindeers.

Comparative study between sites with archaeology dates and available  $\text{C}^{14}$  dates, with techno-stylistic including study of cephalic details (like eye and nostril, or absence of ear for reindeers at Chauvet and Gabillou, two caves sharing out many common points), corporal details, level of insertion of foots, animation degree (like run never translated on Megaloceros, from II/III style, which is only walking in the «Gallery of Megaloceros» at Chauvet), cut out lines («despieces»), perspective (horns, feet) and figurative and abstract subject of which predominance of cold fauna attending Reindeer.

The chronology shows that only Chauvet cave offers dating Megaloceros at 32000 BP. Every one of them are minimum gravettians, or solutreans : 31 from II style, 17, from III style, any from IV style (tab 1). Non-existent animation is usually (28) on unfinished figures often without foots. The Reindeer, always from IV ancient style (included Chauvet) and also from the recent IV style, appears everywhere between IV and III Würm, at the transition Solutrean with Magdalenian, or at middle Magdalenian. Entire, provided with complex animation, it is present right to the end of Magdalenian, substituting for Megaloceros because it becoming scarce and under the peyorative climatic influence, more favorable to Reindeer (tab 2). Their simultaneous presence probably exists in Spain, at La Lloseta (Asturies) where, without radiometric dates, one megaloceros and one reindeer are identically treated by the same filling (black for megaloceros, red for reindeer) and at La Pasiega (Cantabria), where one megaloceros and two reindeers red ochre are ascribed to the same cultural period.

Megaloceros and Reindeers have few luck to be contemporaneous at Chauvet. First, such is the case exceptionally elsewhere, because Reindeer appears on the wall when Megaloceros leaves it and the graphic comparison (included animation) between the two species takes away each other by style. Secondly, the megaloceros dated by AMS radiocarbon date offers a spotted animation by Leroi-Gourhan like indicative of III style, unknown at first glance into Aurignacian. At last, the absolute date of megaloceros comprises a mix with clay from a stump, with contaminating power, that is untrustworthy and the measurement of "13 delta" is incompatible with only that charcoal can do it and also by disqualification of Tandétron which has worked out computation.

ORAL

#### 4. AURIGNACIAN ROCK ART COMPLEXITY IN CANTABRIAN REGION: THE CASE OF ALTXERRI B

Ruiz-Redondo, Aitor - (*Instituto Internacional de Investigaciones Prehistóricas de Cantabria (IIIIPC), Avenida de los Castros s/n, 39005 Santander, Spain*) aruizredondo@gmail.com

González-Sainz, César - (*Instituto Internacional de Investigaciones Prehistóricas de Cantabria (IIIIPC), Avenida de los Castros s/n, 39005 Santander, Spain*) gonzalec@uni-can.es

Garate-Maidagan, Diego - (*CREAP Cartailhac-TRACES-UMR 5608, University de Toulouse-Le Mirail, 5 allées Antonio Machado, 31058 Toulouse Cedex 9, France*) garatemaidegandiego@gmail.com

Iriarte-Avilés, Eneko - (*Laboratorio de Evolución Humana, Dpto. CC. Históricas y Geografía, University de Burgos, Plaza de Misael Bañuelos s/n, Edificio IpDpi, 09001 Burgos, Spain*) eiriarte@ubu.es

Our understanding of the beginnings of Palaeolithic graphic activity has advanced considerably in recent years. Twenty years after the discovery of Chauvet, the number and diversity of Aurignacian ensembles has been increased.

In this communication we present the analysis of the parietal ensemble of Altxerri B (Northern Spain). In this site, we have studied the paintings and their archaeological and geological context. One of the main objectives of our research was to determine the chronology of the pictorial phase in the cave. The impossibility of taking direct painting samples for dating force us to search other evidences for the chronological context of art.

Archaeological, geological and stylistic evidence, together with radiometric dates, suggest an Aurignacian chronology for this parietal ensemble (*ca.* 39000 cal BP). These results, joined to other researches developed lately in Cantabrian Region, are outlining a new panorama for the oldest graphic activity in this region. Well studied examples are still rare, but the discoveries in the last years invite to be optimistic that maybe in a close future our knowledge about the origins of figurative expression could be increased. In this context, the site of Altxerri B can be added to the small but growing number of sites dated in this period in Europe, corroborating the hypothesis of more complex and varied figurative art than had been supposed in the Early Upper Palaeolithic.

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#### 5. INDIRECT DATING OF PALAEOOLITHIC CAVE ART IN THE LOWER GALLERY OF LA GARMA (CANTABRIA, SPAIN) USING THE U-SERIES TECHNIQUE

Arias, Pablo - (*Universidad de Cantabria*) pablo.arias@unican.es

Ontañón, Roberto - (*Museo de Prehistoria y Arqueología de Cantabria*) ontanon\_r@cantabria.es

Pike, Alistair - (*University of Bristol*) alistair.pike@bristol.ac.uk  
Hoffmann, Dirk - (*Max-Planck- Institut*) dirk.hoffmann@eva.mpg.de

García-Díez, Marcos - (*Universidad del País Vasco*) diez.garcia.marcos@gmail.com

Pettitt, Paul - (*University of Durham*) paul.pettitt@durham.ac.uk

Zilhão, João - (*iCrea-Universitat de Barcelona*) joao.zilhao@ub.edu

The research project at the Archaeological site of La Garma, co-directed by two of the signatories (PA and RO), included in 2000 sampling and analysis for absolute dating of calcite formations associated with Palaeolithic cave art. Two methods were used in combination, the U-Series and Thermoluminescence. The results yielded new data on the chronology of pre-Magdalenian representations forming part of a characteristic style in the central sector of the Cantabrian region (depictions composed with dotted lines). These data were significant because they showed a trend, now confirmed, to an older chronology than it was assumed for these cave paintings.

Following with this ongoing research, in 2012 new exploration, selection and sampling of calcite crusts connected with Paleolithic cave art have been made, in cooperation with the team of the "U-Series Dating of Palaeolithic Art" Project. It has been considered appropriate to address this second phase of sampling and dating, given the substantial advances observed in these methods, i.e. higher resolution and less impact on the conservation of parietal supports.

The method of U-Series is based on the differential decay of isotopes of natural radioactive series of uranium and thorium. For the dating of secondary calcium carbonates, the degree of disequilibrium between U-238 and Th-230, along with the imbalance of U-234 and U-238, is calculated by iterative methods to determine the age at which calcite precipitation occurred. If the calcite formation is overlying a painting, the date obtained from this speleothem will be then a *terminus ante quem* for the artistic event.

The results of this second phase of dating are presented and discussed in the context of the cave art of La Garma (especially in relation to the data previously obtained by using these techniques) and within the general framework of Palaeolithic rock art in the Cantabrian region.

ORAL

## 6. REFLECTIONS IN THE EARLY ART OF CAVE OF "EL CASTILLO"

*Bernaldo de Quiros, Federico - (Universidad de Leon) fberg@unileon.es*

The recent dating of a series of "dots" from the painted interior of cave of "El Castillo" bring us the opportunity of present some of the discoveries from the "Transitional Aurignacian" levels of the cave. Also we present a decorated cobble from level 21 who is marked with a straight row of four evenly spaced, incised points which are positioned above a fifth incised dot situated directly in the middle of the upper row. The cultural behavior represented by this decorated stone develops and continues without a gap through El Castillo's earliest Aurignacian levels, where possible evidence for figurative representation is found.

Here we simply wish to stress the increasing and robust evidence for local roots of symbolic behavior in the local Middle Paleolithic of Cantabria, and to note that the cave of El Castillo illustrates the development, without any gaps, from the Mousterian through to its Upper Paleolithic levels. If, as many researchers have proposed, such symbolic behavior is linked, at least in part, to greater desires for inter and intra-group communication, spurred by demographic pressure or by shifts in social morphology, then this small pebble from Level 21a provides elegant evidence of the elaboration of such social expression in the Cantabrian Middle Paleolithic. This development of social expression must also be reflected in the settlement dynamics of the Cantabrian Middle Paleolithic.

The relation between this "dots" and those dated in the cave is also an interesting theme because as the dates are "ante quem", a possibility is open to be considered as being manufactured by the same authors.

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## 7. LA VIÑA ROCK SHELTER (ASTURIAS, SPAIN): RELATIONSHIP BETWEEN THE STRATIGRAPHY AND THE PARIETAL ENGRAVINGS

*González-Pumariiega Solís, María - (Consejería de Educación, Cultura y Deporte. Asturias) maria.glez-pumariiega@asturias.org*

*de la Rasilla Vives, Marco - (Universidad de Oviedo) mrasilla@uniovi.es*

*Santamaría Álvarez, David - (Universidad de Oviedo) santamariadavid@uniovi.es*

*Duarte Matías, Elsa - (Universidad de Oviedo) elduarma@gmail.com*

*Santos Delgado, Gabriel - (Universidad de Salamanca) gsd@usal.es*

La Viña rock shelter is the easternmost of the thirteen well-lit sites with rock engravings spread along the Nalón river basin. It is located ~150 m above the river level, facing S-SE. Its UTM30 ETRS89 coordinates are: X=270739,95; Y=4799489,80; Z=212 m.a.s.l. La Viña is the largest settlement in that valley and contains the most extensive archaeological sequence, from the Middle to the Holocene. There is also an important group of engravings, clustered along the rock face into six different areas with diverse levels of preservation. The two main groups of engravings border the sectors where the archaeological excavations were made.

Great part of the engravings were partially or completely covered by the palaeolithic layers and, as the shelter is widely opened, some others were covered by thick masses of calcareous formations developed over the wall. Moreover, some of the oldest carvings played a role in the rock front natural evolution, guiding the run-off parietal water and consequently creating a calcareous formation, not only over the walls surface but also over the stratigraphic sequence. In addition, some fallen fragments of engraved wall took part of the archaeological deposit.

As archaeological excavation progressed (1980-1986) and the occupation layers were removed, great part of the hidden engravings appeared. J. Fortea organised those engraving into two successive cultural horizons, while recognisable features in the other shelters along the Nalon valley. The oldest period is made up of deeply engraved vertical lines, regularly arranged along the western half of the rock front. The only similar ensemble is found at El Conde cave. On the other hand, the second cultural horizon spreads in different areas of the rock front and it is mainly made up of a tangled mess of non-

figurative deep engravings, although there are some individual depictions. Here the animal figure appears. This horizon is identical to the rock art of other sites in the Nalón valley.

Fortea posed a chronology based on archaeological sequence. Thus, his arguments were the paleolithic deposits covering the decorated wall, the hand-height above the occupation layers, the pieces of wall fallen to the corresponding level and some geological features. Archaeological research carried out in La Lluera I, La Lluera II and El Conde did not contradict his hypothesis: the oldest horizon would have been engraved from the Aurignacian layers while the second horizon would have been done during Graveto-Solutrean periods. Recent topographical surveys of the parietal engravings have supported those proposals and have released new data about the topographic organization of the engravings.

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ORAL

**8. CHRONOLOGY OF PALAEOLITHIC ROCK ART AT FUENTE DEL TRUCHO: STYLE, U-SERIES DATES AND COMPARISON WITH CANTABRIAN SITES.**

*Hoffmann, Dirk - (Max-Planck- Institut) dirk.hoffmann@eva.mpg.de*

*Pilar Utrilla - (Universidad de Zaragoza) utrilla@unizar.es*

*Pike, Alistair - (University of Bristol) alistair.pike@bristol.ac.uk*

*Bea, Manuel - (Sacner 3D Patrimonio) manubea@unizar.es*

*Baldellou, Vicente - (Museo de Huesca) vbaldellou@aragon.es*

*García-Díez, Marcos - (Universidad del País Vasco) diez.garcia.marcos@gmail.com*

*Zilhão, João - (iCrea-Universitat de Barcelona) joao.zilhao@ub.edu*

Nine different calcite samples overlying cave art at Fuente del Trucho (Asque-Colungo, Huesca) have been dated by U-series. The U content in the calcite is high and therefore it has been possible to date very small samples. The detrital component is almost negligible, so the uncertainties of the results are small. Interestingly, the initial  $^{234}\text{U}/^{238}\text{U}$  activity ratio is unusually depleted. The results are quite consistent so far and all fall between 24 and 31 ka. These dates are expressed in solar years before the time of measurement and, therefore, must be interpreted within a regional Upper Paleolithic chronostratigraphic framework expressed in calibrated radiocarbon years before present.

The oldest results obtained are for samples associated with red dots. These results place the execution of the underlying motifs in a time range beyond the Middle Gravettian (i.e., beyond 30 kcal BP, or  $\sim 25 \text{ ka}^{14}\text{C BP}$ ). These results are not as old as the dates obtained at El Castillo, but it should be borne in mind that, in the Cantabrian site, the oldest motifs are disks, not dots.

Calcite overlying a red horse in panel VIII (sample FT5) yielded a minimum age of 29 ka that implies execution minimally in the Middle Gravettian. Stylistically, this motif is comparable to a horse figure from La Pasiega (c2) and also bears resemblance to horse representations found among the engraved plaques of Parpalló.

Samples FT8 and FT9 provide minimum ages of  $\sim 26.5 \text{ ka}$  for two hand stencils. These results are consistent with the Gravettian age obtained by radiocarbon for the black pigment used in hand stencils from Cosquer ( $\sim 27 \text{ ka}^{14}\text{C BP}$ , i.e.,  $\sim 30\text{-}32 \text{ ka calBP}$ ) and for the date on a bone sample archeologically associated with similar motifs at Gargas. At Fuente del Trucho, however, none of the dated hands have missing or truncated fingers. In the Cantabrian strip, minimum ages for hand stencils ranging from 24.2 to 37.3ka have been obtained at El Castillo. Overall, these results remain consistent with two chronological hypotheses: (a) if, given uncertainties and inconsistencies, the Cosquer radiocarbon dates are taken to represent minimum ages only, that hand stencils at these sites are, in all cases, of an Aurignacian-or-older age; or (b) that such motifs span an extended range, some having been made as late as the time of the transition from the Gravettian to the Solutrean ( $21.0\text{-}21.5 \text{ ka}^{14}\text{C BP}$ , i.e.,  $\sim 25\text{-}26 \text{ kcal BP}$ ).

An age of 25.7 ka was obtained for calcite overlying a "trilobate" sign in panel V, placing it minimally in the Late Gravettian; a similar chronology may therefore apply to motifs similarly designated in panel XXII. On the grounds of their identical style, such a minimum age can also be proposed for an ibex figure from the Fuente del Trucho and the engraved, trilinear-headed hind on a pebble from Antoliña.

Fuente del Trucho is confirmed to be a major site of the Paleolithic artistic cycle. Minimally, its art is of Gravettian age. In the case of the dots and hand stencils, their execution can be further constrained to the Early Gravettian or older.

ORAL

**9. PALEOLITHIC ROCK ART FROM COMTES'S CAVE (PEDREGUER-SPAIN), AND ITS AECHAEOLOGICAL RECORD.**

*Boronat Soler, Juan de Dios - (Museu Arqueològic Soler Blasco) Mvsev.xabia@gmail.com*

*Casabó Bernad, Josep - (Museu de La Valltorta) casabo\_jos@gva.es*

*Costa Cholbi, Pasqual - (Museu Arqueològic Soler Blasco) Mvsev.xabia@gmail.com*

*Esquembre Bebia, Marco Aurelio - (Arpa Patrimonio) arpa-patrimonio@telefonica.net.*

*Bolufer Marqués, Joaquim - (Museu Arqueològic Soler Blasco) Mvsev.xabia@gmail.com*

*Martínez, Enric - (Fundació Cirne) cirne2@gmail.com*

The recent discovery of a new cave with paleolithic rock art in Valencian Country, led a research project to document the artistic expressions, and their contextualization through archaeological excavation of the site.

Comte's cave opens in the middle-upper stretch of the ravine Parra, in the town of Pedreguer, just over nine kilometres from the Mediterranean sea. Its a long cave consist of two rooms, connected by a narrow passage. Fifteen sites with painted or engraved paleolithic rock art have been found in the deepest of the cave, that coming to increase the scarce regional record.

We have made the topographic research of the cavity. The panels were scanned in 3D high resolution, and it has made a detailed photographic research, from which we have obtained the digital tracings.

The excavation in the inner room, has found paleolithic layers under study. Harris methodology has been used, and different layers have recorded with referenced 3D photography.

Excavation results are still processed. The anthracological research and radiocarbon dates are almost finished. It seems that the only layer completely excavated, must belong to a warm period of Tardiglacial.

Both lithic and bone artifacts, and faunal remains suggest that the cave was occupied similar way to other nearby settlements. Deer and goats hunting is the origin of the most of the protein intake, although differential intakes are described for each species. Juvenile phalanx of *Homo sapien* with flint marks and human bites that suggest an episode of cannibalism is also documented.

For the time being the bestiary is reduced to nine copies. Zoomorphs show stylistic features that bring us to the early stages of pre.magdalenian art. The triangular shape of a quadruped's legs (perhaps a goat) and the snout making of a horse are like lower solutrean stone flats from Parpalló cave.

The repertoire of signs is also very interesting. Especially we have found three remarkable good size spirals, the only parallel we meet its again on the stone flat number 16726 from Parpalló, that researchers attribute to upper and middle solutrean.

ORAL

**10. URANIUM SERIES DATING OF PALAEOLITHIC CAVE ART IN IBERIA; RECENT RESULTS AND METHODOLOGICAL CONSIDERATIONS.**

*Hoffmann, Dirk L. (Max Planck Institute for Evolutionary Anthropology, Department of Human Evolution, Deutscher Platz 6, 04103 Leipzig, Germany.) dirk\_hoffmann@eva.mpg.de*

*Pike, Alistair W. G (Department of Archaeology, University of Southampton, Avenue Campus, Highfield Rd, Southampton, SO17 1BF, UK) a.w.pike@soton.ac.uk*

*García, Marcos - (Department of Geography, Prehistory and Archaeology, University of Basque Country (UPV/EHU), c/ Tomás y Valiente s/n, 01006 Vitoria, Spain) diez.garcia.marcos@gmail.com*

*Pettitt, Paul - (Department of Archaeology, Durham University, South Road, Durham, DH1 3LE, UK) paul.pettitt@durham.ac.uk*

*Standish, Chris D. (Department of Archaeology, University of Southampton, Avenue Campus, Highfield Rd, Southampton, SO17 1BF, UK) chris.standish@bristol.ac.uk*

*Zilhão, João - (University of Barcelona/ICREA, Departament de Prehistòria, Història Antiga i Arqueologia (SERP), c/ Montalegre 6, 08001 Barcelona, Spain) joao.zilhao@ub.edu*

The U-Th method, based on the radioactive disequilibrium between  $^{230}\text{Th}$  and its parent isotopes  $^{238}\text{U}$  and  $^{234}\text{U}$  has been used in a number of recent projects to date calcite precipitates above and occasionally below cave paintings to constrain their age. Initial results from Spain have shown that the earliest dated paintings date at least to the Early Aurignacian period and present a far longer chronology that that based so far on radiocarbon dating. Here we outline our methodology and the steps we take to demonstrate the reliability of U-Th dates, and present some recent results of our ongoing U-Th dating programme.

ORAL

## 11. URANIUM-THORIUM DATING METHOD AND PALAEOLOGICAL ROCK ART

Georges Sauvet - [georges.sauvet@sfr.fr](mailto:georges.sauvet@sfr.fr) (CREAP-Toulouse)  
Bourrillon, Raphaëlle - (CREAP-Toulouse) [r.bourrillon@gmail.com](mailto:r.bourrillon@gmail.com)  
Conkey, Margaret - (University of California) [meg@berkeley.edu](mailto:meg@berkeley.edu)  
Fritz, Carole - (CREAP-Toulouse) [carole.fritz@univ-tlse2.fr](mailto:carole.fritz@univ-tlse2.fr)  
Garate, Diego - (CREAP-Toulouse) [arkeologimuseoa.teknikari1@bizkaia.net](mailto:arkeologimuseoa.teknikari1@bizkaia.net)  
Rivero, Olivia - (CREAP-Toulouse) [oliviariver@hotmail.com](mailto:oliviariver@hotmail.com)  
Tosello, Gilles - (CREAP-Toulouse) [gilles.tosello@wanadoo.fr](mailto:gilles.tosello@wanadoo.fr)  
White, Randall - (New York University) [randall.white@nyu.edu](mailto:randall.white@nyu.edu)

Dramatic progress has taken place in  $^{14}\text{C}$ -dating with the introduction of accelerator mass spectroscopy (AMS) that has made possible the direct dating of prehistoric artworks drawn with charcoal. However, in the case of engravings, mineral-based black and/or red paintings, we are limited to using only indirect methods that allow the dating of deposits that have covered the works over time (e.g. TL, U/Th, oxalates, etc.).

The uranium/thorium dating method (U/Th) gives reliable and relatively precise results when dating massive speleothems, because the sampling is carried out at the heart of the material where the hypothesis that it is a *closed system* (no exchange with the outside environment) can be verified in most cases. Unfortunately, the situation is quite different in the case of thin layers of calcite overlying Palaeolithic cave drawings. The conditions under which calcite forms depend largely on the hydrologic activity that has varied to a great extent during the Upper Palaeolithic and the Holocene. Consequently the ages obtained are minimum ages (*terminus ante quem*) that are frequently much younger than the real ages of the underlying artworks.

However, a much more serious source of mistake, rarely discussed, yields results in the opposite direction. With thin layers of carbonate deposits that are in a damp medium, the uranium incorporated in the calcite during its crystallization may be partly eliminated because of its solubility in water. The consequence of uranium leaching leads to an artificial increase of the age that may reach considerable proportions (e.g. a negative hand print in a cave of Borneo was dated to 27.000 years by U/Th whereas its age determined by  $^{14}\text{C}$  was only 8-10,000 cal BP; Plagnes *et al.*, Cross dating (Th/U-14C) of calcite covering prehistoric paintings in Borneo. *Quaternary*

*Research*, 2003, 60 (2): 172-179) and this can be also the case for some of the dates recently obtained in Cantabrian caves (Pike *et al.*, U-Series Dating of Paleolithic Art in 11 Caves in Spain. *Science*, 336, 15 June 2012, 1409-1413).

Owing to these two contradictory sources of error, the dates given by the U/Th method may appear younger or older with deviations much larger than the standard deviations given by laboratories. It is thus almost impossible and very dangerous to base an archaeological interpretation on the ages of Palaeolithic artworks as determined by U/Th, *if not confirmed by an independent method*. The most reliable independent method would be the  $^{14}\text{C}$ -dating of the carbonates in the same samples. At present, the application of the U/Th method for dating prehistoric rock art should be regarded as experimental, but improvements are in progress (for instance, the separate dating of ultra thin layers taken in the depth of the deposit by laser ablation; cf. Aubert *et al.*, Uranium-series dating rock art in East Timor, *J. Archaeological Science*, 34: 991-996).



# A11b Late Pleistocene cave art in its context

Commission on Prehistoric art

Organisers: A. Pastoors, T. Lenssen-Erz, P. Arias, , R. Ontañón, G.-Ch. Weniger

Thursday 4th (9:00 to 13:30)  
Meeting Room B02



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ORAL

## 1. WHY PAINT HERE? THEORETICAL THOUGHTS ON THE DOCUMENTATION OF CONTEXT IN ROCK ART ARCHAEOLOGY

*Lenssen-Erz, Tilman - (University of Cologne) lenssen.ertz@uni-koeln.de*

Rock art as an immovable, usually highly visible source of information, by its longevity is prone to new interpretations and appropriations whenever a new social group gets into contact with it in the course of history. The intangible, ephemeral context changes and its specific meanings will probably always remain cryptic for us. But the physical context of rock art usually remains unchanged in its spatial relations, topography and geology. Other contextual elements which never undergo substantial change are the basic human needs (after Abraham Maslow). Through an assessment of the relationship between human needs and physical context in terms of space and resources in a given area we are able to refer to matter that can be grasped empirically. But it also opens an avenue to collect data on intangible issues, relating to religion, symbolism, identity or communication. With a specific format of site data it is possible to construct an Idealised Elementary Site. This represents the 'average' site in which are combined the most common patterns of use in a given rock art region. Eventually this allows reconstructing mental maps which people in the past may have entertained in relation to 'their' landscapes, as will be demonstrated here with the Holocene rock art of the Daureb (Brandberg) in Namibia.

ORAL

## 2. IS PROCESSUALIST THE SHAMANIC INTERPRETATION OF PALAEOLITHIC ART? EPISTEMOLOGICAL APPROACH TO THE POSSIBLE RELATIONSHIP BETWEEN INTERPRETATIONS OF PALAEOLITHIC ART AND ARCHAEOLOGICAL THEORIES

*Fernández Quintano, José - (Independiente) beroso@hotmail.com*

### PRECEDENTS

Some of the principal proposals of Paleolithic Art interpretation:

Mid - nineteenth century. Artistic activity in a society of abundance

Early twentieth - century. (Influence of anthropology).

Magic: concern for fertility and hunting.

Mid - twentieth century. (Influence of structuralism). Structuralism: importance of the panel (rock art). Study your situation in the cave, and their motives.

Late twentieth - century. (Influence primitive cultures). Shamanism: special relationship between consciousness (altered states) and art.

Some of the major archaeological theories:

- From the second half of the nineteenth century to the second half of the twentieth century. Diffusionism, Evolutionism, Cultural-historical.

- From the second half of the twentieth century to the present. Processualism, Postprocessualism, Systemic, Landscape archaeology.

No interpretations of Palaeolithic Art, no archaeological theory, have the support of the entire archaeological community. There are archaeologists who give more importance to the chronology and technological research of the materials.

### QUESTIONS OPEN TO DEBATE

Is there a direct relationship between the proposals on the Paleolithic Art and archaeological theories? Or, any proposed interpretation of Palaeolithic art may be related to any archaeological theory?

Interpretation of Palaeolithic Art is independent of archaeological theory? So one interpretation of Palaeolithic Art processualist is possible?

### APPROACH

A first approach would be: Processualists are the interpretations of Paleolithic art initially developed with assumptions from other sciences (such as anthropology); Postprocessualists are the interpretations that are made only from the direct study of Paleolithic art.

### PROPOSAL

Some archaeological theories are methodological (precede the work of the archaeologist), leaving more open cultural conclusions (archaeologists work more freely, but this raises the problem of the influence on his work as scientists, of their ideological values ??as individuals or as members of a corporation). Other archaeological theories, from the start, bind method and culture. This affects the development and research findings.

As for the proposals on Paleolithic art, some of these proposals tend to give more importance to cultural conclusions that a methodological procedures. By having more importance the final conclusions are not clearly perceive

the ideological values that researchers introduced at first.

ORAL

### 3. THE PALAEOLITHIC ART OF TITO BUSTILLO CAVE (ASTURIES, SPAIN) IN ITS ARCHAEOLOGICAL CONTEXT.

*Balbín Behrmann, Rodrigo de - (Area de prehistoria. Universidad de Alcalá) babubera@movistar.es*

*Alcolea González, José Javier (Area de Prehistoria. Universidad de Alcalá) javier.alcolea@uah.es*

Over the last four decades, the research conducted in the cave of Tito Bustillo (Asturies, Spain) has provided us with a comprehensive view of the site's archaeological content. The works carried out in the 1970's and 1980's consisted essentially in the excavation of the Magdalenian deposit of the cave's first room, and in the analysis of the Palaeolithic rock art located all along the cave. During the last 15 years we have completed the documentation of the cave's rock art, and we have also valued some little known aspects of its archaeological reality.

Recent works in the cave of Tito Bustillo have included both a review of all the rock art locations in the cave, and an intensive survey of the entire underground area. The review of rock art has been undertaken using new technical means in lighting and photographic recording, and it has also included a program of direct and indirect dating by <sup>14</sup>C AMS and uranium series. Survey works have been accompanied by specific test-pit excavations in different parts of the cave, aimed at contrasting some ideas on the human frequentation of the cavity.

Our research has allowed us to better understand the prehistoric structure of the cave, and especially its settlement by its prehistoric inhabitants throughout the Upper Palaeolithic. We have discovered new decorated galleries, and also new traces of human presence in the form of archaeological structures and portable art objects. The dating program, which has been extended to some structures discovered near the entrance and in the cave's deepest area, has allowed us to frame the chronological development of the human occupation of Tito Bustillo, as well as to better understand the role of the graphic elements in the whole palaeolithic habitat.

The evaluation of all data available at present points to the characterization of the Palaeolithic graphic ensemble of the Tito Bustillo cave as a major factor in the humanization of the underground space. It also points to the consideration of this space as an important part of

the Upper Palaeolithic habitat.

ORAL

### 4. THE SALLE DU FOYER IN LES TROIS-FRÈRES

*Bégouën, Robert - (Association Louis Bégouën) robert.begouen@wanadoo.fr*

The Salle du Foyer is in the deep part of Les Trois-Frères. Numerous engravings were found there in 1964. From the cave's discovery in 1914, the finders noted a lithic structure in the center of this gallery from around which emerged bone splinters and charcoal suggesting a hearth.

During the excavation of Enlène, we undertook an exhaustive study of this part of the cave (parietal art, excavation, deposited objects, sedimentology, dating etc.). Oval in shape, this small gallery measures 7 m long and 5 m wide. Taking into account the preservation of the cave and it being secure, the remains uncovered were left in situ. Thus, with one glance, it is possible to observe the remains in their entirety just as they were abandoned by the Magdalenians. This strategy did not make their study easy as some of it had to be done on site.

Several activities were carried out by the Magdalenians in this deep part of the cave, at 640 m from the light of day. Excavation confirmed the human origin of the lithic structure, composed of large limestone blocks, stalagmites and a large fragment of sinter bassin. Around it the space was adapted and fires made, survived by pits dug into the clay floor where bone clearly served as a combustible. Two of the pits contain various objects, such as sandstone slabs brought in from the exterior. Fauna was eaten on the spot, particularly reindeer.

The mobiliary material recovered is poor, with no art. The flints are above all local but with the presence however of several distant imports (Bergerac, grey Perigordian and Chalosse from Gascony). Certain were worked on-site to produce blades and splinters, while other blades were imported already worked. With the notable exception of two nuclei deposited on a wall, all the others were imported. The tools from the site suggest alimentary activities and a use in creating parietal engravings.

Finally, the gallery's walls harbor deposits, mainly lithic, and a quite large piece of jet carefully hidden in a secret crevice.

#### The parietal art

The Salle du Foyer is surrounded by walls completely

polished by the passage of bears in earlier times, which gives them a marbled appearance. This particularity attracted the Magdalenians' attention and they took advantage of this quality background for very fine engravings. These engravings are in fact so fine that their study by classic methods is impossible. Molds were therefore taken and their reconstitution in resin has revealed all their richness and diversity.

This study makes it clear that we are in the presence of a place for the Magdalenian engravers where the well-preserved archaeological context allows us a close encounter.

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ORAL

**5. THE SOLUTREAN CAVE ART OF LA CUEVA DE AMBROSIO (ALMERÍA, SPAIN).**

*Ripoll, Sergio - (UNED) sripoll@geo.uned.es*  
*Muñoz Ibañez, Francisco J. - (UNED) fjmunoz@geo.uned.es*  
*Martín Lerma, Ignacio - (Universidad de Murcia) ignaciomartinlerma@hotmail.com*

In the solutrean site of La Cueva de Ambrosio several engraved and painted figures dated on the Upper Palaeolithic, have been found during the field works of 1992 and 1994. In The panel I we have identified an excellent representation of a horse, a bird, one bovidae and another protome of a horse. Below this surface there are many red ochre wallpaintings covered by a calcitic path and for the time being we are unable to give any interpretation for it. In the second panel we have discovered more tone splendid red painted horse, two more engraved horses and a little head of one other black painted horse. There are many engraved lines and pictural rests that must be studied in the future.

The exceptionality of this discovery is that we can interrelate perfectly these rock art paintings with the archaeological levels clearly defined chronologically and culturally (ca. 20.000 B.P.), Middle Solutrean and Upper Solutrean from the same site.

More than twenty years ago, we find the first figures traits in La Cueva de Ambrosio. During these long years we have spent countless hours in front of the various panels and many others in front of the computer monitor to try to decipher those unconnected strokes that were watching and not got to define. The advance of computer technology, reflection and maturation of some ideas that already we knew some time ago, they have enabled us to significantly enlarge the iconographic corpus

of this surprising season. In this site, in which we have been working for more than 30 years, we have found the more complete and interesting sequence for the Spanish Mediterranean Solutrean period. According to the investigations carried out so far, it seems to this shelter was not a permanent camp, but rather a place that is used to go at certain times to renew the lithic tools (Ripoll et alii, 1988) and where, despite the brevity of their stays, found through the low thickness but high extension of the fire places and little osseous remains to have constituted a food they had time to paint and engrave samples of Palaeolithic parietal cave art on its walls.

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ORAL

**6. HUMAN AND ANIMAL ACTIVITY TRACES (TRACS) IN THE CAVE OF CUSSAC (LE BUISSON-DE-CAUDOUIN, DORDOGNE, FRANCE).**

*Ledoux, Lysianna - (Université de Bordeaux, PACEA, UMR 5199, PPP, Pessac) lysianne@orange.fr*  
*Fourment, Nathalie - (SRA Aquitaine, DRAC, Bordeaux et Université de Bordeaux, PACEA, UMR 5199, PPP, Pessac) nathalie.fourment@culture.gouv.fr*  
*Maksud, Frédéric - (SRA Midi-Pyrénées, Toulouse) frederic.maksud@culture.gouv.fr*  
*Delluc, Marc - (Spéléoclub de Périgueux, SCP, Bergerac) marc.delluc@sfr.fr*  
*Klaric, Laurent - (Préhistoire et Technologie UMR 7055, MAE René Ginouvès, Université Paris Ouest La Défense Nanterre) laurent.klaric@mae.u-paris10.fr*  
*Plisson, Hugues - (Université Bordeaux, PACEA, UMR 5199, PPP Centre archéologique du Domaine de Campagne, F-24260 Campagne) hugues.plisson@u-bordeaux1.fr*  
*Goutas, Nejma - (ArScAn, Ethnologie préhistorique, MAE Université Paris Ouest Nanterre La Défense) nejma.goutas@mae.u-paris10.fr*  
*Théry, Isabelle - (Université Nice Sophia Antipolis, Campus Saint-Jean-d'Angély SJA3, CéPAM - UMR 6130 CNRS) isabelle.thery@cepam.cnrs.fr*  
*Valladas, Hélène - (LSCE/IPSL, UMR 1572, CEA-CNRS-UVSQ) Helene.Valladas@lsce.cnrs-gif.fr*  
*Jaubert, Jacques - (Université de Bordeaux, PACEA, UMR 5199, PPP, F-33615 Pessac) jjaubert@pacea.u-bordeaux1.fr*

The Gravettian cave of Cussac well-known for its art and human remains contains numerous traces of human and animal incursions covering the whole cavity. Most of them include, for instance, static or dynamic footprints, hand or finger marks, lithic and bone industries, slides, scratch marks, wallows, charcoal deposits, red or black traces (colorant?), broken concretions, moved speleo-

thems.

Since 2009, a team incorporated in the *Projet Collectif de Recherche "Grotte de Cussac"* directed by J. Jaubert is engaged in the identification, inventory and study of these Activity Traces (TrAcS). The objective is to study the interaction of humans and animals with the subterranean environment and understand how Gravettians perceived this complex space, by crossing data on these different traces with information provided by other disciplines (parietal art, anthropology, geosciences, ichnology, pigment analysis, etc.). To our knowledge, Cussac is the first cave where a comprehensive inventory is carried out by a specific team. This new approach is due to the discovery conditions of the cave, which was left almost untouched since the Palaeolithic and to the policy of conservation. The team prospects with non-invasive methods, respecting the limits of the path and records, describes, photographs the accessible TrAcS.

The areas that are currently inventoried show that human TrAcS are more frequent and diverse than that of animals and mostly composed by the red and black traces (including snuffing torches also revealed by the presence of charcoal on the ground, wall friction, etc.), and breakage and movement of speleothems. Industry evidences are rare but there are three lithic artefacts (two blades and one laminar flake) and one (maybe two) bone artefact that are the subject of specific studies by specialists (technology, traceology, petrography, etc.). Animal TrAcS are for the most part produced by bears, and mainly characterized by scratches on large areas. Chronologically, bear traces always predated the human activity. We are only at a preliminary stage of our research and even though we can already reconstruct the actions of bears and Gravettians on small areas of the cave, there are still TrAcS that need to be inventoried and interpreted for better understanding of their appropriation of the symbolic space of the cavity in its entirety. New imaging technology, such as 3D scanner and photogrammetry, already used at Cussac by the parietal art (dir. V. Feruglio) and anthropology (dir. D. Gambier) teams, will be principally used for the footprints study. The interest of 3D scanning is twofold. Firstly, footprints can be the subject of morphometric and dynamic studies. Secondly, it ensures a perfect conservation of walls and floors, while reaching areas that are distant from the walkways.

The presence of TrAcS, art and human remains shows a complete and intense appropriation of the subterranean environment by humans and bears. Our study constitutes a fundamental step for the understanding of the

cavity, and more generally, of the identity of Gravettians, their culture, behavior, activities, movements or occupations in the context of a complex site with monumental engraving.

ORAL

## 7. CUSSAC CAVE: THE INFLUENCE OF THE SUPPORT ON ART WORKS DISPOSITION, TECHNICAL CHOICES AND TRACE RECORDING

*Ferrier, Catherine - (Univ. Bordeaux-UMR PACEA 5199) c.ferrier@pacea.u-bordeaux1.fr*

*Konik, Stéphane - (Ministère de la Culture et de la Communication-CNP Périgueux-UMR PACEA) stephane.konik@culture.gouv.fr*

*Ballade, Marie - (UMR PACEA-Univ. Bordeaux) marie.ballade@etu.u-bordeaux1.fr*

*Bourdier, Camille - (UMR TRACES) camille.bourdier@univ-tlse2.fr*

*Feruglio, Valérie - (UMR ArScAn) feruglio@free.fr*

*Chapoulie, Rémy - (UMR IRAMAT-CRP2A, Univ. Bordeaux Montaigne) Remy.Chapoulie@u-bordeaux3.fr*

*Jaubert, Jacques (UMR PACEA-Univ. Bordeaux) - j.jaubert@pacea.u-bordeaux1.fr*

The parietal art of Cussac cave, a major ornate site for the parietal art of the Gravettian period, is characterized by the dominance of engraving. The lithological characteristics of the limestone banks from the Upper Campanian have somehow influenced the localization of representations. The surface states of the support - which were acquired by alteration before human beings first used them - influenced the choice of the engraving technique and permitted the conservation of traces whether they were intentional or not.

The approach uses sketches realised with different scales, both in 2D and 3D, as well as physico-chemical analyses of the limestone banks by comparing their unaltered and altered features:

- mapping of the lithology and the surface states of the walls (downhill branch). Representation of the signs of alteration corresponding to a heap sand which resulted from the disintegration of the rock.
- taphonomic sketch of the Triptych's panel
- study of a wall fragment which had fallen to the ground next to the Great panel and the sand: petrography, granulometry, mineralogy by XRD and Raman spectrometry, analyses of chemical elements by SEM-EDXS and EDXRF. The walls show two lithological features :

- at the bottom, the first one is made of decimetric banks which contributed to the formation of irregular profiles, in the shape of stair steps.

- at the top, the second feature corresponds to metric banks which form large subvertical or horizontal surfaces with smooth morphologies. The analyses demonstrate that the rock suffered from superficial, millimetric dissolution. That was reflected by the almost complete disappearance of the sparitic and microsparitic cement. That phenomenon had several consequences:

-increase in porosity, leading to much lesser cohesion in the rock;

-release of millimetric grains which progressively heaped up on the walls or at their foot;

-relative concentration of iron hydroxydes which maybe caused the yellow-earth colour of the rock patina.

Because of the dimension and shape of the surfaces available, it was the massive banks which were preferred. That type of support enabled the realization of large works on panels which sometimes reach several metres in length. The fragility of the surface means that the technique of finger-engraving was preferred, giving more or less large and deep traces. Soft and hard tools were also used. Hence the fact that the rock which had been altered on several millimetres could be easily cut, as far as the healthy part, whose clearer aspect than that of the patina makes it easier to see the representation. Moreover the surface's crumbly consistency seems to have been used to overcome the issue of the curvatures and use a relief effect thanks to the asymmetry of the inclination of the stroke edges (Egyptian relief). The support also bears light and fortuitous traces of the hands that rested on it and which enable the understanding of the artist's gestures on certain outlines.

## ORAL

### 8. NATURAL TO CULTURAL: THE DIFFERENT CONTEXTS OF ROC-AUX-SORCIERS (ANGLES-SUR-L?ANGLIN, FRANCE) ROCK ART

*Bourdier, Camille - (Université Toulouse Le Mirail ? UMR TRACES 5608) camille.bourdier@univ-tlse2.fr*

Localized between the Aquitaine and the Parisian Basin, Roc-aux-Sorciers rock shelter was occupied and abundantly decorated – engraved, painted and sculpted – during the Middle Magdalenian (19 000-16 000 cal. BP). Our researches tackle the function of this site and, thus, question the social role of rock art. These issues require not only the analysis of the graphical productions,

but also the examination of the contexts in which they were made and used. This broader reasoning process considers three contexts: the natural context (topography of the site), the internal archaeological context (nature of the occupation) and the external archaeological context (nature of the other “contemporary” decorated sites). Each context provides complementary information about the public that could have had access to the decorated walls and about the activities that were associated to the rock imagery.

Roc-aux-Sorciers rock art lies in the walls of a huge shelter opening on the bank of a river, i. e. in a visible and accessible place with a collective accommodation. Three archaeological layers show an intense occupation of the site during the Middle Magdalenian. The abundant and varied material (lithic industry, bone industry, fauna, portable art, personal ornaments) underlines the diversity of activities carried out: domestic, hunting and symbolic. The scale of the shelter, the profusion of material and the reoccupation of the site seem to indicate that Roc-aux-Sorciers was an aggregation site. In this perspective, this public rock art could have participated in reinforcing the social cohesion of the people gathered there. In this particular context, rock art could have acted as an affiliation pattern, with an imagery expressing and transmitting a common system of values and beliefs. Finally, Roc-aux-Sorciers is not isolated; it is part of a group of decorated sites, about forty kilometres away. Numerous links have long been noticed with the cave of La Marche which occupation contained several hundreds of engraved slabs. The industries and the personal ornaments are very similar, so is the iconography, especially through the abundance of human realistic representations. However, the bestiary of La Marche is more varied and the formal variability is wider. These techno-stylistic differences raise the hypothesis of distinct practices: a collective expression in Roc-aux-Sorciers, performed by one or a few specialists, against a more individual practice in La Marche.

Therefore, studying the multiple contexts of Roc-aux-Sorciers rock art, both natural and cultural, opens new perspectives on the likely diversity of functions of the decorated sites in the Middle Magdalenian and, beyond, on the all the more probable symbolic plurality of this rock art.

ORAL

**9. FIRES IN THE MEGACEROS GALLERY (CHAUVET-PONT-D'ARC, ARDÈCHE) : CHRONOLOGY AND LINK WITH THE ROCK ART**

*Ferrier, Catherine - (Univ. Bordeaux-UMR PACEA 5199)  
c.ferrier@pacea.u-bordeaux1.fr*

*Debard, Évelyne - (Université Lyon 1-Laboratoire de Géologie de Lyon-UMR 5276) Evelyne.Debard@univ-lyon1.fr*

*Kervazo, Bertrand - (CNP Périgueux-UMR PACEA) bertrand.kervazo@culture.gouv.fr*

*Lacanette, Delphine - (I2M-Université de Bordeaux) lacanette@enscbp.fr*

Researches on the taphonomy of the rock art walls of the Chauvet cave led to detailed study of fire marks: pink and grey color of the rock, flakes due to the heat, and soot deposits. This thermal wall state was observed in the first rooms, where the main red paintings are located, as well as the deep rooms where most of the wood coal paintings were found.

The Megaceros Gallery, located in the deep area, comprises the most widespread marks of this wall state. They are divided in five zones and are associated with artefacts and prints on the ground (fire places, charcoals, pieces of wood prints, thermoclasts).

The study lies on :

- the description and the cartography of the thermal wall state and of the artefacts on the ground ;
- fire experiments in an underground quarry (LaScArBx IThEM program).

The chronological data (C14 datings of the charcoals and relative chronology with the rock art) links the fire to the Aurignacian. Two major periods are distinguished, according to the results of the study of the Panneau du Mégacéros, where several realisation phases can be observed. Considering the narrowness of the gallery and the number of identified hearths, the contemporaneity of the fires is non conceivable.

The cartography, the fire experiment results and the modelling of the combustion gases flow, show the great size of the fires and their location on the axis of the gallery. The smokes were evacuated at the ceiling, which allowed the palaeolithic man to maintain the fire and to breathe in the lower part. This results has been confirmed by 3D numerical simulations of the burning of a fire in a simplified geomery of the Megacros Gallery.

The functions of the fires keeps unknown: lighting, getting the torch going again, protection from the bears who were present in the cave at the same period...

In the Megaceros Gallery, other hypothesis can be considered:

- colourant production, given the great quantity of charcoals uncollected on the ground and, in one case, gathered under one of the paintings ;

- markings, for two small rubefied areas, located above a rock step, in the medial part of the gallery ;

- or, in a more hypothetical way: smoke, heat or light production, without reason other than symbolic ; modification of th wall state, in particular its colour and maybe its consistence.

ORAL

**10. ELEMENTS OF THE PREHISTORIC ILLUMINATION SYSTEM IN ARDALES CAVE**

*Cantalejo, Pedro - (Cueva de Ardales) pedrocantalejo@gmail.com*

*Ramos, Jose - (Universidad de Cádiz) jose.ramos@uca.es.*

*Weniger, Gerd-Christian - (Neanderthal Museum) weniger@neanderthal.de*

*Espejo, Maria del Mar - (Cueva de Ardales) mariadeespejo@gmail.com*

The Ardales Cave is located in a mountain area near the village of Ardales about 50 km North of Malaga. It was Henri Breuil who recognized first its rock art in 1918. Ardales cave is outstanding in Southern Spain for its numerous examples of paintings and engravings from the Upper Palaeolithic. To date 1010 pictorial artefacts from 252 panels have been described. They probably represent three chronological phases from the Gravettian, the Solutrean and the Magdalenian. Apart from the rock art an important number of non-pictorial artefacts have been conserved. These are stone and bone tools placed near the panels, paste of red and yellow pigment, stone containers used as pigment palettes and stone lamps used for artificial lightning. The talk will present latest results of the spatial distribution of the non-pictorial artefacts and their possible relation to human movement in the cave and to the position of the rock art panels.

ORAL

**11. PAINTED STONES AND RITUAL PITS: NEW EVIDENCE ON LATE EPIGRAVETTIAN ART AND SYMBOLIC BEHAVIOR**

*Dalmeri, Giampaolo - (MuSe - Museo delle Scienze di Trento) giampaolo.dalmeri@muse.it*

*Duches, Rossella - (MuSe - Museo delle Scienze di Trento) rossella.duches@muse.it*

*Bassetti, Michele - (CORA Ricerche Archeologiche snc) michele@coraricerche.com*

*Cerilli, Eugenio - (Sezione di Paleontologia del Quaternario e Archeozoologia, Soprintendenza al Museo Nazionale Preistorico Etnografico "L. Pigorini") eugenio.cerilli@pec.arc.it*

*Cusinato, Anna - (MuSe - Museo delle Scienze di Trento) anna@casanovadesign.com*

*Hrozny Kompatscher, Maria - (MuSe - Museo delle Scienze di Trento) nandi@azzolini-kompatscher.it*

*Kompatscher, Klaus - (MuSe - Museo delle Scienze di Trento) klaus@azzolini-kompatscher.it*

*Fiore, Ivana - (Sezione di Paleontologia del Quaternario e Archeozoologia, Soprintendenza al Museo Nazionale Preistorico Etnografico "L. Pigorini") iva.fiore@gmail.com*

*Neri, Stefano - (MuSe - Museo delle Scienze di Trento) stefano.neri@muse.it*

*Tagliacozzo, Antonio - (Sezione di Paleontologia del Quaternario e Archeozoologia, Soprintendenza al Museo Nazionale Preistorico Etnografico "L. Pigorini") antonio.tagliacozzo@beniculturali.it*

The artistic and symbolic expression in the Late Epigravettian of Northern Italy consists essentially of the mobiliary art found in residential and funerary contexts. An exceptional case is represented by Dalmeri rock shelter, an hunting seasonal camp located at about 1240 m asl on the Asiago-Sette Comuni Plateau (Trento). This site not only has played a key role in revealing the socio-economic dynamics of settlements and resource exploitation of Late Epigravettian hunters, but also has provided unique evidence of symbolic activities.

The earliest human occupation of the site, dated to 13,400-13,100 cal BP, is characterized by the presence of hearths, a dwelling structure, and rich cultural components such as a lithic industry and faunal and charcoal remains (Montoya, 2008; Tagliacozzo and Fiore, 2009). In addition, these layers revealed a total of 267 stones painted with red ochre that have zoomorphic, anthropomorphic, and geometric motifs (Dalmeri et al., 2006; 2009; 2011).

The spatial distribution of the stones indicates that a fan-shaped area of ca. 30 sq m and more than 4 m wide

oriented east-west towards the rock wall was reserved for ritual activities. Most of the stones were found with the decorated side facing down and were often in small piles (Dalmeri et al., 2009). This distribution suggests the intentional concealment of the painted images.

Another interesting discovery made just outside of the rock shelter involves three pits that were filled with different materials. The structures (and substructures) contained an abundant selection of ibex cranial parts with horns and single horns with more than 8,000 remains, particular objects, polishers and stones painted with ochre. The stratigraphic and taphonomic analyses of the filling revealed the intentional deposition of the materials and the utilization of the ibex horns for filling up the pits.

A direct connection between the painted stones and the ritual pits is supported by the stratigraphic data, the spatial organization and the C<sup>14</sup> dates. This evidence, moreover, suggests the hypothesis of a complex ritual activity that involved a large parte of the living space, including significantly the entrance area of the shelter. The presence of ochre marks applied to the upward-facing sides of the painted stones, probably finalized to recognize them, associated to the evidence of a gradual filling of the pit 1, suggests a dynamic ritual, repeated and renovated over time in a relatively short period.

ORAL

**12. DETERMINING NATURAL VERSUS CULTURAL COLOURED ROCKS (?PIGMENTS?) AT NAWARLA GABARNMANG, A 48,000-50,000 YEAR OLD ABORIGINAL SITE IN NORTHERN AUSTRALIA**

*Castets, Géraldine - (Laboratoire EDYTEM) geraldine.castets@univ-savoie.fr*

Western Arnhem Land's rock art is world famous yet very poorly dated. One of the key challenges facing researchers is establishing how old the rock art is, since, unlike other archaeological materials, art is not straightforward to date because of the mineralogical nature of most pigments used by Aboriginal people in the past. In some sites, considerable numbers of coloured nodules of uncertain cultural status are excavated in painted caves and rockshelters, offering the potential to better understand the antiquity of the painted art itself by chronostratigraphic associations with buried pigments. To do so requires matching the chemical properties of buried pigments with on-wall paints. Yet a critical challenge is



to first weed out non-cultural buried pigments: that is, to recognize what constitutes earth pigments brought to a site by people, as opposed to non-cultural coloured rocks that have naturally formed within a site. To distinguish between the two requires understanding the geomorphological and chemical processes that cause the diagenesis of pigmentation on buried rocks.

This study reports on the earth pigments excavated from Nawarla Gabarnmang (Jawoyn country, western Arnhem Land, Australia), at 48,000-50,000 cal BP one of the oldest known cultural sites in Australia. The shelter's ceiling and many of its rock pillars are literally covered in multiple layers of paintings. Excavations have revealed numerous coloured rocks, some clearly natural, some clearly cultural, with various degrees of uncertainty in-between.

Using a range of techniques including macroscopic observations and chemical analyses (XRF) coupled with structural techniques (XRD, Fourier Transform Infrared, Raman micro-spectroscopy), we present initial results aimed at determining which objects are natural, which are cultural, and what kinds of diagenic processes have resulted in the colouration of the natural pieces.

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ORAL

### 13. EXPLORING THE ORGANIZATIONAL STRUCTURE OF CAVE USE THROUGH PHYSICAL CONTEXT ANALYSIS

*Villeneuve, Suzanne - (Simon Fraser University) suzanne\_villeneuve@sfu.ca*

A century of hypotheses concerning Paleolithic cave use has focused either on individual activities (such as vision quests or shamanistic visits) or group activities such as initiations. Resolving this issue provides an important foundation for examining more complex questions such as the exclusivity/inclusivity of groups using caves and their possible roles in the development and maintenance of inequalities in the Upper Paleolithic. The basic research problem that I have attempted to address is whether any of the decorated Upper Paleolithic caves were used for group rituals? If so, what was the nature of the group activity (at least in general size of groups), and what types of social groups might have been involved? A sample of caves from the Perigord Region of Southwest France was examined to test a systematic approach to examining these issues. An activity area approach (as applied in other domains of archaeology) was adopted

in the analysis of the spatial distribution of cave images, to explore what the immediate contexts of images may reflect in terms of associated activities or group sizes and how different portions of caves may have been used. It was important to document the physical and visibility conditions surrounding images, and to understand image patterns according to these contexts. Thus, variation within caves (and between caves) in the physical contexts of images and the way space was used are central concerns of this work.

A number of subgroups of cave spaces resulted from this analysis that potentially reflect subcomponents of activity. Their distribution appears to hold insight into the overall organizational structure of cave use, and implications for similarities in activity between some caves. These results take into consideration: 1) the size of the physical space, wall topography and visibility conditions to understand possible group sizes; 2) clustering or distribution of images to understand where activities may have concentrated and what type of movement may have been involved, and 3) image characteristics within this context (although further effort is required when attempting to interpret intentionality in terms of audiences).

Thus, when viewed from an activity area (or social context) perspective, with attention to physical contexts and visibility in examining image distributions, a similar organizational structure to cave use seems to emerge. This is different from most past explanations and something that would perhaps not emerge when focusing on the symbolic content of the images themselves. If there is a similar organizational structure to the use of some caves, symbolic content of the images might more profitably be examined within this context, at least at the level of animals, anthropomorphs, and geometric shapes.

The transformations or maintenance in Upper Paleolithic beliefs are undoubtedly reflected in some way in the caves. The painted caves may in fact be an ideal place from which to better understand the development of complexity during the Upper Paleolithic, and the emergence of inequalities, if examined in terms of a social context perspective in a dynamic temporal and regional model.

ORAL

#### 14. PLAQUETTES DECORATED AS A HISTORICAL SOURCE OF PALEOLITHIC

*Clavijo, López Juan - (UNED) j.clavijo@lacroixnorte.com*

The work aims to conduct an overview of the phenomenon of plaquettes decorated Palaeolithic.

There have been various methods used to achieve this goal, first a literature review of research results, including the most recent, and assumptions of the most important authors, and on the other hand has made several visits to museums to see documentation.

As a result the paper develops different hypotheses: Petrifaction art, why art towards 35000BP might appear, usually called full, fully developed; Natural message communication system, the art in response to a communication system between two species graph; From the board to the wall, the more complex societies need a more expressive communication; Technical variability of the performing arts, traditions that established the operational chain to create art were discontinued with the death of specialist.

In conclusion we can say that Paleolithic plaquettes decorated were not made for one reason, but there were different situations that led to its realization. I mean, probably a result of a variety of uses. Furthermore iconography represented why did not maintain the same meaning throughout the period, could evolve in content, is able to adopt the same but with different meanings signs and therefore need not be a single explanation for implementation.

ORAL

#### 15. THE IMPORTANCE OF HISTORIOGRAPHY IN THE PALEOLITHIC CAVE ART CONTEXT STUDIES

*Ochoa, Blanca - (Universidad del País Vasco UPV/EHU) blanca.ochoa@ehu.es*

In the course of the last decades there has been new cave art discoveries such as La Garma, Chauvet-Pontd'Arc, Le Réseau Clastres in the Niaux Cave, Cosquer or Cussac, these have allowed researchers to advance in context and spacial studies. This has been due to the fact that the decorated chambers were intact in the moment of the discovery and soon after that protocols to protect these invaluable records were developed.

The problem is that these types of caves are a minority. Most of the discoveries were made at the beginning of the 20<sup>th</sup> century and a few years after the first studies were published, the caves were modified to a great extent to prepare them for touristic visits. This altered the space of the cave to a great degree and destroyed evidences that could have existed. In these cases, we have lost invaluable information for the majority of the Palaeolithic cave art. However, the study of historiographical documents can provide information regarding the context and the original space distribution of the caves. In this poster we will introduce available data from different historiographical sources such as pictures and descriptions available in publications but also in unpublished materials. These documents are invaluable for the reconstruction of the space and the context in the moment of the discovery of the caves because they will allow us to reconstruct, to some extent, the spatial configuration that existed before the modifications were made on the caves.

ORAL

#### 16. TRACKING IN CAVES ? FIRST DECIPHERMENT OF PALAEOLITHIC HUMAN FOOTPRINTS IN PAINTED CAVES BY TRACKERS FROM THE JU/'HOANSI-SAN (NAMIBIA)

*Pastors, Andreas - (Neanderthal Museum) pastors@neanderthal.de*

*Lenssen-Erz, Tilman - (University of Cologne) lenssen.ertz@uni-koeln.de*

Human hand- and footprints from prehistoric times along with human bones are the most personal remains left from an individual. Under ideal conditions a short lapse of time of a single person may be recorded in a plastic surface. No other findings (stone tool, artwork or other) are so clearly linked to a short individual moment. Prehistoric foot- and handprints are known from different continents and periods. Among them the most spectacular ones are footprints from Laetoli and Koobi Fora. No less fascinating are footprints left by Pleistocene humans in decorated caves in South-western France. The extraordinary status of such fragile remains stands in stark contrast to the scientific interest during the last 100 years because only three researchers have seriously studied small parts of the known footprints. This imbalance is perhaps owed to the cultural alienation to this kind of remains and the potential means to interpret them.

This experiment aims to test the feasibility of such an integration of two knowledge systems and the benefit for archaeological science but not to test the reliability of indigenous tracking skills. Even if the concrete method of tracking is still unknown and study in process, the precise and plausible results are worth to be presented to a wider public.

To stimulate the research on human footprints three professional trackers from the Ju/'hoansi-San from Tsumkwe (Namibia) - once known as "Bushmen" -, Ciqae, Thao and Kxunta, were directly confronted with the original footprints in four French caves: Niaux, Pech-Merle, Fontanet and Tuc d'Audoubert. For perhaps the first time, indigenous knowledge (IK) was integrated into archaeological data-gathering without the detour of ethnographic analogy or as mere confirmation of previous results.

In all four caves visited, the old interpretations of human tracks are now flanked by alternative readings which imply several necessary revisions. Most spectacular may be the identification of toe-imprints at the track that hitherto was present in literature as the only print of a shod foot. If pointed out by an expert, the impressions of the toes are even recognisable to an untrained observer, so that the hypothesis of a moccasin can hardly be upheld. For none of the tracks that formerly had been interpreted as 'ritual dance' or similar ceremonial behaviour was there any corroboration by the trackers. All footprints seem to be generated by ordinary stride with few exceptions of a faster pace, thus leaving no space for hypotheses regarding extraordinary behaviour. In none of the caves investigated was there any proven or even potential connection between spoor and the parietal art of the caves. In three cases the hitherto assumed number of acting people was either augmented (Pech-Merle) or diminished (Niaux, Tuc d'Audoubert).

Human tracks constitute a source that is comparatively obvious and unambiguous, though replete with information. They are equally accessible to various kinds of knowledge systems and therefore may be an ideal prototype for the integration of IK into archaeological sciences, not as an exotic add-on but as a serious interdisciplinary liaison method.

# A11C New solutions for old problems: The use of new technologies for the documentation and conservation of prehistoric art

Commission on Prehistoric art

(Organisers: Roberto Ontañón, Luis C. Teira, Vicente Bayarri)

Tuesday 2nd (9:00 -13:30 to 14:30 – 19:30)  
Meeting Room A02



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ORAL

## 1. THE ROLE OF GRAPHICAL DOCUMENTATION IN THE STUDIES ON PREHISTORIC GRAPHIC EXPRESSION

*Teira, Luis - (Instituto Internacional de Investigaciones Prehistóricas de Cantabria) teiral@gestion.unican.es*

If we analyse the publications related to the documentation of prehistoric rock art, especially if we refer to moments before the impact of computers, we will probably agree that the imagery shown in them acts as an "illustration", understood as a specific category that speaks of images that accompany a text. The relation between these two elements in this type of papers is vastly varied and methodologically dark. In fact, unlike text, images can hardly be placed in the argumentative structure of the studies. Do they belong to data submission or are they part of the development of interpretations? Taking the words of P. Ucko on methodology in the analysis of rock art, "most publications seem to assume we all know what we are doing and we have good theoretical basis to do so" (Ucko, 1989, *Subjectivity and the study of Paleolithic rock art*). In this communication we analyse the role of graphics –understood as scientific images– in the documentation of Prehistoric Graphic Expression; the impact of digital technology on a renewed and vain use of the terms "objective" and "subjective" and also the use, often contradictory, of technical terms such as 2D, 3D, image, photo, tracing... In this sense, we will try to expose the defining keys of the image generation process in a subject as peculiar as Prehistoric Graphic Expression.

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ORAL

## 2. L'ART PARIÉTAL DE CUSSAC (DORDOGNE, FRANCE) : MÉTHODOLOGIE ET PREMIER BILAN

*Feruglio, Valérie - (PCR Cussac) feruglio@free.fr*  
*Bourdier, Camille - (Université Toulouse Le Mirail - UMR TRACES 5608) camille.bourdier@univ-tlse2.fr*  
*Aujoulat, Norbert*  
*Delluc, Marc - (Spéléoclub de Périgueux, SCP, Bergerac) marc.delluc@sfr.fr*  
*Portais, Jean-Christophe (CRMH Aquitaine)*  
*Jaubert, Jacques (Université de Bordeaux, PACEA) jjaubert@pacea.u-bordeaux1.fr*

En 2008, un collectif (Projet collectif de recherche sous l'égide du Ministère de la Culture) a été constitué pour

étudier la grotte ornée et sépulcrale de Cussac (Dordogne) découverte par M. Delluc en 2000. Nous présenterons un bilan de 5 années de terrain (2009-13) consacrées, pour l'art pariétal, à une reprise de l'inventaire et à l'étude des principales caractéristiques techniques, thématiques, stylistiques et iconographiques qu'avait commencée Norbert Aujoulat et dont il avait livré des résultats préliminaires (Aujoulat *et al.*, 2001, 2002).

Nous confirmerons d'une part l'extrême homogénéité qui sous-tend ces productions, et d'autre part leur cohérence au sein du répertoire graphique du Gravettien moyen.

Pour des raisons d'accès, d'équipement et de programmation, l'étude ne porte que sur une partie du réseau représentant cependant la quasi-totalité de la branche Aval, de l'entrée actuelle au Panneau du Passage, soit près de 400 m de linéaire de la longue galerie de Cussac. Cette zone est la plus densément ornée de la cavité, concentrant les panneaux majeurs (Panneau de la Découverte, Grand Panneau). Au-delà, le Panneau du Fond, conclut ce secteur et ne peut être étudié pour l'heure faute d'équipements difficiles à mettre en œuvre.

Pour l'étude de l'art pariétal, quatre principaux objectifs ont été programmés : 1) Reconnaissance topographique des panneaux ou figures isolées ; 2) Inventaire systématique et établissement d'une base de données déclinée en panneaux et entités graphiques reportée sur un SIG ; 3) Approche taphonomique de la paroi ornée par une analyse interdisciplinaire avec des géoarchéologues et des informaticiens sur un support 3D (étude de cas pour le Panneau du Triptyque) avant de procéder au dernier volet qui est prévu sur le moyen ou le long terme : 4) Relevés sur support 3D dont la première tranche vient juste d'être livrée.

Compte tenu de la richesse et de la densité iconographique de la Branche Aval, une analyse, même préliminaire, autorise une vue d'ensemble fiable et représentative de ce sanctuaire d'exception.

La présentation de ces divers volets méthodologiques, faisant largement appel aux nouvelles technologies nourrira la réflexion sur les approches actuelles et les nouveaux outils de l'étude de l'art pariétal dans un souci de compréhension, mais aussi de conservation et de diffusion de ce patrimoine.

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ORAL

### 3. NEW STUDIES AT THE GENOVESE CAVE, SICILY, USING A PORTABLE XRF

*Vianello, Andrea - (independent researcher) a\_vianello@hotmail.com*

*Tykot, Robert - (University of South Florida) rtykot@usf.edu*  
*Giglio, Rossella (Soprintendenza per i Beni Culturali e Ambientali Trapani) - giglioro@libero.it*

The so-called Genovese Cave in Levanzo has been the subject of new studies with a non-destructive portable XRF. The cave is very important because of its geographical location at the western end of Sicily and its parietal art, both carved and painted. There are both human and animal figures depicted in the cave. The painted art includes black and red figures in separate panels. Past excavations in the cave have revealed a long occupation that spans from the Palaeolithic to the Bronze Age.

The phenomenon of Palaeolithic cave art is widespread in Europe, but it appears concentrated in Iberia and France, with very few sites found in Mediterranean areas at the crossroad of future development. This study intends to briefly compare some of the art from these 'marginal' sites with the better studied and more famous European art.

In this study, we present the data from a portable XRF, which has been used to analyse the elements of the painted art and distinctive areas of the geology of the cave. From such data, we can reconstruct the materials used to paint the figures. A fresh look at the archaeological evidence from the Genovese cave provides much needed contextual information on the use of the cave itself. We have also begun exploring the contexts of other caves in the area for comparative purposes, though no other cave in Sicily contains all types of figurative art as in the Genovese Cave. The portable XRF has been used on many types of materials.

We have also initiated a new study of the parietal art taking into consideration new discoveries of figurative art from across Sicily. In particular, Sicilian ceramic idols seem very similar to those depicted in the cave, suggesting that cave art and portable art stemmed from the same beliefs but were not used together in the same contexts. The number of carved and painted figures is also much higher than any assemblage of figurines. These differences and the scientific data that we are producing will form the basis for a new re-interpretation of the cave. Here, we discuss some of the empirical data and review some of the constraints that they place for future interpretations.

We aim to differ from past interpretations of cave art that consider only art itself and rather recognise the art as one of the long-lasting manifestations of a group of people that used the cave habitually.

ORAL

### 4. EPHEMERAL HERITAGE: THE ROCK ART MOULDS OF THE TAGUS VALLEY (PORTUGAL) AND THE APPLIED PHOTOGRAPHY TO ARCHAEOLOGICAL MATERIALS.

*Garcês, Sara - (Universidade de Trás-os-Montes e Alto Douro - FCT PhD scholarship; Instituto Terra e Memória; Grupo de Quaternário e Pré-História do Centro de Geociências) sara-garces.rockart@gmail.com*

*Joaquim, Flávio Nuno - . (Instituto Politécnico de Tomar, Estrada da Serra 2300 Tomar, Portugal; Instituto Terra e Memória) flavio.joaquim83@gmail.com*

*Oosterbeek, Luiz - (Instituto Politécnico de Tomar, Estrada da Serra 2300 Tomar; Instituto Terra e Memória (ITM, Mação); Grupo Quaternário e Pré-História do Centro de Geociências (u. ID73 - FCT) loost@ipt.pt*

*António Ventura - (Instituto Politécnico de Tomar, Estrada da Serra 2300, Tomar, Portugal) aventura@ipt.pt*

An innovative protocol between the Earth and Memory Institute (Instituto Terra e Memória) and the Master's Degree in Applied Photography of the Tomar Polytechnic Institute (Portugal) has brought forward a reliable record of the latex moulds of the Tagus Valley Rock Art Complex engraved rocks. This material is the result of a tracing technique of the rock engravings used in the early 70's in the Tagus Valley, when the discovery of the thousands of engraved rocks was made at the same time as the imminence of the construction of the Fratel dam.

Latex moulds were the object of an ambitious registration and documentation project, in the scope of the project *Ruptejo*, which culminates with the necessity of recording exactly and objectively this material, whose state is still pretty good, though fragile, after four decades. It is, however, one of the few materials that certify the importance of the rock art collection of the Tagus Valley, which is now submerged.

The Master's Degree in Photography has been responsible for the systematic photographic registration of the moulds and has suggested a study to find out how can photography contribute to new forms of visualizing and perceiving rock art engravings, which are today regis-

tered by the moulding process. Applied Photography is, thus, an extremely important tool for the construction of continuous and reliable evidence of an ephemeral heritage.

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ORAL

## 5. NEW TECHNOLOGIES APPLIED TO PREHISTORIC ROCK ART STUDIES.

*Bayarri Cayón, Vicente - (Gim-Geomatics) vicente.bayarri@gim-geomatics.com*

*Ripoll, Sergio - (UNED), José Latova - latova@asfimagen.es (ASF-Imagen) sripoll@geo.uned.es*

*Municio González, Luciano - (Junta de Castilla y León) luciano.municio@gmail.com*

The present paper shows the project *Development of a Management System for the protection, enhancement and dissemination of Prehistoric Rock Art and Stations (SIGAREP I and II)* which has advanced the promotion, protection and dissemination of cultural heritage and archaeological sites comprising stations rock art in the mountains of Central System in the provinces of Madrid, Guadalajara, Segovia and Avila. This art, due to its characteristics is not easy to guard or be displayed in museums, through the implementation of a common transverse project for the institutions belonging to different Autonomous Communities. The scope was promoting the use of new information technology systems and the most innovative 3D documentation systems of the heritage for preventive conservation that contribute to the maintenance and recovery of this art so difficult to guard. Later through the use of new information technologies it should be available to museum visitors.

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ORAL

## 6. THE CAVE OF FUENTE DEL TRUCHO (ASQUE-COLUNGO): THE GEOMETRIC DOCUMENTATION 2005-2014

*Angas, Jorge - (3D Scanner Patrimonio e Industria, Spin-off University of Zaragoza. Group "Primeros Pobladores del Valle del Ebro" Area of Prehistory, Dpt. Sciences of Antiquity. University of Zaragoza.) j.angas@3dscanner.es*

*Bea, Manuel - (PostDoc Researcher "Torres Quevedo", 3D Scanner Patrimonio e Industria, Spin-off University of Zaragoza & MINECO. Group "Primeros Pobladores del Valle del Ebro" Area of Prehistory, Dpt. Sciences of Antiquity. University of Zaragoza.) manubea@unizar.es*

*Utrilla, Pilar - (Area of Prehistory, Dpt. Sciences of Antiquity. University of Zaragoza. Group "Primeros Pobladores del Valle del Ebro.") utrilla@unizar.es*

*Baldellou, Vicente - (General Direction of Cultural Heritage. Government of Aragon. Group "Primeros Pobladores del Valle del Ebro.") vbaldellou@aragon.es*

During the last few years, new techniques for surveying applied to Rock Art have been developed. Nowadays the apparent rate of development of technology, together with social immediacy, often does not allow the establishment of an entire process of technologies and procedures necessary in all types of archaeological documentation projects. Deciding how to focus the latest survey techniques applied to archaeological sites, aimed at a didactic application, is a complex process. The development of this purpose must balance the research process with the social spreading of scientific knowledge.

We present a proposal of a geometric documentation methodology to apply in Palaeolithic caves. The experience carried out in the cave of Fuente del Trucho (Asque-Colungo, Huesca), from 2005 to 2014, has allowed us to outline a systematic and accurate registry for the physical reality of the cave. The application of different geometric documentation systems (laser scanner, structured light scanning, microphotogrammetry) makes it possible to obtain three-dimensional models at different scales as well as ortho-rectified and point clouds of high density for certain areas.

Combining different methodologies, for a global geometric documentation of the cave and on selected reduced surfaces, we have as a result a high density and high resolution point cloud to rebuild the tri-dimensional panels for the study, those that, for conservation reasons, must be analysed in greater depth.

All the techniques mentioned allow us to obtain a tri-dimensional mesh from which it is possible to incorporate measurements based on the point clouds by extracting the 2D and 3D characteristics to be measured. Comparison between point clouds of the same area captured at different times will give us the necessary data to have a better comprehension of the diachronic behaviour of the wall and rock art motifs and, with them, to determine and orientate the best manner of conservation.

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ORAL

## 7. NEW CARTOGRAPHY AND MICRO-CARTOGRAPHY OF CAVE OF ALTAMIRA

*Bayarri Cayón, Vicente - (GIM Geomatics, S.L.) vicente.bayarri@gim-geomatics.com*

*Latova, José - (ASF Imagen, S.L.) latova@asfimagen.es*

*Lasheras, José Antonio - (Museo Nacional y Centro de Investigación de Altamira) Investigacion.maltamira@mecd.es*

*De Las Heras, Carmen - (Museo Nacional y Centro de Investigación de Altamira) Investigacion.maltamira@mecd.es*

*Prada, Alfredo - (Museo Nacional y Centro de Investigación de Altamira) Investigacion.maltamira@mecd.es*

Cave of Altamira is located in Santillana del Mar, in northern Spain. It is one of the most prominent examples of human symbolic creation and is recognized as one of the landmarks of the World Prehistory. Therefore, the Cave of Altamira is included in the World Heritage List since 1985.

The cave of Altamira has different maps, made over time and since its discovery in 1879, and that have evolved together to the development of geomatics techniques. Since the first sketch freehand which was published in newspaper *El Impulsor* in 1880, plane of Harlé in 1881 until 1942 maps made by Francisco Fernández Montes, FOESTRA series in 1975, cartography of *Instituto Geográfico Nacional* between 1998 and 2002, and many others. Such maps often do not match due to the unreliability of the methods used and the complexity of the cavity. They have served instead as a fundamental tool for different preservation art studios of the cave and tourist use.

The importance historically given to cartography within the caving and the study of prehistory is that any subsequent study after discovery of a cavity requires a plane on which to base it. Hence surveying is one of the first tasks performed and it is essential to provide support to different multidisciplinary information from other sciences.

The new data capture techniques allow resolution and detail information ranging from the centimeter to micron. Traditional maps and planes have evolved to 3D mapping, from which implicit information can be derived such as heights of gallery and thickness of the roof maps usually very difficult to represent. This model can be used for climate simulations and calculations of all kinds to become the base map or essential support of multiple data enabling the creation of a GIS. Nowadays it is also possible to document painting and engraving or

microbiological monitoring processes with a reliability of microns.

This article shows the process followed for the new cartography of Cave of Altamira by generating comprehensive 3D documentation using different techniques, both Cave of Altamira and its external environment, with reliability from several millimetres to micron depending on the different elements represented.

The presentation will compare the new cartography with other historical surveys and the new values that can be drawn from the model as the surface area and volume of the rooms, geological setting, etc.

Also it will be analyzed using the new cartography, measured facts from previous studies and possible lines of future work to exploit the potential of the new data.

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ORAL

## 8. NEW DOCUMENTATION AND ART STUDY IN THE WALLS ROOM AND RED SMALL ROOM OF THE CAVE OF ALTAMIRA

*Bayarri Cayón, Vicente - (GIM Geomatics, S.L.) vicente.bayarri@gim-geomatics.com*

*Latova, José - (ASF Imagen, S.L.) latova@asfimagen.es*

*Lasheras, José Antonio - (Museo Nacional y Centro de Investigación de Altamira) Investigacion.maltamira@mecd.es*

*De Las Heras, Carmen - (Museo Nacional y Centro de Investigación de Altamira) Investigacion.maltamira@mecd.es*

*Prada, Alfredo - (Museo Nacional y Centro de Investigación de Altamira) Investigacion.maltamira@mecd.es*

The Cave of Altamira Cave is located in Santillana del Mar, in northern Spain. It is one of the most representative examples of Paleolithic art and is a reference in the history of art.

It was the first cave in which was described what we now call rock-art and therefore the origin of other discoveries of this kind of expression of man. It constitutes one of the most prominent examples of human symbolic creation and is recognized as one of the landmarks of World Prehistory. Therefore, the Altamira Cave is included in the World Heritage List since 1985.

The study of its rock-art is still partial and presents some obsolescence in part based on an unequal iconographic documentation. The study of art has focused on the famous Hall of Polychrome, vast canvas on which



the artists painted and recorded for over 20,000 years. However, Altamira has a lot of artistic performances spread along its 270 meters long, that have not been studied in detail and, in many cases, not published. The conservation of the Cave of Altamira and its artistic representations requires a comprehensive inventory and technical documentation and knowledge according to what we have available today for these representations.

Therefore we have initiated a project to revise and update the catalog of cave art. The development of the method and protocols work is being developed on panels of called *Sala III*. This space was originally part of a continuous area which integrated Polychrome room and that extended to the entrance of the cave. Here are located several artistic ensembles of various technical characteristics.

In this study, it was analyzed a panel painted in black with representations on the vertical wall and series of signs painted in red within a narrow chamber formed in a diaclast.

This article shows the results obtained by applying the latest documentation methods based in photogrammetry and terrestrial multispectral remote sensing along with the mathematical analysis of different digital files which provide new documentation of parietal art sets. We will also introduce a historical analysis comparing the different ways in which have been documented and represented these sets to try to understand the evolution that over time has suffered its understanding and see how the evolution of the different methods of representation has made vary our understanding of these signs and figurative representations. Things are as we represent them.

The integration of some geomatics methods permit to document rock-art in a rigorous, safe and detailed way. These techniques offer 2D and 3D results that can be used in any study. The new amount of information can change the way to understand them.

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ORAL

**9. LA LLUERA I CAVE (SAN JUAN DE PRIORIO, OVIEDO, ASTURIAS, SPAIN): ART AND GIS OF THE MORE FIGURATIVE AREAS OR "NICHE AREAS" OF A SANCTUARY.**

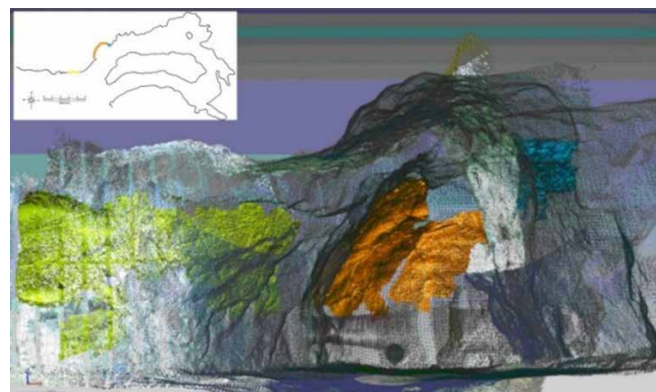
Rodríguez Asensio, José Adolfo - (Universidad de Oviedo)  
adolfo@uniovi.es

Aguilar Huergo, Eugenio - (Universidad de Oviedo)  
e.aguilar.0@hotmail.com

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Since the beginning of the rock art until today, the study of prehistoric art has been done with different tools (drawings, photos, tracings...). The study of the engravings in La Lluera I cave (San Juan de Priorio, Oviedo, Asturias, Spain) is a good example. Since its discovery in 1979, by the Polyphemus group for the study of his engravings have been done all kinds of photos, drawings and tracings. Thanks to these early studies, his engravings were framed as belonging to the Solutrean (Fortea Pérez, 1990). In 2008, we proceeded to the scanning of his engravings (4 areas: niche, bison's area, left entry and right entry). Today, everything can be integrated into the appropriate tool: GIS. The engravings are the peculiarity to destroy a portion of the surface rock leaving a hole made with an object or even by hand (Sanchidrián, 2001). This hollow drawn in 3D is the sketch. It is known as sketch to the delineation that is formed with the design or plant of anything.

3D scanning engravings - Lluera I cave. Yellow: entry's horse, orange: niche and blue: bison's area.



The present study focuses on the more figurative areas or "zones niche" the cave of Lluera I: the niche (379 sketches), the entry's horse (22 sketches) and the bison's area (111 sketches). Thanks to this study is achieved:

- The representation of every sketch or engraving in 3D. Which allows us to: observe and take information of its Length, Width, Depth; if it is made: in V, in U, etc.
- Encode all the information of each sketch and artistic manifestation: measures, direction taken by the artist in making each sketch, etc.
- Create a catalog of the artistic manifestations of these three areas.
- Create all kinds of analysis and consultations, and view them immediately in 3D. The realization of the same in the three areas leads us to a working hypothesis: Is pos-

sible, good starting from planning or from the margin of improvisation that in every work of art is, the artist used sketches in dry skin as a visual support by making them? A thing is clear: it is not any hand that engraved, and much has drawn on dry skin and in the full light of day before making these three areas.

Catalogue of figures: the niche. Scale: 30 cm



The creation of a 3D GIS of the sketches has been, thanks to the technical advantages posed by GIS, a revision to the art of these three areas, and a face wink to the future: GIS, thanks to augmented reality and interactivity, may be the best didactic support for a virtual visit.

Elaboration's phases: the niche. Phase 1- Red. Phase 2- Blue. Phase 3- Green. Phase 4- Purple. Phase 5- Orange. Phase 6- Black. Phase-7 Brown. Without phase- Yellow. Scale: 30 cm.



ORAL

## 10. PHOTOGRAMMETRY AND PCA APPLIED TO THE TRACING OF ROCK-ART PAINTINGS. A CASE STUDY FROM THE PRECORDILLERA REGION (NORTHERN CHILE).

Cerrillo Cuenca, Enrique - (CSIC, Instituto de Arqueología)

*enrique.cerrillo@csic.es*

*Sepúlveda Retamal, Marcela - (Universidad de Tarapacá)*

*marcelaasre@gmail.com*

*Ortiz Coder, Pedro - (E-Capture) pedro@ecapture.es*

In the present paper we introduce a computer-aided method for recording rock-art paintings through digital photographs. The aims of the method can be summarised in two: the creation of high-resolution ortho-images and the digital detection of pigments in them.

We present a first advance to an on-going work focused on the digital analysis of rock-art paintings from the precordillera region (Northern Chile). The case illustrated is Mullipungo 1, one of the sites excavated by Schiapacasse and Niemeyer (1996) in the 1980 decade. At that time, they identified 6 panels with depictions of dynamics camelids, anthropomorphic representations and geometric motives. The preservation of paintings is currently poor and its recording is greatly hampered. Comparative approach and stylistic analysis regarding to other sites are complex.

Photogrammetry is becoming the standard for archaeological documentation tasks, and is especially advantageous in the case of rock art. We have obtained a 3D model and high-resolution ortho-images from the panels by using 4e software, a powerful and precise solution for photogrammetric restitution.

Complementarily, we have developed an experimental software platform called PyDRA for improving the recognition and documentation of paintings through photograph that allows a fast and efficient processing of data. The resultant ortho-images are transformed into three matrices (one per image channel) and statistically analysed. Among the several methods that PyDRA implements, we have selected the Principal Components Analysis (PCA). This method projects the matrices from the original image into a new space, whose representation usually splits in different channels the information about pigments and the background.

The application of photogrammetric techniques to the site of Mullipungo 1 has served to produce a new tracing of the site, in a totally digital way. More than 200 images were used for the photogrammetric restitution, whereas the general ortho-image of the site was divided in 6 images for a faster and efficient analysis. Once processed by PyDRA, the statistics showed a high correlation between the RGB bands and how the depicted motifs were clearly visible when transforming into images the 2<sup>nd</sup> and 3<sup>rd</sup> components (matrices).

Several authors have described or designed different procedures for simplifying the documentation and digital tracings of rock-art paintings. As it can be stated, the choice of the software used for the digital processing can play a noteworthy role when presenting the final results. The use of our own software allows a more accurate choice of the parameters requested during both photogrammetric restitution and analytical processes, as the high resolution and precision of the 3D model and the enhancement of pigments can show.

Different kinds of improvements can be outlined on the newly obtained tracings from Mullipungo 1: 1) the recording of new figures; 2) additional details of some depictions; and, 3) more information about the use of the rock surface. The proposed methodology decreases the time spent during the fieldwork, as well as the equipment used, which is especially important when working in a mountainous region, as the precordillera is.

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#### ORAL

### 11. REMEDIATION IN PREHISTORIC PAINTED CAVES; CONCEPTS AND PRACTICES FROM FRENCH SITES.

*Bourges, François - (GEConseil, 30 rue de la République, 09200 St Giron, France) fbourges@wanadoo.fr*

*Genthon, Pierre - (IRD/HSM, Univ. Montpellier II, Case MSE, 34095 Montpellier, France) pierre.genthon@ird.fr*

*Genty, Dominique - (LSCE, UMR CEA/CNRS 8212, L'Orme des Merisiers CEA Saclay, 91191 Gif/Yvette cedex, France) dominique.genty@lsce.ipsl.fr*

*Lorblanchet, Michel - (Directeur de recherche honoraire au CNRS, Saint-Sozy, 46200 France) michel.lorblanchet@wanadoo.fr*

*Mauduit, Éric - (Service Régional de l'Archéologie, Direction Régionale des Affaires Culturelles de Midi-Pyrénées 32, rue de la Dalbade, 31080 Toulouse, France) eric.mauduit@culture.gouv.fr*

*D'Hulst, Dominique - (GEConseil, 30 rue de la République, 09200 St Giron, France) dominique.dhulst@free.fr*

During the last 150 years, many prehistoric decorated caves suffered from growing touristic exploitation and invasive archeological operations. This resulted in irreversible destructions and in uncontrolled degradations of the remains, associated with permanent or temporary destabilization of cave microclimates. We propose remediation strategies able to restore satisfactory conservation properties in these sites.

Multisite, multiparametric monitoring in cave and at the surface provides information on karst dynamics and cave microclimates. These data are compared with in situ observations of the evolution of the remains and of their rock support. The identification of multiple buffering mechanisms responsible of stable condition in karstic caves and former work in Chauvet cave led to define underground confined state, which possesses optimal conservation properties.

In le Mas d'Azil and Marsoulas caves, exchanges conditions with outside had been dramatically changed by modifications of the entrance and even internal geometry of the cave, resulting in open microclimatic conditions expanding to most of the decorated zones. Restoration of confined zones in le Mas d'Azil reduced the thermal impacts due to visits and to the outside climate influence, preventing condensation on parts of the decorated walls. Further improvements are needed in this site. In Marsoulas, remediation is expected in the future with a double door structure whose buffering properties will mimic those of the initial scree removed by archeologists in 1931. In Pech Merle tourist cave, recurrent painting fading was related to natural seasonal drying of walls. Comparing microclimate studies achieved 30 yrs ago and present ones lasting since 1998, allows to assess the effects of improvement of the cave closure system which restored a confined state insuring a permanent stable and optimal visibility of the paintings. In Gargas, starting from a completely open state with documented degradations, optimization of the closure and of the lightning system as well of the number of visits, allowed to reach gradually a semi-confined state that improved the conservation properties of the cave.

Remediation operations in decorated caves have to be based on the identification of regulation processes that should be re-established. A particularly important point is to refer to a realistic "initial state" of the cavity, which often has to be reconstructed from documents, archeology, geology, or geomorphology. Remediation consists of restoring progressively natural buffers or introducing new ones, and should be assessed by monitoring physical and chemical parameters of the cave atmosphere especially near archaeological remains.

ORAL

**12. MANAGING THE CLIMATE OF CAVES WITH  
ROCK-ART THROUGH COMPUTERIZED MODELING**

*Bayarri Cayón, Vicente - (Gim-Geomatics)*

*vicente.bayarri@gim-geomatics.com*

*Ontañón-Peredo, Roberto - (Museo de Prehistoria y Arqueología y Cuevas Prehistóricas de Cantabria) ontanon\_r@cantabria.es*

*Castillo, Elena - (Universidad de Cantabria) castille@unican.es*

One of the key aspects in the management of the caves with rock art is maintaining the balance -or, at least, "a" balance- in the environmental conditions of underground spaces. The reason for the conservation of this magnificent heritage from about 40,000 years ago to the present is the maintenance of a marked climatic stability fostered by the isolation, absolute or relative, of this subterranean environment.

The main purpose of this paper is to promote sustainability and conservation of the caves with rock-art, by increasing and improving the capacity of the managers of these sites through the design and implementation of a powerful analysis tool that allows us to base the decision making process on solid quantitative data, not on inferences more or less consistent derived from methodologically limited studies. In the framework of the project, the climate of the caves, the influence of the impact of human presence in the underground environment and possible changes in cave's management system are studied.

The methodological basis of the research is founded on numerical simulation in fluid mechanics. This relates to the study of the air flows, the energy and mass transfer and transport of particles, all phenomena involved in the configuration of each cavern climate (Lacanette et al. 2006, 2007; Malaurent et al. 2006).

The work program includes 3D scanning in order to have the models of the caves; location and geo-referencing of the sensor's network; determination of the conservation equations of the fluid environment and running of computerized simulations: Different hypothetical scenarios are being implemented, depending on the issues that arise for conservation and the specific requirements of each cave.

The paper describes the considerations to take into account and the results obtained when analyzing the configuration of the climate in the cave, the influence of cli-

mate configuration on the movement of air, the impact of human presence and the analysis of the attenuation of parameters altered by this presence.

POSTER SESSION

POSTER

**13. THE PHOTOGRAPHY APPLIED IN ARCHAEOLOGY - THE CASE OF COBRAGANÇA ROCK ART SITE**

*Joaquim, Flávio Nuno - . (Instituto Politécnico de Tomar, Estrada da Serra 2300 Tomar, Portugal; Instituto Terra e Memória) flavio.joaquim83@gmail.com*

*Garcês, Sara - (Universidade de Trás-os-Montes e Alto Douro - FCT PhD scholarship; Instituto Terra e Memória; Grupo de Quaternário e Pré-História do Centro de Geociências) sara-garcês.rockart@gmail.com*

*Borralheiro Pereira, Anabela - belaborralheiro@gmail.com (Museu de Arte Pré-Histórica e do Sagrado do Vale do Tejo, Mação, Portugal)*

Photography is a cross-discipline, which demands specific knowledge of words and things. It crosses from the surface of an image for semantic depth of the visual field (optical). Archaeology processes knowledge in the inverse way, from the depth to the surface by contact (the haptic). Both deal with the darkness in emergency and revelation, respectively, of the image and the layers.

In both the awareness of time and duration is a crucial dimension. These two processes of (re) construction of knowledge and reality are deficient. Together, they complement and potentiate each other. It would say that would constitute a third discipline that detects the material and immaterial dimensions of the environment, what surrounds us, it brings to mind the past time, who summons the memory trace as the union of continuity, the transmission of a heritage and cultural heritage.

The application of photography in archaeological work was once considered only as a descriptive technique for knowledge of the monument, with a highlight on its historical value. The photography used in a systematic way, as a support for cooperation of notes and observations made during excavation work, complement the visual perceptual information and aesthetics of archaeologists during the intervention process and study of the archaeological sites.

The work presented here is intended to illustrate the photographic methodological development in archae-

ology, with the highlight of the rock engravings from the Cobragança site located in Mação, Portugal.

These are two engraved quartz countertops with representations of concentric circles, squares, lines, rectangles, and that seems to suggest a zoomorphic figure. The history of this rock art site accompanies various times of the evolution of the use of photography in archaeology. It has been proved as indispensable technique in digital preservation thereof having regard to the engravings near-total destruction by the action of a forest fire a decade ago.

Illustration connects these two concepts of memory in different media: photography, the photographic record in its visual support in paper, and the rock engraving, permanent engraved in the rock, both documenting something of different perceptions and different meanings in different media, but both connect up to your visual concept.

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#### ORAL

### 14. ANALYSIS AND INTERPRETATION OF A PARIETAL REPRESENTATION USING ADVANCED CAPTURE AND DATA PROCESSING TECHNIQUES: THE ANTHROPOMORPHIC FIGURE FROM HORNOS DE LA PEÑA (CANTABRIA, SPAIN)

*Ontañón-Peredo, Roberto - (Museo de Prehistoria y Arqueología y Cuevas Prehistóricas de Cantabria) ontanon\_r@cantabria.es*

*Bayarri Cayón, Vicente - (Gim-Geomatics) vicente.bayarri@gim-geomatics.com*

*Teira, Luis - (Instituto Internacional de Investigaciones Prehistóricas de Cantabria) teiral@unican.es*

The anthropomorphic figure from Hornos de la Peña is an engraving well known in the Paleolithic cave art of the Cantabrian region. Since its first publication in the early twentieth century has been the subject of several studies that have provided different lectures of the motif involving various interpretations of its relation to other traits present in the same parietal panel.

In an attempt to clarify the reading of this representation, we have chosen to apply innovative technologies for capturing and processing geometric data in order to quantify the operational process, so that the graphic result is a product methodologically verifiable by other observers, and therefore, rigorous in the sense of the scientific procedure.

The circumstances of location of the parietal sector in which the subject is situated complicate its study because of the limitations of the available space. Therefore we chose the use of small size equipment such as the handheld laser scanner ZScanner 700. The reliability of the instrument, 50 µm, and resolution up to 100 µm in depth, make it perfectly useful for scanning engravings. The data were processed using algorithms based on primitive search, adjusting different levels of smoothness, strength, tolerance and curvature of the generated 3D grid. The combined analysis of the results allows us to set thresholds to discriminate statistically similar traits that can be isolated to facilitate the reading and interpretation of the engraving.

The application of this method allowed us to discriminate "families" of traits corresponding to the anthropomorphic figure from other immediate matching other causes (including natural cracks), which had been subject to diverse interpretations by different researchers. In our view, the key interest of this work lies in the presentation of a method that is reproducible by other researchers or by ourselves on successive graphic evidences, within the logic of a scientific procedure, which allow us to quantify the subjective choices implicit in that process.

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#### ORAL

### 15. TRACKING BIODETERIORATION PROCESSES BY PHOTOGRAMMETRIC METHODS

*Bayarri Cayón, Vicente - (Gim-Geomatics) vicente.bayarri@gim-geomatics.com*

*Ontañón-Peredo, Roberto - (Museo de Prehistoria y Arqueología y Cuevas Prehistóricas de Cantabria) ontanon\_r@cantabria.es*

*Castillo, Elena - (Universidad de Cantabria) castille@unican.es*

Microbial colonization is one of the main problems in the conservation of prehistoric art. Key factors in the conservation studies are the identification and quantification of microbial populations in caves and the assessment of their interaction with substrata and infiltration water. Geomicrobiological studies reveal that the growth of microbial communities is associated to the partial or total destruction of substratum surface (host rock, speleothems, pigments) as well as to the development of chemical precipitates by microbial activity.

Different methods have been applied by cave research

groups during the last years, varying from visual inspection to photographic coverage and, more recently, models from 3D laser scanner or photogrammetric cameras. The main objective of this project is to get a reliable, accurate and straightforward tool allowing the collection and processing of quantitative data to monitor visual impacts of microbiological communities.

The procedure begins with data acquisition, in form of pairs of images of very high resolution on the study areas. The photogrammetric support is carried out by 3D laser scanner, for georeferencing and increase reliability over other traditional methods such as range finders. Equivalent pixel size can vary, being able to get up to 3.5 microns for details in areas where required. The second step is processing the data to create 3D models comparable among them over time and thereby control the 2D and 3D evolution of the observed biodeterioration processes. Thirdly, in the phase of data analysis a double study of the models is performed: (a) 2D analysis, to determine the variation in length and control surface changes and (b) 3D analysis, to define the volumetric variation or height growth of colonies of bacteria, fungi, algae or other existing item.

This new method intends to be a most optimized technique for recording, as well as for monitoring over time, the visible microbiological or mineral recoveries commonly found on the walls of caves that may have an impact on the appearance of parietal works.

The potential advantages of this method compared with conventional studies performed using photographic scans, are: Collection and management of quantitative data, not semi-quantitative or qualitative; manageable protocol for data collection into the caves; micron accuracies; analysis of the evolution of the microbe colonies not only in surface but also in volume.

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ORAL

## 16. DISCRIMINATION OF PIGMENTS IN DIFFERENT ROCK FACES THROUGH THEIR SPECTRAL SIGNATURE

*Bayarri Cayón, Vicente - (GIM Geomatics, S.L.) vicente.bayarri@gim-geomatics.com*

*Castillo López, Elena - (Universidad de Cantabria) castille@unican.es*

*Ontañón-Peredo, Roberto - (Museo de Prehistoria y Arqueología y Cuevas Prehistóricas de Cantabria) ontanon\_r@cantabria.es*

Spectral signatures are the specific combination of emitted, reflected or absorbed electromagnetic radiation at varying wavelengths which can uniquely identify an object.

The spectral signature of an object is a function of the incidental electromagnetic radiation wavelength and material interaction with that section of the electromagnetic spectrum.

Different pigments used in rock-art have different spectral signatures. Calibrating spectral signatures under specific illumination collected are needed in order to apply an empirical correction digital images.

The objective of the tests is to distinguish various pigments used in such paintings as well as the possible prints using an Analytical Spectral Device-Full Resolution Spectrometer (ASD-FR). The ASD-FR covers the region between 350 and the 2500 nm; from the invisible to the near infrared.

Most remote sensing applications process digital images to extract spectral signatures at each pixel and use them to divide the image in groups of similar pixels using different approaches. They try to assign a class to each group by comparing with known spectral signatures. Correct matching of spectral signature recorded by image pixel with spectral signature of existing elements leads to accurate classification in remote sensing.

The article shows the spectral signatures both in open-air and in a cave, since the sampling was made in the Shelter of El Cubular and the Cave of Cudón.

It is possible to distinguish pigments based on the spectral signature to later derive more accurate classification maps.

Collect spectral signatures is important since it makes possible to identify different substances, pigments or classes and separate them by their spectral signatures.

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POSTER

## 17. DECORRELATION STRETCH AND POLYNOMIAL TEXTURE MAPPING - TWO METHODS FOR THE DOCUMENTATION, CONSERVATION AND THE ANALYSIS OF MOBILE ART. EXAMPLES FROM BAVARIA AND BURGUNDY.

*Nadine, Huber - (Universität Tübingen) nadine.huber@student.uni-tuebingen.de*

*Christian, Hoyer - (Universität Tübingen) christian.hoyer@uni-tuebingen.de*

*Harald, Floss - (Universität Tübingen) harald.floss@uni-tuebingen.de*

As part of recent research, regarding decorated objects from the Klausenhöhlen in the Altmühl valley, Bavaria and Solutré, Burgundy, two new methods were used to document and analyze objects bearing traces of pigment or engravings, which were poorly or not published yet.

Decorrelation stretch is a method, which was developed as a tool for aerial photography and, later, the digital improvement of pictograms, but works with all kinds of faded colorants and in all scales of photography. With this method, the painted limestone slabs and pebbles from the old excavations in the Klausenhöhlen Magdalenian were examined to enhance the contrast of partially faded rows of points of red pigment. The advantage of this method is, to deliver precise outlines of pigmented zones, even if they are hard to define with the naked eye. For one of the pieces, we were able to verify the shape of the point rows as they were visible in the 1960ies, when they were drawn for the last time, and faded out strongly over the years. All features considered, this method is not only interesting for documentation and analyzing issues, but also appropriate for the conservation of paintings in a poor condition.

The second method presented, is polynomial texture mapping (PTM). This method, as well as the closely related reflectance transformation imaging (RTI), allows to combine a bulk of photographs from a single object, illuminated from different light directions. As a result, a digital model is created, which enables a virtual review of the object under varying light conditions. PTM or RTI photography can easily be used for the documentation of archaeological objects of most different kinds, for example stone artefacts or engraved objects. For simulating different light conditions, the method is predestined to visualize very fine structures on objects like negatives on stone tools or very fine engraved lines on bone, ivory or limestone.

The method was used by the authors to document a larger amount of decorated objects from Solutré, in very short time, one of the advantages of this kind of documentation is, that objects are accessible for research very comfortably by a computer, when direct access to the original finds is not possible for any reasons.

Summarized decorrelation stretch and PTM or RTI represent two different tools for the documentation, con-

servation and analysis of a wide range of archaeological objects. Both are easy to learn and apply and in the low budget sector compared with many other computer-aided techniques.

# A11d Styles, techniques and graphic expression in rock art

Commission on Prehistoric art

(Organisers: A Marc Groenen, Marie-Christine Groenen)

Thursday 4th (9:00 to 13:30 14:30 to 19:30)  
Meeting Room B08



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ORAL CONTRIBUTIONS

ORAL

**1. CROSSING ICONOGRAPHIC TRAJECTORIES BETWEEN LE ROC-AUX-SORCIERS (ANGLES-SUR-L'ANGLIN, VIENNE) AND LA MARCHE (LUSSAC-LES-CHÂTEAUX,VIENNE): FROM NORM TO IDENTITY CLAIM THROUGH THE TREATMENT OF HUMAN DEPICTIONS.**

*Fuentes, Oscar - (Université Paris I Panthéon Sorbonne - UMR ArScAn 7041 Ethnologie Préhistorique) oscar.fuentes@roc-aux-sorciers.com*

The formal, technical and stylistic study of the art in the Magdalenian sites of Le Roc-aux-Sorciers (Angles-sur-l'Anglin) and La Marche (Lussac-les-Châteaux) unites these two sites of the Eastern Vienne. When this is associated with the study of material culture, it becomes clear that, within a limited territory, the Magdalenian populations shared the same cultural traditions, the same norms. These graphic norms, which were fluid and changing, are established in accordance with the mechanisms of difference and make it possible to tackle the social dynamic of the decorated sites. The numerous human depictions in a realistic style pose the problem of the claim to identity within these social norms. The analysis of these images thus refers us to the construction of these identities during the Magdalenian.

ORAL

**2. ROCK ART AND LANDSCAPE OF ERONGO REGION, NAMIBIA.**

*Nankela, Alma Mekondjo - (University of Trás-os-Montes e Alto Douro- Quinta de Prados, Vila Real, Portugal) amnan-kela@gmail.com/ahamulo@gmail.com*

The Erongo region in western Namibia is a well-established area having one of the largest concentrations and accumulations of prehistoric rock art sites in Southern Africa with principal sites from the Brandberg, Erongo Complex and the Spitzkoppe Mountains in Erongo Region, Namibia. There is, however, a distinctive regional variability for the placement of rock art in this region and such variability is largely driven by physical (geology), social, religious and cultural settings of the region. The content of the rock art varies within the region as well, but there are several themes that are sufficiently widespread

to indicate broad, high-level geographical and temporal continuity within the Southern African hunter-gatherer, herder, and agriculturist belief systems over the period in which rock art were created.

In this paper, I wish to present the rock art of Erongo Region in relation to the elements of landscapes with practical examples from the Brandberg, Spitzkoppe and Erongo Mountains in Erongo Region, Namibia looking at the typology of the figures, traditions, techniques, style, graphic expressions, the relationship between rock art and landscape and their variability. Furthermore, we will explore how hunter-gatherer and herders activities and symbols on the landscapes where form of cultural impressions through manipulation of the surrounding natural environment. This relationship is based on an acute observation and perception of the environment which is part of an integrative cognitive whole. Thus, the spatial distribution in the context of interpretation of rock art is also reflected in the location of mythic events, cosmological structures, wisdom teachings and ritual symbolism within the specific landscape.

This investigation might inform us of the possible reasons behind the placement of the art in the landscape and whether there is a link between the natural world and the rock art to indicates decisions about what was to be incorporated in rock art. The case study approach will be used to understand my research findings within the global landscape of rock art research.

ORAL

**3. NORM AND INDIVIDUALITY IN ROC-AUX-SORCIERS ROCK ART (VIENNE, FRANCE): DEALING WITH THE « HANDS » IN THE ANIMAL BAS-RELIEFS.**

*Bourdier, Camille - (Université Toulouse 2 Le Mirail - UMR TRACES 5608) ca.bourdier@laposte.net*

*Pinçon, Geneviève - (Ministère de la Culture et de la Communication (France) - UMR TRACES 5608) genevieve.pincon@culture.gouv.fr*

Occupied several times during the Middle Magdalenian (18 000-16 000 cal. BP), Roc-aux-Sorciers rock shelter (Vienne, France) is also characterized by a rich rock art, combining bas-reliefs, paintings and engravings that associate geometric patterns and depictions of animals and humans. The stylistic analysis of the animal bas-reliefs reveals the strong homogeneity of the graphical codes together with subtle variations of some anatomical elements. For two successive sets of bas-reliefs have been

identified, part of this formal variability could result from the slight evolution of the codes during the occupation of the site. However, in both sets of bas-reliefs, each animal shows specific formal attributes (ears, nostrils) which then could illustrate the creativity of the author(s). Thus this stylistic analysis questions the respective shares of the individual expression and of the collective norms in the Middle Magdalenian rock art iconography. It also gives the opportunity to discuss our capacity to identify authors or "hands" through formal criteria.

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ORAL

#### **4. PRIMITIVE ENGRAVINGS IN THE MEGALITHIC COMPLEX OF MEZORA (ARCILA, MOROCCO)**

*Gozalbes Garcia, Helena - (Universidad de Granada), Enrique Gozalbes Cravioto (Universidad de Castilla-La Mancha) helenagoga@hotmail.com*

In 1829, during his visit to the megalithic monument Mezora, the British traveler Sir Arthur de Capell Brooke identified several engravings which, due to its characteristics, he considered as parts of a gateway in the circle. Nearly half a century later, Ch Tissot failed to identify the motifs, although he managed to recognize the hypothetical gate. Since then these aspects are lost in the historical-archaeological researches, which mostly pointed out that they had not found the engravings.

Mezora megaliths. Study of the surface of the megaliths, detecting antique engravings.

During the course of an investigation conducted in 2013 we have identified several of the antique prints, the ones which coincide with those mentioned by Capell Brooke, and we have also located the area of the mentioned door, which had to be modified by the moving of some of the monoliths (probably during the diggings developed in 1932-1936). Presence of engravings in certain megaliths of the Mezora Circle.

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ORAL

#### **5. STYLISTIC REPRESENTATION AND DISFIGUREMENT OF HUMAN FIGURES ON ROCK WALL: SOCIAL IDEOLOGIES AT STAKE.**

*Vialou, Denis - (Muséum national d'Histoire naturelle, Paris) dviaiou@mnhn.fr*

The common designations of the human prehistoric representations, like "realistic", "naturalistic", "schematic" ..., do not really reveal their own particular stylistic status in relation to animal representations. For the human representations, the styles express an ideological feeling of the societies which produce them.

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ORAL

#### **6. GROTTA SCRITTA, AN EXAMPLE OF MEDITERRANEAN PREHISTORIC ART EXPRESSION.**

*Marchetti, Marie-Laure - (Service des Patrimoines, Archéologie, Direction de la Culture et du Patrimoine, Ajaccio) Marie-Laurence.Marchetti@ct-corse.fr*

The Grotta Scritta site contains the only known prehistoric cave paintings discovered to date on the Corsican territory and demonstrate the symbolic thought of this period. These paintings belong to the Iberian Peninsula artistic current called "schematic art". They show evidence of more or less stylized anthropomorphic and anthropozoomorphic, secondary or additional signs (dots and dashes) and geometric patterns very schematic representations. One of the remarkable facts is the organization of paintings on the walls, exploiting significant microtopography. Its date is determined by comparison with similar sites of the Mediterranean area in Provence, Spain and Sardinia between the late third and early second millennium BC (Late Neolithic - Early Bronze Age), for the very first representations and may extend to the 2<sup>d</sup> Iron Age. Grotta Scritta is part of a geographical context including prehistoric areas like Nebbiu and Agriate, both rich of burial and worship sites, often with megalithic expression (statues, tombs) as the site of Monte Revincu.

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ORAL

#### **7. FROM INDIVIDUAL STYLE TO COLLECTIVE STYLE. TENTATIVE APPLICATION TO PALAEOOLITHIC CAVE ART.**

*Groenen, Marc (Université Libre de Bruxelles), Didier Martens - dmartens@ulb.ac.be (Université Libre de Bruxelles) - mgroenen@ulb.ac.be*

The practice that consists in determining the date of art works and the place of their production based on a corpus of references firmly anchored in time and space has gained recognition. Of course, such frame of reference does exist for Palaeolithic cave art. Nevertheless, it seems

possible to isolate some stylistic characteristics particular to certain groups, in certain geographical areas, and to determine, within this set of common characteristics, individual ways of doing. This is the course of analysis that we would like to test, by trying to shed some light on the figurative material of the Cantabrian caves of La Pasiega and Covalanas, and of the Perigord sites of Lascaux, Les Combarelles and Rouffignac, with the help of notions such as individual and collective styles.

ORAL

## 8. LE PILIER SCULPTÉ DE LA GROTTE D'ISTURITZ : SYNTHÈSE PLASTIQUE DES IMAGES ANIMALES

*Labarge, Aude - (Aulame - Espace Culturel Isturitz oxocelhaya) aulame@free.fr*

En 1913, le pilier sculpté de la grande salle d'Isturitz est découvert par E. Passemard. Il identifie un potentiel d'une quinzaine d'animaux figurés. Tout au long du XX<sup>e</sup> siècle, les chercheurs ont observé le pilier, infirmant ou confirmant le bestiaire présentés par les chercheurs précédents, jusqu'à la relecture exhaustive du pilier en 2013.

Le pilier sculpté a fait l'objet d'une étude technique, stylistique et plastique. Afin de réaliser l'étude plastique, plus de 200 croquis préparatoires d'analyse ont été effectués, traitant de tous les faits plastiques fondamentaux liés à cinq catégories de traitement plastique : forme, couleur, valeur, matière, composition.

Chaque figuration a été étudiée pour elle-même et mises en comparaison avec la variété des figurations du pilier.

La démarche plastique contribue à une meilleure observation des figurations, notamment sur le plan artistique : les jeux d'illusions optiques, d'anamorphose, des étapes d'élaboration des formes figurées, des reprises et corrections de formes... mais surtout l'étude plastique met en valeur la complexité de la figuration et permet de reconnaître la codification du langage artistique.

Le bestiaire du pilier central de la grande salle d'Isturitz est varié et riche : il comprend près d'une quinzaine de figurations, dont certaines ont été effacées et réexploitées. La plasticité du pilier est complexe et offre tous les savoir-faire fondamentaux artistiques : anamorphoses, narration, ébauche, réexploitation de forme, jeux de volumes variés...

Cette analyse a permis de mettre en valeur le langage plastique, codifié et savamment exploité durant le Magdalénien moyen.

ORAL

## 9. COMPARATIVE STUDY OF THE VALIDITY AND RELIABILITY OF THE MACROSCOPIC

*Apellániz, Juan María - (Universidad de Deusto) juanmaria@apellaniz.biz*

*Amayra, Imanol - (Universidad de Deusto) uanmaria@apellaniz.biz*

**Introduction:** We present a method tested with experimental figures that demonstrates reliability in the attribution of drawings and engravings. This involves comparing the hit rate between the visual inspection method and two methods based on geometric analysis of the shapes of drawings and engravings. The results indicate the usefulness of the application of the geometric/microscopic method in prehistoric figures.

**Material and methods:** Research analyses the predictive value of two main variables: shape and stroke. In the study of shape, two methodologies are compared: a macroscopic attribution of 40 figures made by students and experts versus a geometric analysis of 134 experimental figures and 70 Palaeolithic figures. These last ones are measured with **the 20 variable method** which factorizes contours from the points of maximum negative curvature, minimal positive curvature and inflection into five anatomical parts: neck, trunk, length, internal hindquarter and external hindquarter. In the study of stroke, geometry from the variables width, length and angulation in the grooves of 60 engraved figures and in the width of the stroke of 39 painted figures are analysed microscopically. The following statistical techniques were applied in the aforementioned studies: frequencies, percentages, descriptive statistics, bivariate correlations, confusion matrix, exploratory multidimensional scaling, exploratory factorial analysis and discriminant analysis.

**Results:** Results obtained indicate a greater degree of validity and reliability of the microscopic /geometric method (70% in the experimental painted figures; 82.5% in the Palaeolithic painted figures; 74.28% in the Palaeolithic engraved figures; 78% in the experimental engraved figures) compared to the traditional macroscopic method (59% of the experimental painted figures).

**Conclusion:** It can be concluded that visual examination is more subject to perceptual errors of attribution than

the geometric/microscopic analysis, and that this last method is shown as a valid and reliable technique for the identification of the authorship. It demonstrates that there is an individual graphic formula each person expresses him or herself with consciously or unconsciously. Outline geometry of Ekain or Niaux figures, or from the grooves of the stroke of an engraved work, reflects this formula with a particular and unrepeatable organization.

ORAL

## 10. ARTISTES PALÉOLITHIQUES : AURIONS-NOUS PEUR DES MOTS ?

*Feruglio, Valérie - (equipe scientifique grotte Chauvet) feruglio@free.fr*

Il semble qu'aujourd'hui il soit de moins en moins possible de parler d'artistes pour qualifier les peintres, graveurs, sculpteurs qui ont investi certaines grottes d'Europe occidentale. Cet état de fait s'inscrit-il dans le «politiquement correct» à l'instar des paraphrases institutionnelles qui remplacent les substantifs trop précis qualifiant des handicaps ou des métiers considérés comme peu gratifiants ou ce refus du terme « artistes » réside-t-il dans le constat de la faiblesse de nos outils scientifiques pour le certifier ?

Si nous considérons ces producteurs d'images en tant qu'artistes, des champs d'analyse nouveaux s'ouvrent à nous. Au travers d'exemples pris dans des grottes ornées couvrant différentes cultures du Paléolithique supérieur telles que Chauvet, Cussac, Lascaux ou Les Trois-Frères, nous verrons comment les outils de l'histoire de l'art ou de l'esthétique peuvent nous faire envisager différemment ces expressions graphiques qui, outre les questions qu'elles nous posent, à tout le moins, nous émeuvent encore.

Envisager le travail qui consiste à faire ployer la matière et sélectionner les matériaux pour servir au mieux le message à véhiculer permet d'approcher l'individu, sa part de créativité de même que l'apprentissage qu'il intègre et reformule au fil du temps. Mais tout créateur s'inscrit dans une société en s'y confondant ou en s'en démarquant, qu'on lui impose les choses ou qu'il les déclenche ; conformiste ou novateur il traduit son environnement social. Les contraintes sociales marquent-elles ses limites ou lui permettent-elles de les transgresser ? L'environnement lui est-il favorable ou sent-t-il la nécessité de le transcender ?

Le changement de regard dans l'analyse des graphismes pariétaux tourné vers l'individu peut nous offrir les clés de lecture de sa société et de son environnement.

ORAL

## 11. CONTRIBUTION OF ELEMENTAL AND STRUCTURAL ANALYSIS TO THE INTERPRETATION OF PAINTED AND DRAWN COMPOSITIONS OF EL CASTILLO CAVE (CANTABRIA, SPAIN).

*Groenen, Marc - (Université Libre de Bruxelles) mgroenen@ulb.ac.be*

*Groenen, Marie-Christine*

*Gilles Wallaert - (Université Libre de Bruxelles, Materials engineering, characterization, synthesis and recycling) gwallaer@ulb.ac.be*

*Dille, Jean - (Université Libre de Bruxelles, Materials engineering, characterization, synthesis and recycling) jdille@ulb.ac.be*

*Segato, Tiriana - (Université Libre de Bruxelles, Materials engineering, characterization, synthesis and recycling) tsegato@ulb.ac.be*

*Delplancke, Marie-Paule - (Université Libre de Bruxelles, Materials engineering, characterization, synthesis and recycling) mpdelpla@ulb.ac.be*

At the present day, our census of the painted and drawn motifs of El Castillo cave reaches 1835. Up to now, no analysis of the pigments has been carried out. Such analysis may prove useful to bring closer the various rock art compositions of painted and drawn motifs.

46 samples of coloring materials were taken from the drawings and paintings as well as 6 samples from deposits of Cantabria. They were characterized by various methods. The morphology and elemental composition of the 46 samples were determined by scanning electron microscopy (SEM) coupled with EDX analysis. For the samples containing mineral compounds, a local characterization by transmission electron microscopy (TEM) coupled with EDX and electron diffraction was carried out. Finally, the previous results were confronted to those obtained by micro and macro X ray diffraction.

ORAL

**12. THE PLAQUETTE OF VILLALBA DE ALMAZAN IN THE INTERIOR PALEOLITHIC OF THE IBERIAN PENINSULA.**

*de Balbín Behrmann, Rodrigo - (Universidad de Alcalá, Departamento de Historia y Filosofía) babubera@movistar.es*  
*Baquedano Pérez, Enrique (Museo arqueológico regional de la Comunidad de Madrid) enrique.baquedano@madrid.org*  
*Alcolea González, José Javier (Universidad de Alcalá, Departamento de Historia y Filosofía) javier.alcolea@uah.es*  
*Fernández Moreno, José Javier (Museo arqueológico de Asturias) info@museoarqueologicodeasturias.com*

The Paleolithic art of the Interior of the Iberian Plateau is sparse in demonstrations, dispersed in their situation and poor in material relationships. This is not only because its reality, but also for the lack of focused studies. This failure is softened in recent years. One of the scarce known mobile manifestations is the plaquette of Almazan, published in 1988 and found again without material context. It is an isolated item with very good graphic quality, in which we intend to take full profit using the actual implements we have for study. We possess a 3d scanner and a complete photographic series, which will be useful for that effect. But we want also give a graphical, stylistic and chronological context linking their content with the near known sites in the plateau areas, like the Coa, its excavations, and all the elements that allow us to value completely this unique and fundamental Paleolithic graphy.

ORAL

**13. ANIMATION IN PALAEOLITHIC ART OR DO PALEOLITHIC ARTISTS DREAM OF ANIMATED ANIMALS?**

*Azéma, Marc - (Chercheur associé à l'UMR 5608 du CNRS, TRACES-UMR 5608 / CREAP, Toulouse-Le Mirail) marc.aze-ma@wanadoo.fr*

On the wall and the ground of caves, on the items of daily life, the Paleolithics sought to animate, literally "give life" to their artwork. Several processes and graphical conventions enabled to reproduce the movement of natural models taking account of the physical characteristics of different materials and the influence of external parameters (lighting in particular). The existence of an optical mechanism, like « thaumatrope », shows genius and intentions of artists of our Prehistory.

ORAL

**14. ANIMALS AND SIGNS, FROM REALISM TO ABSTRACTION AT THE END OF MAGDALENIAN. LA MAIRIE CAVE AND MÈGE SHELTER IN TEYJAT (DORDOGNE).**

*Paillet, Patrick - (Muséum national d'Histoire naturelle, Département de Préhistoire, UMR 7194) paillet@mnhn.fr*  
*Man-Estier, Elena - (Ministère de la Culture, Centre National de Préhistoire, UMR 5199-PACEA) man-estier@mnhn.fr*

The animals present in the parietal device of La Mairie cave, or on the mobile supports found in this cave or in the Mège shelter nearby constitute a well-known corpus with its realistic and conventional style as well as extraordinary formal qualities. This triumphing realism is what is remembered. Yet it has to be tempered if not challenged by the presence in the same parietal and portable corpus, perhaps even from the hand of the same artists, many schematic, geometric, almost abstract or in any case very original representations. Very few structured signs similar to the ones prehistorians usually like, but here, next to horses, bovines and classic deers, we find exceptional animals by their zoological origin (seals, swans, reptiles, etc.) and their expressive modality (schematic animals, seen from the front, etc.), fantastic beings and organized patterns whose inspiration we don't know but where the unmoving and living coexists at the same time. Henry Breuil saw in 1905 a "degeneration" of representations towards animal ornaments. The term is somewhat excessive and we do not believe that there is an alteration or regression in this graphic development process, and even less in its symbolical resonance.

Instead, it is for us an evolution in an inexorable artistic expression and reorganization, or an even more radical change, in the semantic content that accompanies the final moments of the Late Ice Age. These representations, with their specific typology and their close relationship with a more conventional art, are forcing us to investigate the symbolic thoughts of the last Magdalenians, at that specific time when deep environmental changes affect their world and society. This symbolic universe from which reality escapes gradually announces the close-by Azilian universe.

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ORAL

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**15. PIGMENTS AND PIGMENT MAPS. SOME NON-DESTRUCTIVE APPROACHES TO ESTABLISH RELATIVE CHRONOLOGY OF A SITE.**

*Solodeynikov, Alexey - (Arkus Heritage Preservation Center, Saint-Petersburg) solodey@mail.ru*

The report is dedicated to some digital techniques in painted rock art researching. Being based on composition of the known dyes I am looking for a non-destructive method to differentiate pigments, which had been made of dissimilar input materials, with particular prescription or other process conditions. This gives us an opportunity to separate paintings which were made by different masters in limits of the given site, which means that we obtain possibility to separate different chronological layers of the site. The job is made on Kapova cave materials.

# A11e Public images, private readings: multiperspective approaches to the post Palaeolithic rock art

Commission on Prehistoric art

(Organisers: Ramón Fábregas Valcarce, Carlos Rodríguez-Rellán)

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ORAL

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**1. 'GOING BY THE NUMBERS', A QUANTITATIVE APPROACH TO THE GALICIAN PREHISTORIC PETROGLYPHS**

Vázquez Martínez, Alia - (Departamento de Historia I. Facultade de Xeografía e Historia Universidade de Santiago de Compostela) [alia249@gmail.com](mailto:alia249@gmail.com)

Rodríguez Rellán, Carlos - (GEPN - Departamento de Historia I. Facultade de Xeografía e Historia Universidade de Santiago de Compostela) [crrellan@gmail.com](mailto:crrellan@gmail.com)

Fábregas Valcarce, Ramón - (GEPN - Departamento de Historia I. Facultade de Xeografía e Historia Universidade de Santiago de Compostela) [ramon.fabregas@usc.es](mailto:ramon.fabregas@usc.es)

Today, despite the notable progress on the knowledge about Galician's carvings, we still lack an updated census of these and, as a result, we do not have adequate information about the precise number or the geographical distribution of the main groups of motifs that make up this artistic phenomenon. In order to tackle this problem, we have gone through the Xunta de Galicia's Catalogue of the Archaeological Heritage, obtaining a database of 3361 petroglyphs.

By using both GIS and data management programs, we have drawn a series of maps and charts showing the iconographic variability of the panels, correlation patterns of motifs and the dispersion of those across Galician territory.

Preliminary observations confirm that coastal areas have the largest concentrations of carvings, in sharp contrast with the inland districts. On the other hand, geometric motifs tend to associate mostly among themselves, while zoomorphs often share the panel with geometric images. Metallic weapons such as daggers or hallebards have a marked tendency to appear on the same rock and less so with other kinds of motifs. Finally, petroglyphs of clear historical chronology –such as crosses, alphabetic forms, etc– are in clear dissociation with prehistoric carvings.

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ORAL

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**2. CVARN- ROCK ART VIRTUAL CORPUS OF THE NORTH-WESTERN PORTUGAL. A MULTIMEDIA TOOL TO INVESTIGATE AND DISCLOSE THE POS-PALAEOLITHIC ROCK ART**

Bettencourt, Ana M. S. - (University of Minho) [bettencourt.ana@gmail.com](mailto:bettencourt.ana@gmail.com)

[ana@gmail.com](mailto:ana@gmail.com)

Abad Vidal, Emilio - (CESGA) [emilio.abad@gmail.com](mailto:emilio.abad@gmail.com)

Rodrigues, Alda - (University of Minho) [aldacrodrigues@gmail.com](mailto:aldacrodrigues@gmail.com)

The purpose of this paper is the dissemination of the Rock Art Virtual Corpus of the Northwest of Portugal (CVARN), a database dedicated to the subject of Pos-Palaeolithic rock art in the Northwest of Portugal that will be available through a website at the end of September 2014.

This software tool is being built and nourished under the ENARDAS project, a scientific project financed by the Operational Programme Thematic Factors of Competitiveness and by the European Regional Development Fund, an ongoing project since 2011, but open to the entire scientific community.

Apart from being a first compilation of different 'styles' of rock art, which occur in the western façade of Iberia between the basins of the rivers Minho and Vouga, it will have both social and scientific functions.

In social terms, the results obtained may contribute to regional development, especially considering the development of tourism.

In scientific terms, it will allow the identification of different stylistic spatial areas (such as the Atlantic Rock Art or Schematic Rock Art); different stylistic groups inside the Atlantic Rock Art (for example); areas with higher or lower density of rock art; the spatial distribution of certain carving motifs, in short, to promote scientific research in this field.

Some examples and considerations will be carried out.

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ORAL

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**3. THE ARCHAEOACUSTICS OF MACROSCHEMATIC ART. AN INITIAL STUDY**

Díaz-Andreu, Margarita - (ICREA-Universitat de Barcelona) [m.diaz-andreu@ub.edu](mailto:m.diaz-andreu@ub.edu)

García Benito, Carlos - (Universidad de Zaragoza) [cgb@unizar.es](mailto:cgb@unizar.es)

García Atiénzar, Gabriel - (Universidad de Alicante) [g.garcia@ua.es](mailto:g.garcia@ua.es)

In this paper the results of acoustic tests undertaken in



a new rock art landscape, the macroschematic rock art area of the mountains to the north of Alicante, will be explored.

In the mountain ranges located to the north of the province of Alicante a new rock art style was identified in the early 1980s. This rock art tradition was dated to the Neolithic on the basis of the similarities of some of the painted motifs to some figures impressed onto Cardial impressed ware. The number of sites is not high, twenty shelters in nine sites, and the motifs painted include anthropomorphs, serpentiforms, lines and thick points. A few casual comments had been made about how excellent the acoustics are in one of the major macroschematic group of sites at Pla de Petrarcos, but the literature has remained silent about this.

The paper will describe the results of the of the acoustics tests undertaken at the Pla de Petrarcos, Barranc de l'Infern and Sarga sites. As in our previous studies on acoustics and rock art, we will analyse the results of reverberation and echoes.

We will compare the areas with and without rock art sites in order to identify whether the shelters to be decorated were chosen in the locations with the best acoustic properties. We will also examine whether the places with higher number of motifs have the best acoustics. The results obtained in the Macroschematic sites will then be compared with those of other areas in which only Levantine style is present.

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ORAL

#### 4. ROCK ART, SYMBOLIC POTTERY, TRAVELLING AND NOSTALGIA

*Ferraro, Lorena - (Administración de Parques Nacionales) ferrarolorena@yahoo.com.ar*

*Vidal, Aixa - (Universidad Complutense de Madrid) aixavidal@gmail.com*

The connection between rock art and pottery has been traditionally been established either with a chronological intention (i.e. to date the representations) or as a marker of a common cultural background. This idea is based on the conception of the former as a static feature in the landscape, a place where people go to, avoid or live in, a fixed location incorporated in the *habitus* but distant from most of daily activities.

Pottery, on the other hand, inasmuch as a chronologi-

cal marker has been typically considered a utilitarian tool which takes actively participates in everyday life. Thus, notwithstanding its portability, it is also mentally fixed to a specific place, be it the raw material source, the task place or its final deposition. Even when commerce and exchange are considered, pottery is seen just as evidence of trade relations or as an important good which raises the interest of people other than its makers.

However, both rock art and pottery can be interpreted as a key element in the movements of human individuals or groups. People is constantly "in the move", collecting materials and resources, following herds, making visits to relatives, joining places of symbolic interest, exploring. And they do not just go from a place to another one; they go through places as well and they gain meaning not only by their features but also by the values and interpretations people make of them. They turn the landscape into a homely place by marking them with representations which makes them feel safe, at the same time the place acquires domesticity by participating in the voyage.

Similarly, pottery accompanies the traveller along the landscape. It may be argued that it makes part of the baggage because of utilitarian reasons regarding food consumption, or due to its value as a trading good. Nevertheless, the vessels chosen for the trip are not always the most appropriate ones for these functions, but they are usually easily identify as typical of a group, a token of local identity. Hence, they link the travellers with their place of origin, as much as the familiar representations they may read on the walls and caves when passing by. This paper aims at opening new possibilities for interpreting these expressions of human culture as an element needed to recreate the homeland left behind (even if it is temporarily), creating in the traveller a sense of being-in-the-world and copying with the nostalgia of the household and the known world.

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ORAL

#### 5. STONES BEFORE STONES. REUSED STELAE AND MENHIRS IN GALICIAN MEGALITHS.

*Bueno Ramirez, Primitiva - (Universidad Alcalá) p.bueno@uah.es*

*Carrera Ramirez, Fernando - (Universidad de Vigo) fcarrera@uvigo.es*

*de Balbin Behrmann, Rodrigo - (Universidad de Alcalá) rodrigo.balbin@uah.es*

*Barroso Bermejo, Rosa - (Universidad de Alcalá) rosa-barro-*

so@uah.es

Darriba, Xermán (*L'École des Hautes Études en Sciences Sociales (EHESS-CNRS)* <http://www.becariosbarrie.org/node/2354>

Paz, Alexandre

Interpretations of European megalithism have been gradually diversifying in very different ways during the last few years. In the present text we will focus on the contributions of the study protocols of megalithic art which define megaliths as a result of complex stories which include rebuilding, maintenance and, in short, continuous adaptation. The strategy –widespread in the Iberian Peninsula– which consists of an in-depth analysis aimed at the decoration of monuments, has brought interesting innovations: direct C14 dates, decoration in different stages, repainting and reusing of pieces that accurately illustrate the long stages of maintenance and rebuilding of megalithic architecture.

Based on a comparison with other archaeological sites that can be found in different geographical areas, this study proposes a critical analysis of the above-mentioned archaeological items in the north-west Iberian megalithism. We analyse mound and structure alterations, stones with unusual shapes or compositions, certain superimposed artistic techniques, etc.

Therefore, it seems possible to predict hypothesis that have already been established in other European regions, which include megaliths in ancient processes of erection of big stones.

.Among all the possibilities available, the most attractive one is probably the possible existence –widespread and non-extraordinary– of megalithic stelae previous to the chambered architectural structures that have been so well studied in the regions covered in this project. The maintenance of these series of stelae and megaliths along the whole life cycle of European megalithism is another analysis item that has not been previously documented in the Iberian Peninsula.

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ORAL

## 6. BY THE WAY: MOBILITY AND PERCEPTION OF OPEN-AIR ROCK ART.

Rodríguez-Rellán, Carlos - (*Universidad de Santiago de Compostela*) [carlos.rellan@usc.es](mailto:carlos.rellan@usc.es)

Fábregas Valcarce, Ramón - (*Universidad de Santiago de Compostela*) [ramon.fabregas@usc.es](mailto:ramon.fabregas@usc.es)

Open-air rock art and Atlantic Rock Art in particular, have been often considered as an active element in the configuration of the economic and symbolic significance of prehistoric landscapes. Thus, in the last 20 years, the spatial setting of Galician petroglyphs was analysed and repeatedly associated with the control of certain resource-rich areas or the routes leading into them. Nevertheless, such considerations have been frequently based on relatively shallow spatial analyses and the importance of those paths and areas established *ad hoc*. Furthermore, the interaction between rock art and the surrounding landscape was approached in a superficial manner, neglecting the importance of perceptibility of the decorated panels as a main element in determining their agency.

The use of GIS applications and high-resolution cartography (LIDAR maps) together with the implementation of new methods for the analysis of the potential intensity of transit through the landscape will allow us to check the hypothesis of the link between Galician petroglyphs and the so-called “geography of movement”. On the other hand, the use of new methodologies such as the Agent Based Modeling makes possible to study and simulate the processes of perception of rock art sites, comparing their theoretical level of perceptibility with that of other monuments allegedly playing an important role in the configuration of the landscape: the mounds.

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ORAL

## 7. ROCK ART AT THE CABECIÑA HILLFORT (MOUGÁS, OIA, PONTEVEDRA, GALIZA, SPAIN): SOME POINTS FOR DISCUSSION

Carrera, Fernando - (*Escola Superior Conservación Galicia*) [fcarrera@uvigo.es](mailto:fcarrera@uvigo.es)

Álvaro, Arizaga - (*Escola Superior Conservación Galicia*) [alvaroarizagacastro@gmail.com](mailto:alvaroarizagacastro@gmail.com)

Varela, María - (*Rock Art Conservation S.L.*) [ma.varela.martinez@gmail.com](mailto:ma.varela.martinez@gmail.com)

Cortón, Natalia - (*Rock Art Conservation S.L.*) [nataliac\\_n@yahoo.es](mailto:nataliac_n@yahoo.es)

Gómez, Carmen - [feito.cg@gmail.com](mailto:feito.cg@gmail.com) (*Rock Art Conservation S.L.*) [javier.goberna@yahoo.es](mailto:javier.goberna@yahoo.es)

Costas, F. Javier - (*Asociación Cultural Amigos do Mosteiro de Oia, Acamo*)

Martín, Esperanza - (*Dolabra Arqueología*) [dolabra@gmail.com](mailto:dolabra@gmail.com)

We offer here some results from an archaeological proj-

ect in A Cabeciña hillfort, northwestern Iberian peninsula, taking into account two little campaigns in 2012 and 2013. This is a small-scale but very fruitful project promoted by the local community and scientifically directed by the Galician School of Conservation for Cultural Heritage.

The Cabeciña hill is a cultural landscape where two different kind of sites live together, apparently apart but, as we know now, completely interrelated. First, some rock art groups, more or less clearly linked to Bronze Age Atlantic style. Second, an Iron Age hillfort, as they are common in Galiza.

Our main aim was to build archaeological knowledge through documentation without "aggressive" archaeological techniques, always bearing in mind the importance of preventive conservation and sustainable local development. We think we do not always need "traditional" and deep digging to bring out new data for prehistorical discussions. In fact we think that kind of "old archaeology", that is, excavation without planned conservation, may imply some important problems related to financial and conservation issues.

Our results offer, for instance, some implications for Galician rock art chronology, recently involved in very interesting arguments. Galician rock art has always been associated as a whole with Bronze Age but nowadays some prefer to think of a long chronology and multiple styles. Our main rock art panel shows some strange typological implications: uncommon motifs in Northwestern Iberia were linked to Atlantic relationships and even Neolithic chronology. Our work was very limited and our results are, obviously, hypothetical, but in many ways we think rock art is in this case completely related with the later hillfort. The chronological debate gets more complicated but still unresolved. The rocky landscape, both natural and cultural, seems to be integrated with the hillfort, maybe during the construction of the impressive masonry walls. This is clearly a place with a very long occupation. Both the landscape and the rock art are adapted and transformed, maybe rethinking its symbolism. Some decorated stones were clearly moved and placed as a sort of "stelae", for example. Apart from that, this site serves also for discussing the natural/cultural character of granitic "panholes" or "basins". Long discussed, this kind of "rock art features" have been considered at the same time religious elements (mainly sacrificial basins), natural eroded depressions or Roman wine or olive presses. Such a radical debate needs some new data and a new approach. Our case is specially important because in the 19th century it was located in the surroundings a proper

sacrificial basin with a Roman inscription, the huge and famous "Pía of Mougás". This context given, we were really surprised by some new discoveries worth publishing and debating.

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ORAL

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**8. A MILLENNARY CHORUS LINE. THE SITE OF LA PEÑA DEL CASTREJÓN (ÁVILA, SPAIN).**

*Ripoll, Sergio - (UNED) sripoll@geo.uned.es*

*Bayarri Cayón, Vicente - (Gim-Geomatics) vicente.bayarri@gim-geomatics.com*

*Latova, José - (ASF-Imagen) latova@asfimagen.es*

*Municio González, Luciano - (Junta de Castilla y León) munigonlu@jcy.es*

*Fabián, José F. - (Junta de Castilla y León) FabGarFr@jcy.es*

The research project "SIGAREP II" was centered on rock-art cavities of North Face of the Central System as a continuation of SIGAREP I which was centered in the southern face of the mountainous chain. Both projects have been a real experimental laboratory in which we were able to test a number of methodologies not only dedicated to rock-art, but the entire environment in order to contextualize those art forms in an area riddled with archaeological sites. Emerging technologies such as 3D laser scanning, photogrammetry, remote sensing or high resolution photography, have been some of the tools that we used to conduct this study, which was complemented with a complex relational database in order to set up a GIS of the central Iberian Peninsula. We will not extend on these issues since they are going to be presented in another session (A11F - The role of art in prehistoric societies), and we will here to the findings in the area of Ávila. Rock art in the province of Ávila is not too well known, except for some sets such as *Ojos Albos* or *Raso de Candaleda*, but in recent years has significantly increased the corpus of stations with schematic art. During the work of documentation in *Ojos Albos* site, we attracted attention to a completely exposed area close to the previous shelter in which was appreciated a Phi-shaped anthropomorphous. We proceeded to full document this panel and our surprise was that by applying different digital image processing algorithms, we found that the only figure had become a complex scene that was particularly important due to their stylistic characteristics were similar to other places very remote from this area.

The scene is formed by a set of 20 human figures with a

strong naturalism far from local conventions. Apparently only one is a male and the rest female, associated with three circular ideomorphous with different morphologies. Clearly superimposed on this set is the figure of the discovery which has become three human figures and circulate a sign made of points.

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ORAL

## 9. THE SACRED CANYON. ROCK ART IN THE DURATÓN CANYON (SEGOVIA, SPAIN)

*Ripoll, Sergio - (UNED) sripoll@geo.uned.es*

*Bayarri Cayón, Vicente - (Gim-Geomatics) vicente.bayarri@gim-geomatics.com*

*Latova, José - (ASF-Imagen) latova@asfimagen.es*

*Municipio González, Luciano - (Junta de Castilla y León) mun-gonlu@jcy.es*

Reaching the centenary of the publication of the Marqués de Cerralbo, on the rock art of the Barranco del Duratón (Segovia), they continue to produce new discoveries of great interest for this great set. This research team has proposed to carry out an ambitious interdisciplinary project to document with the appropriate technology, this extensive set of manifestations, in order to pay tribute to all those who have gone before us in the analysis of this canyon in its corresponding interactive monograph.

In 1933 the Abbé Henri Breuil published his monography *Les Peintures rupestres schématiques* of the Péninsule Ibérique, in the first volume, he resumed the relationship of stations published by the Marqués de Cerralbo, incorporating some illustrations and plates. It took 40 years until the Professor Rosario Lucas were faced with the systematic study of the cave representations of the Barranco del Duratón which conducted to his doctoral thesis. From the defense of this work in 1973, some more or less systematic works have been held such as the *Carta Arqueológica* of the province of Segovia, which greatly expanded the number of stations which had inventoried the Dr. Lucas (27) until 59 sites distributed in five municipalities.

The SIGAREP II project (Sistema Gestor de Arte Rupestre y Estaciones Prehistóricas), awarded in competitive call by the Ministry of Education, Culture and Sport, aims to encourage the promotion, protection and dissemination of the cultural heritage composed of archaeological sites and sites of cave art of the Central System in the provinces of (Madrid, Guadalajara, Segovia and Ávila)

and which due to its characteristics is not easy to exhibit in museums.

The scope of the project has been the promote the creation and use of new technologies, creating synergies between the needs of traditional documentation and representation of archaeology and heritage 3D documentation more innovative systems of the time so that this heritage through these technologies is perfectly documented and reach both the research community and the general public developing a set of elements of dissemination of variable complexity.

The relevant territory contains one of the highest concentrations of prehistoric art in the central area of the Iberian Peninsula. And do not stop appearing new stations such as the shelter Remacha discovered just two years ago. Sampling carried out in the framework of the cited project has focused on the station of the Solapo del Águila, in which the Professor Rosario Lucas identified a total of 76 Iconographies. The leading methodology that we have applied, allowed us to expand the inventory until 118 figures and define more precisely some of the analyzed in the doctoral thesis of this researcher.

Here we present the preliminary results of this ambitious project that aims to analyze all of the decorated shelters that reaches the number of 59 stations in an enclosed space such as the Barranco del Duratón, which with this concentration becomes the Sacred Canyon.

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ORAL

## 10. THE DRAWINGS OF "MASKS" AND OTHER

*Sanches, Maria de Jesus - (Research Center in Archaeology, Arts and Cultural Heritage (CEAACP) mjsanches77@gmail.com*

This paper aims to discuss the imagery known as "eye idols" in the context of the Neolithic and Chalcolithic settlement of northern Portugal and particularly its regional graphic traditions dating from the recent prehistory. It is motivated by our recent discovery of several panels with figures of "masks" and anthropomorphic figures of schematic body, both of type "o eye idols" on the rock escarpments of the Serra de Passos / Sta Comba mountain (Eastern Trás-os-Montes).

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ORAL

## 11. ILLUSTRATING SABOR'S VALLEY (TRÁS-OS-MONTES, PORTUGAL): ROCK ART AND ITS LONG-TERM DIACHRONY SINCE THE UPPER PALEOLITHIC TILL THE IRON AGE

Soares de Figueiredo, Sofia - (ACE- Odebrecht/Bento Pedroso Construções e Lena Construções) sofia.csf@gmail.com

Xavier, Pedro - (ACE- Odebrecht/Bento Pedroso Construções e Lena Construções) pedroxavy@gmail.com

Nobre, Luís - (ACE- Odebrecht/Bento Pedroso Construções e Lena Construções) luis\_nobre@sapo.pt

Domínguez García, (ACE- Odebrecht/Bento Pedroso Construções e Lena Construções) Isabel - isabeldoga@gmail.com

Neves, Dário - (ACE- Odebrecht/Bento Pedroso Construções e Lena Construções) darioneves1@gmail.com

The construction of a major dam in the Trás-os-Montes region, in Northeast Portugal, has led to an unprecedented archaeological survey that included a specific rock art study across a 3,000 hectares area. Over the past four years, the implementation and the development of this study revealed that the number of rock art sites is much higher than initially expected. In addition, the quality and the chronologies of the findings are exceptional, not only in a regional context but also on a peninsular and European scale.

The present paper seeks to explore a specific geographical area within the Sabor valley, an area where we found the highest concentration of rock art sites, with chronologies ranging between the Upper Paleolithic and the contemporary period. However, this paper will only focus on the rock art produced between the Upper Paleolithic and the Iron Age period, meaning, before historical times.

With regards to the Paleolithic era, we will study the Foz do Medal terrace and its exceptional portable art that accounts over than 1500 engraved plaquette fragments. In terms of rock art from the transition of the Holocene and post-Paleolithic period, we will focus our attention on three main sites containing original depictions of caprids and cervids. Finally, we will study almost one hundred Iron Age plaquettes uncovered in the Crestelos archaeological site. We would like to stress the fact that all mentioned sites are located within a radius of less than 2 Km. Due to the concentrated materiality in a single and restricted area, our aim is to approach different continuities and discontinuities in terms of rock art archaeological records. Were the same animals depicted in the Upper Paleolithic and in the post-Paleolithic periods? Why do we find mobil supports both in the Paleolithic and Iron

Age periods and none in the time in between? These are some of the questions we will be addressing.

ORAL

## 12. THE ROCK ENGRAVINGS OF LAGE DOS SINAIS/MONTE DO OLHEIRO (BARCELOS, NW PORTUGAL). DISCOURSING ABOUT PLACE, MORPHOLOGY AND AUDIENCE

Aluai Sampaio, Hugo - (Universidade do Minho) hugoaluai@gmail.com

Cardoso, Daniela - (Universidade de Trás-os-Montes e Alto Douro) danyrest5@gmail.com

It was Sarmiento (1933[1894-95]) who first published *Lage dos Sinais/Monte do Olheiro*, referring a carved rock with a set of circular compositions.

Rejecting rock art sites as mute entities in the landscape and beyond the simple analysis of the depicted motifs, this work aims to present new interpretations taking into account other important features.

Based in Sarmiento (1933[1894-95]), Cardoso (1951) and Coimbra (2004) the first task of the present work was to assemble the available information about the place. Secondly, it implied the observation *in situ* of the carved outcrop during different hours of the day, sometimes using artificial light, allowing the subscribers to specify the description of some motifs and to identify new ones in neglected areas of the outcrop. At the same time consented the contact with the *locus'* physical context (in relation to water, natural passages, visibilities and inter-visibilitys, grazing, mining, etc.) and the carved outcrop's topographic features.

The *Lage dos Sinais/Monte do Olheiro* occupies a platform in the middle Northwestern slope of Mount Saia, near the ridge that separates the hydrographic basins of two major water courses. It is easily accessed from the immediate valleys using two pedestrian tracks connecting with the top of the mount. Medium to coarse grain granite formations of different kinds proliferate. The carved outcrop, in that same type of rock, has an irregular surface leveled with the ground with two protuberances.

Within the carvings occur typical Atlantic Rock Art motifs: concentric circles, cup marks, spirals and a circle with semi circles attached to the outer ring. It also figures a swastika inside a circle.

Aware of the intrinsic chronological problems we accept Atlantic Rock Art manifestations in the Iberian Peninsula since the IV millennium BC (Alves 2003). However, in this specific case the presence of a swastika ratifies the long biography of this place.

We understand the *Lage dos Sinais/Monte do Olheiro* as a place of great importance from Recent Prehistory until historic times, including regional Iron Age. A *locus* that witnessed the creation, the addition and the alteration of meanings, testifying the intertwinement of senses and audiences in its large diachrony. In a micro-scale of analysis it appears to reproduce Mount Saiá's history, functioning as a mnemonic place, reproducing and amplifying the mount's own memory.

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#### ORAL

### 13. A MULTIDISCIPLINARY APPROACH TO ROCK ART SHELTER OF PALA PINTA

*Lima, Paulo - (Centro de Estudos em Arqueologia, Artes e Ciências do Património Faculdade Letras U. Porto) ncaos@sapo.pt*

*Pires, Hugo - (Centro de Investigação em Ciências Geo-Espaciais da Faculdade de Ciências U. Porto e Superfície, L.da) miqhapaqnan@gmail.com*

*Pessoa, Tiago - (Faculdade de Ciências e Tecnologia da U. de Coimbra) tj.pessoa@hotmail.com*

*Bravo Pereira, Luís - (Escola das Artes, U. Católica Portuguesa) luis.bravo.pereira@gmail.com*

*Fernandes, João - (Departamento de Matemática, Faculdade de Ciências e Tecnologia da U. de Coimbra) jmfernandes@mat.uc.pt*

*Ramos, Normando - (Administrador da Metais Jaime Dias, SA) normando.ramos@gmail.com*

This communication presents the results obtained in the framework of a multidisciplinary approach taken to the set of schematic paintings from prehistoric shelter of Pala Pinta, Alijó, in the Portuguese region of Trás -os-Montes in the northwest of the Iberian peninsula.

The aim of this study is to evaluate the performance and applicability in specific contexts involving the rock art of non-intrusive digital methodologies for the detection, chemical analysis, survey, registration and graphic documentation of this art.

The use of digital / multi-spectral photography has allowed us to achieve results that substantially improved

the accuracy with which we can observe the paintings and has led not only to the detection of a novel motif as to reset the contours of other depiction of the composition. Chemical analysis of paintings by the method of X-ray fluorescence allowed the identification of Fe with its colouring element. Furthermore, the 3D scanning has made possible the integration of depictions and rock support in a single three-dimensional interactive platform, allowing us to examine systematically and from multiple perspectives the figurative scheme, improving the possibility of establishing the correct spatial relationship between motives and how to analyze any unintended associations to certain geological features displayed by the support.

The results achieved with the combined application of these methodologies have opened them so the possibility to better understand and support our proposed interpretation for the composition of the shelter.

The presence of several steliforms in the composition has led to a broad consensus interpretation, around the archaeological community, as probable evocations of our star. However, its iconic resemblance to the various aspects that a comet can develop during a sighting, led us to conclude that the differences in configuration, size and arrangement can be related to various stages of development of such an event.

Furthermore, some geological features of the shelter seam to establish a relation between the paintings and the landscape, alerting us to the possibility of the society that decided to make these depictions have intentionally attempted to establish a direct correlation between his astronomical conjectures and the territory of their experiences. Although aware of the low probability of success in finding a comet among those of which we have the orbital parameters, it did not dissuade us from trying to find among them those that, once we reversed their orbits, one could establish a coherent link between their path under the sky shelter and its possible evocation in paintings. This demand, allowed us to find four comets in the period between 5500 BC and the year 0, in which the development of the various stages of their eventual sighting occurred within the field of the sky that can be seen from the shelter

POSTER

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POSTER

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**14. ARCHAEOLOGICAL FIELD SURVEY IN THE ER-  
QUEYEZ SITE (WESTERN SAHARA): NEW DISCOV-  
ERIES OF ROCK ART**

*Muñiz-López, Teresa - (Archaeologist. Lemgasem Research Group) [tmuizlpez@yahoo.com](mailto:tmuizlpez@yahoo.com)*

*Khatri, Ahmed (Archaeologist. Museum of Tifariti)*

*García González, David - (Archaeologist. Lemgasem Research Group) [garcia.gonzalez.jdavid@gmail.com](mailto:garcia.gonzalez.jdavid@gmail.com)*

*López Rodríguez, Carmina - (Andalusian Institute of Earth Science (CSIC-UGR) [karmymem1983@gmail.com](mailto:karmymem1983@gmail.com)*

In the time allotted for an Investigation project and Co-operation in the archeological site of Erqueyez in Western Sahara, an archeological field survey was carried out, the results of which are presented in this work. For various reasons, there are still plenty of areas that have not been explored yet, especially everything on the west slope of the rocky massif where we focus our archeological intervention.

An intensive archeological field survey was carried out in the areas with probability of housing geological formations susceptible to painted motifs. We centered our sampling zone in the west sector of the rocky massif but some areas of the east face and superior platform were covered as well. The cave paintings were documented by digital photography with a high resolution and GPS system which make it possible to localize the small caves and subsequently use these findings to elaborate a GIS. During the work of the survey, some thirty small caves with intact paintings, to this day, were discovered. The majority of them were found in the west face of the massif, the area less surveyed in previous campaigns.

Eight of the documented small caves were selected for their description in this work, for being the one that present the best preserved paintings because they are situated in more protected places from the erosive agents.

The survey has allowed us to amplify the number of known small caves with paintings in different publications at the moment. We have been able to detect certain differences in form, size and motifs represented in the eastern and western sectors, even though we have no known explanation for them at the moment.

The work in this survey provided evidence of the need for the continuation of the line of recognition of the site.

# A11f The Role of Art in Prehistoric Societies

Commission on Prehistoric art

(Organisers: Esther López-Montalvo, Georges Sauvet, Carole Fritz)

Friday 5th (9:00-13:30 to 14:30-19:30)

Meeting Room: FACULTAD DE DERECHO "SALA RUTA JACOBEA"



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ORAL CONTRIBUTIONS

ORAL

## 1. ART IN PREHISTORY AND THE CULTURAL BACKGROUND OF NON-LITERATE SOCIETIES

Fritz, Carole - (CREAP-TRACES-Toulouse) [carole.fritz@univ-tlse2.fr](mailto:carole.fritz@univ-tlse2.fr)

López-Montalvo, Esther - (CREAP-TRACES-Toulouse) [esther-montalvo@gmail.com](mailto:esther-montalvo@gmail.com)

Sauvet, Georges - (CREAP-TRACES-Toulouse) [georges.sauve@sfr.fr](mailto:georges.sauve@sfr.fr)

In the frame of a program of the French Research Agency (ANR) devoted to creation, we have developed a research project on *the Arts of Prehistory and the Cultural Dynamics of Societies before Writing*. The team includes international specialists of Palaeolithic and Post-Palaeolithic art in different parts of the world (France, Spain, North and South Africa) as well as anthropologists, neuropsychologists and linguists. This communication is presented on behalf of the whole group. The main goal of this research is to better understand the status of art in non-literate societies, going from the elementary actions of the maker to the perception by the whole community and the influence of art on the behaviour of each member.

Artwork can be considered by archaeologists and anthropologists from two complementary points of view: as a manufactured artefact or as a societal indicator, but the two aspects should not be dissociated, because the creative gesture cannot be understood out of its social context. Since the oldest symbolic artwork production in the Upper Palaeolithic (portable and cave art), it clearly appears that the various steps of the operating sequence are carried out by individuals under the control of the group and according to processes of learning. Globally, the production of a graphic item obeys to the same social constraints than flint or bone work. Today, the skill of the engravers can be highlighted thanks to strong magnification devices and the knowhow of the painters thanks to the new technology of non-invasive pigment analyses.

The influence exerted by the society can be also highlighted in many other aspects of prehistoric art, such as formal, stylistic and expressive features, spatial organization and composition. A thorough study of these aspects, in association with the technical gesture and making use of multi-dimensional data analysis processes, provide useful indicators concerning the cultural level

of interaction between groups and the dynamics of exchange networks. The main goal of most rock arts is to inscribe in a long-lasting medium essential stories such as myths. The way these stories are expressed is particularly informative, as well as their frequency and territorial distribution. We have found, thanks to examples taken from various rock arts, that the same narrative devices are used in different parts of the world (Spanish Levantine art, Sahara, Ennedi, Brandberg) and can be tracked down even in the Upper Palaeolithic cave art.

The current trend in prehistoric art research is towards multidisciplinary integrative studies in order to reach an holistic approach. Nothing can be said from a single category of facts, because the most relevant thing is the relationship between data issued from different domains. Crossing the methodologies of various sciences is particularly useful in the case of art, because art encompasses various domains: semiotics, phenomenology of perception, Gestalt psychology, neuropsychology, theory of mind, cognitive sciences, sociology, anthropology, etc. When archaeological data are introduced in this melting pot, a real progress can be expected in the knowledge of a society, intertwining technical, socio-economic and cultural aspects.

ORAL

## 2. THE ORIGINS OF IMAGES BETWEEN PSYCHOLOGICAL PROJECTION AND TRACING INNOVATION

Ego, Renaud - (indépendant) [renaud.ego@orange.fr](mailto:renaud.ego@orange.fr)

The origin of images (as defined by figurative tracings) is still an open question. Through Gombrich and Whitney Davis's hypotheses, we are confronted with fundamental factors in the arising of images during the Paleolithic period.

In *Art and illusion* (1960), E.H. Gombrich proposes the idea of « projection ». According to this psychological approach, images were originally suggested by shapes in natural features, such as cracks and evocative rocks, upon which men imposed semantic values. Men would have discovered horses and bulls in vaguely suggestive rock surfaces and would have highlighted them with colours to make them visible to other onlookers. Whitney Davis reverses this process in *The origins of images making* (Current Anthropology, 1986, 27-3) : objects (as evocative rocks) are no longer perceived as marks ; rather, marks (digitally traced lines) are seen as objects. « Once marks are perceived as things, the full analogical

power of the line is logically derived and even detached from mere experience of perceptual ambiguity.»

Gombrich's hypothesis is paradoxical, as it requires the intellectual ability of « seeing as » - through the previous existence of « natural » images - to explain the birth of such an ability as intentional tracings. But in David's view, the birth of images arises as a happenstance, even considered as a « logical » and necessary possibility inscribed in lines, that keeps tracing activities separated from any intentionality.

If figurative tracings were only a technical development of the power of lines, they would have given form to all kinds of figures instead of being so strictly circumscribed to a limited range, namely animals and sexual emphasized figures. In that sense, images making reveals an expectation, rooted in tracing activities, that emerges through this innovation in tracing activities: the outline. Even in its incomplete state, the outline is a synthesis of the two primary units of tracing: the point and the line. But it overcomes them in deepening their internal dimension. To draw a point allows a « here » which also considers the space that surrounds it; drawing a line is to enter a motion (and time as motion) while also revealing the division of two spaces, shaping the question of limits in an absolute simple form. The outline goes beyond them by encircling this dimension of time, internal to the line, in the spatial unity of a surface. This is a primary symbolization of a living body.

The visual threshold of resemblance arises from this significant shift but still has to be explained as a mental, fundamental process. With the outline, the original question of limits moves to the more dialectic one of the partake present in both animal and sexual themes. The outlined figures embody the limits of time, (death and regeneration) through the sexual theme; and they embody spatial limits, through the animal/ species theme. With these living ensembles of both shared and divided spaces, the question of identity (similar/dissimilar, unity/diversity,) begins to be visually exposed.

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ORAL

### **3. QUANTITATIVE ANALYSIS OF EARLY AURIGNACIAN BEAD MORPHOLOGY: MODELING PRODUCTION ORGANIZATION AND EXCHANGE**

*Heckel, Claire - (New York University) [claire.heckel@nyu.edu](mailto:claire.heckel@nyu.edu)*

In the prehistory of personal ornamentation, the imposition of specific forms on plastic raw materials such as

ivory, soapstone, and amber is a significant development beyond the perforation of naturally-occurring objects, and occurs in several regions of Eurasia during the Early Upper Paleolithic. The morphological standardization of Early Aurignacian beads has been recognised as an important characteristic of these artifacts in their function as social technologies and as symbolic artefacts. Even so, few studies have been performed to quantitatively characterize the standardization and variation of these remarkable artefacts at the site and regional levels.

This study applies software developed in the biological sciences to the morphometric and attribute analysis of over 600 basket-shaped beads from five Early Aurignacian sites in southwestern France (Grotte d'Isturitz, Grotte des Hyènes at Brassempouy, Abri Castanet, Abri Blanchard, and Abri de la Souquette). Evidence on raw material procurement and production stages from each of these sites is also considered.

The results of this study provide data on patterns of standardization at site and regional levels based on several lines of evidence. A newly-developed typology for basket-shaped beads demonstrates that there is spatial variation in bead typologies beyond the general level of "basket-shaped bead." Statistical analysis of the variation of specific shape attributes confirms that certain attributes were consistently more controlled than others. Further statistical analyses determine the importance different factors (such as provenience and raw material) on final bead morphology.

The combined results of these studies confirm the existence of semi-specialized craft production in specific territories during the Early Aurignacian and provide data for the construction of new models for the organization of these activities. They also provide new insights on the production and exchange of these artifacts in Early Aurignacian landscapes, and on the role of standardized ornaments in Early Aurignacian social and economic systems.

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ORAL

### **4. THE IVORY FIGURINES FROM THE SWABIAN JURA IN THE CONTEXT OF THE AURIGNACIAN SOCIETIES IN CENTRAL EUROPE**

*Floss, Harald - (Universität Tübingen, Germany) [harald.floss@uni-tuebingen.de](mailto:harald.floss@uni-tuebingen.de)*

Four cave sites in the Swabian Jura (Southern Germany) have yielded a spectacular array of Aurigna-

cian art: Hohle Fels, Geißenklösterle, Vogelherd, and Hohlenstein-Stadel. From these sites, we know about 50 figurines realized mostly in mammoth ivory. These objects of portable art constitute some of the earliest known representational artifacts in the world. Subjects addressed in this contribution include the possible religious and social foundations underlying the production and use of these objects. New aspects of daily life in the Aurignacian are becoming clearer through ongoing research at these sites that add richness and depth to their study and interpretation. We are particularly interested in the spatial and stratigraphical informations of these figurines in order to create hypotheses about their use. Objects of mobile art often are identified as “non-utilitarian”. Nevertheless, they are strongly linked with social and religious needs and therefore very “utilitarian”. In a period when Neanderthals and anatomically Modern Humans shared partly the same areas of Europe, art production might contribute to find self-conception and identity.

ORAL

## 5. EARLY SYMBOLISM IN THE LONE VALLEY (SOUTH-WESTERN GERMANY)

*Dutkiewicz, Ewa - (Department of Prehistory, University of Tübingen) ewa.dutkiewicz@uni-tuebingen.de*

*Wolf, Sibylle - (Department of Prehistory and HEP, University of Tübingen) sibylle.wolf@ifu.uni-tuebingen.de*

*Conard, Nicholas J. - (Department of Prehistory and HEP, University of Tübingen) nicholas.conard@uni-tuebingen.de*

The two cave sites, Vogelherd and Hohlenstein-Stadel, located in the Lone Valley in the Swabian Jura, are of particular interest concerning the appearance of early symbolism during the Aurignacian. In the 1930ties Gustav Riek excavated in Vogelherd and Robert Wetzels conducted the excavation at Hohlenstein-Stadel (both University of Tübingen). Recent fieldwork at both sites delivered several hundreds of three-dimensionally carved personal ornaments, made of mammoth-ivory as well as tooth pendants. These sites yielded also the earliest figurative art. The Aurignacian people mostly depicted Pleistocene animals. From Hohlenstein-Stadel we know the tallest Ice-Age-figurine, the famous hybrid “Lion Man”. Numerous marks on these figurines are a distinctive feature within this cultural complex. The ensemble of the signs shows interesting regularities. We use new methods for the documentation and analyzes of the marks. We also show new results of the studies of osseous material. In our talk we will present and discuss the expressions of

symbolic behavior and their meaning for the Aurignacian people in the Lone Valley.

ORAL

## 6. THE ROLE OF GRAPHIC SIGNS IN PREHISTORIC SOCIETIES

*Sauvet, Georges - (CREAP-TRACES-Toulouse) georges.sauvet@sfr.fr*

*Bourrillon, Raphaëlle - (CREAP-TRACES-Toulouse) r.bourrillon@gmail.com*

*Gárate Maidagan, Diego - (CREAP-TRACES-Toulouse) garatemaidagandiego@gmail.com*

*Petrognani, Stéphane - (ARSCAN UMR 7041 Nanterre) clarkpetro@yahoo.fr*

*Rivero Vilá, Olivia - (CREAP-TRACES-Toulouse) oliviariver@hotmail.com*

*Robert, Eric - (ARSCAN UMR 7041 Nanterre) eric.robert15@wanadoo.fr*

*Tosello, Gilles - (CREAP-TRACES-Toulouse) gilles.tosello@wanadoo.fr*

Prehistoric societies need to be equipped with strongly rooted rules and laws. Most often, the force of these laws rests on founding myths that nobody can contest. Images play an important role in the stability of these societies because they act as a binder. Those who share and understand these images belong to the same cultural community. In Palaeolithic art (as in many other rock art), the main topic is probably related to myths and everybody who knows the myths is able to understand the meaning of the figurative representations. However, non figurative representations (often called “signs”) need a supplementary and specific training. Whereas animals and human images may be understood within a large intergroup area, signs having a more limited diffusion acquire a **distinctive function** in the society.

In traditional societies, each member is defined by his (her) membership to a group (clan, lineage, social status, etc.) and this is shown by marks that may be directly inscribed in the body or drawn on a fix medium such as a rock wall. Corporeal signs (body paintings, tattoos and scars) are **differential markers** linked to a socially ruled practice, obeying to precise rules. External marks drawn on rocks may have a similar meaning to which is often added the function of **territorial marker** (rather than Leroi-Gourhan’s **ethnic markers**). When found very far from their original territory, signs may still recall their “distant” origin and act as a label (**e.g.** in Palaeolithic art, the presence of claviform signs in the Cantabrian Region

might have kept a memory of their “Pyrenean” origin). Some specific motifs in portable art may bear a similar connotation.

In Palaeolithic art, the practice of corporeal signs is impossible to discuss, but the hypothesis of signs used as differential markers may be argued. The case of signs belonging to the same formal family accumulated in narrow recesses will be illustrated with the quadrilateral signs found in Cantabrian caves such as El Castillo, La Pasiega, Las Chimeneas and Altamira. A formal and statistical analysis made with the help of Correspondence Analysis shows that Pasiega and Castillo form distinct groups and that the main distinctive features are independent and freely combinable. A scheme showing the various combinations of features demonstrates that we are dealing with a codified system, which is in agreement with the hypothesis that the whole set of Cantabrian quadrilateral signs was used as *differential markers* of human groups or individuals. A similar hypothesis may be considered for the tectiforms found in four nearby Perigord caves. Many historical and contemporaneous examples of the same behaviour may be found.

Palaeolithic art probably involves different subsets of items, with different purposes and different levels of signification. Figurative items were likely related to essential beliefs shared by a large cultural community, whereas more localized subsystems, mainly based on non-figurative signs, seem to be designed for the purpose of social interactions between local groups.

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#### ORAL

### 7. SOUTH OF THE GUADALQUIVIR: HANDS, HINDS, HORSES AND SIGNS.

*Sanchidrián Torti, José Luis - (University of Córdoba (UCO))  
gt1satoj@uco.es*

*Medina-Alcaide, M<sup>a</sup> Ángeles - (University of the Basque Country (UPV/EHU))  
mangeles.medina@ehu.es*

*Hernando Álvarez, Clara - (University of Salamanca (USAL))  
clara85@usal.es*

All the Upper Palaeolithic sites in Andalusia are located to the south of the River Guadalquivir, in a geographical area bounded to the north by the river, and to the south by the coastline.

The area is favoured by a number of bioclimatic factors, even in the harshest conditions. In particular, the southernmost section of the Mediterranean coastline, running

from the province of Granada down to the Bay of Algeciras, constitutes a unique niche surrounded by a barrier of mountain peaks (average altitude 1500 m. a.s.l.) which protect it from cold northerly and north-westerly winds and act as a heat screen towards the south. Moreover, thanks to the complex thermohaline circulation off the Bay of Málaga, this local sector of the ocean is highly productive. These optimal bioclimatic factors, also reported for Pleistocene chronologies in the south of the Peninsula, favour human settlement in the area.

The present study focuses on Iberian Gravettian and Solutrean chrono-cultural phases (26.000-16.500 BP), since the parietal art (the main object of the study) and occupational layers belonging to these techno-complexes are the most representative of the study area.

New archaeological data deriving from the excavation of local occupation layers (e.g. Bajondillo, Nerja), together with new dating for the Palaeolithic settlement of caves containing Pleistocene art (Nerja) provide an enriching scenario which prompts a critical reappraisal of the spatio-temporal distribution of graphic morphotypes characteristic of the southern Iberian Peninsula. However, the figurative sequences derived from overlapping parietal art and the direct dating both of the Cueva de la Pileta and of the mobiliary art of the Cova de Parpalló remain essential to any approach to Palaeolithic art in this region. Shared access to the various records reported has ensured significant progress in the sequencing and understanding of Palaeolithic art in the southern Iberian Peninsula.

This study takes a new look at the chronology of certain figurative prototypes (negative handprints, conventional three-line hinds figures, “duck-bill” horses and signs), discerning different stages in the major artistic block known as pre-Magdalenian. Secondly, the spatial and chronological adscription of these prototypes enables some of them to be identified as territorial markers which provide information on changes in population (peaks and troughs) prompted by socioeconomic and palaeo-environmental changes, and also on the relationships within and between the human groups living in this area prior to the Magdalenian techno-complex.

ORAL

## 8. SOCIAL AND CULTURAL INTERACTION IN THE CANTABRIAN-PYRENEAN REGION DURING THE LATE MAGDALENIAN (14500 - 11500 BP): NEW DATA FOR A LONG-STANDING THEORY

Ruiz-Redondo, Aitor - (*Instituto Internacional de Investigaciones Prehistóricas de Cantabria (IIIIPC). Avenida de los Castros s/n, 39005 Santander, Spain*) aruizredondo@gmail.com  
Garate-Maidagan, Diego - (*CREAP Cartailhac-TRACES-UMR 5608, University de Toulouse-Le Mirail, 5 allées Antonio Machado, 31058 Toulouse Cedex 9, France*) garatemaidagan-diego@gmail.com

In the field of graphic activity, the second part of Magdalenian period is characterized for an stylistic homogenization in an extensive territory of southwestern Europe. Some areas that had previously shown a distinctive personality, became in that period part of a common graphic form.

In this communication, we introduce the analysis of the thematic and other technical and stylistic characteristics from Pyrenean and Cantabrian parietal ensembles in the timelapse between 14500 and 11500 BP. We include unpublished data resulting from new findings and recent reviews of already-known ensembles.

The graphic activity from these two regions, which until then had shown great peculiarities, is well integrated into the homogenizing process. The ensembles of both areas show some deep similarities in terms of thematic, techniques and graphic conventions, although some differences are still present. These data could be joined to with others obtained from studies of lithics and raw materials of that period. All of them point to a very strong social interaction between the Cantabrian Sea and the Pyrenees.

The new data reported in this communication confirm the research carried out during the last 30 years about the cultural relationships between human groups in a large territory encompassing the Cantabrian Region, the north side of the Pyrenees and a large part of the southwest of France during the late Magdalenian (see among others Sieveking, 1978, *Trabajos de Prehistoria*, 35:61-80; Bahn, 1982, *Oxford J. Archaeology*, 1-3:247-268; Fortea, 1989, in *Le Magdalénien en Europe*, ERAUL, 38:419-437; Corchón, 2004, in *La Materia del language prehistórico*, p. 105-126; Sauvet et al., 2008, *Zephyrus*, LXI:35-56).

ORAL

## 9. COGNITIVE PROCESSES RELATED TO THE PALEOLITHIC FIGURATIVE DRAWING: EXPERTS OR NOVICES?

Amayra, Imanol - (*Universidad de Deusto*) imanol.amayra@deusto.es

Apellaniz, Juan María (*Universidad de Deusto*) - juanmaria@apellaniz.biz

Experimental studies of neuroscience and cognitive psychology have shown that skilled artists are more analytical in their drawings. Analytical thinking is characterized by decomposing the image into natural parts. Instead, perception of novices is holistic, schematic and less concerned about the relationship of the parts. Another mechanism that differentiates experts from novices is the graphical invariance, ie, the constancy of the proportions in the representations. The artists who perform a large number of representations have higher graphical invariance and are more easily identifiable with mathematical methods of decomposition of images.

In order to investigate whether the behavior of Paleolithic graphic artists is similar to the skilled modern artists, we conducted a comparative study of Paleolithic Figures 70 and 140 experimental figures.

The total sample consists of 70 figures paleolithic horses (from Spain and France), 70 experimental horses made by experts and 70 figures horse made by novices. Experts and novices performed an average of 4 figures. All selected figures had a complete outline. The method of sampling was randomized and single blind. The complete outline of each figure was measured with 20 geometric variables related to the length and width. The variables are related to the contour points of maximum negative curvature, minimal positive curvature and inflection. The exploratory factor analysis was applied to the study of the decomposition of the images into parts. Instead, multidimensional scaling was applied to the recognition of the authors.

Exploratory factor analysis identified a total of five anatomical parts: neck, trunk, length, internal hindquarter and external hindquarter. The total variance explained was 77% (KMO Index = 0.82). This mathematical structure appears mainly in expert and Paleolithic groups. In the novice group, the factor structure is not clear. The factorial components are not discrete, for example, variables of the trunk, hindquarter and external hindquarter presented a correlation greater > 0.40. However, often the correlation is less than this magnitude between vari-

ables within the same anatomic area.

Regarding the criterion of identification of the author was as follows: at least three figures should appear close in three of five multidimensional scalings of the five anatomical parts (neck, trunk, length, internal hindquarter and external hindquarter). The average percentage of identification in the expert group was 75%, 78% in the Palaeolithic and 65% novice.

The anatomical parts of mayor diagnostic validity in the Palaeolithic figures painted were the trunk and the neck; in the engraved Palaeolithic and experts figures the trunk and the hindquarter. In the group of novices is not clearly identified an area of attribution of authorship.

The Palaeolithic authors' graphic behaviour was very similar to the experimental experts: analytic and analogic vision, figure segmentation in parts, and graphic consistency in the dimensions of at least two out of the five parts of the figure. The similarity between the parts dimensions, especially in the painted Palaeolithic figures, is not necessarily correlated to the macroscopic similarity.

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ORAL

## 10. SINGULARITY AND SURVIVAL OF ROCK ART AT THE OJO GUAREÑA CAVES (BURGOS, SPAIN)

*Ortega Martínez, Ana Isabel - (CENIEH) anaisabel.ortega60@gmail.com*

*Martín Merino, Miguel Ángel - (Grupo Espeleológico Edelweiss) mamartinmerino@gmail.com*

The Ojo Guareña karst, located in the Cantabrian Range in the north of province of Burgos (Spain) in a relatively isolated area, is far away from the big natural routes of communication in the Iberian Peninsula. The Ojo Guareña Complex is one of the biggest cave systems in Spain, including fourteen interconnected caves with a total length of at least 110 km. The complex has an impressive record of Prehistoric activities, from the Middle Paleolithic to the Middle Ages. Cave art is of special relevance, with sites dating from the Last Upper Palaeolithic to the Bronze Age, including the rock art of Cueva Palomera (with seven main sites) and six other caves, the Cueva de Kaite being of special value.

The Paleolithic of Sala de las Pinturas in Palomera Cave is a unique rock art site which is chronologically and stylistically related to the last Magdalenian culture towards the transition to the Epipaleolithic culture (Pleistocene-

Holocene boundary).

The graphic record of Kaite site is represented by semi-naturalists with deer and goat figures, some of which include young offsprings and surrounding lines and signs which enclose them. This graphic conception seems to have a continuity with local codes of the Paleolithic art, in the transition between the last hunter-gatherers and early farmers in the beginning of Neolithic times.

The Sala de la Fuente in Palomera Cave, near the Sala de las Pinturas, shows a post-Palaeolithic rock art, where the graphic expression of the human figure is persistent. This site presents the same type of wizard ("Brujo") anthropomorphic that can be found in Sala de las Pinturas, Paleolithic, perhaps because they had a special meaning. Interestingly, the same kind of schematic deer design engraved in Kaite Cave is also documented in this site. It is proved that the Kaite sanctuary is from an earlier period in time; however, these schematic designs are frequent in the Iberian Neolithic and Bronze Age art.

The rock art of Sima de Villallana shows geometric signs linked with human remains and tumulus of sandstone boulders. The chronological data allow us to relate this site to the Late Bronze Age phases and the possible continuity with the ritual use of Vía Seca maze, in Cueva Palomera, during the Iron Age.

The graphic analysis and the comparison with different rock art sites from the Ojo Guareña Complex allows us to assess the continuity or the change in graphic activity and the population inside of an isolated territory. Moreover, these concept and space relationships among these rock art sites imply that the artists had to have a complete knowledge of this vast karst system from the Late Paleolithic until the Bronze Age. The use by these prehistoric people of the underground Landscape with symbolic activities is associated with the transformation of this cave-territory in a social and symbolic landscape for the community.

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ORAL

## 11. SPATIAL ANALYSIS OF ROCK ART IN THE MOUNTAINS OF EL SISTEMA CENTRAL. (MADRID, GUADALAJARA, ÁVILA AND SEGOVIA, SPAIN).

*Bayarri Cayón, Vicente - (Gim-Geomatics) vicente.bayarri@gim-geomatics.com*

*Ripoll, Sergio - (UNED) sripoll@geo.uned.es*

*Latova, José - (ASF Imagen) latova@asfimagen.es*

*Municio González, Luciano - (Junta de Castilla y León) luciano.municio@gmail.com*

The mountain Central System has always been considered as a natural barrier between the North and the South Plateaus. Research Projects SIGAREP I and II, conducted by the signatories of this paper during the years 2011 to 2013, were dedicated to the study and documentation of both Paleolithic and post-Paleolithic rock-art using advanced technologies. The study showed connections between north and south parts.

The paper shows the recording and spatial analysis techniques undertaken in this vast territory, which shows through different patterns designed by the research team that there are clear links between the two sides of this mountain chain from at least 20,000 years to the present. Applied patterns clearly show that our ancestors had no such barrier through which they were traveling incessantly, techniques, themes, ideas, deep thoughts and something as intangible as spirituality.

ORAL

## **12. ANTHROPOLOGICAL INSIGHTS INTO THE SPANISH LEVANTINE ROCK ART: AN APPROACH TO THE IBERIAN NEOLITHIC SOCIETIES THROUGH THEIR IMAGES.**

*López-Montalvo, Esther - (CNRS-UMR 5609 TRACES) esther-montalvo@gmail.com*

The narrative content of scenes and the naturalistic features of depictions of the Spanish Levantine rock art make of this art an useful tool in our goal of digging for a better comprehension of the social and economic organisation of prehistoric societies concerned.

Since these paintings show significant continuities and ruptures in time and territory regarding formal features of figures but also the activities portrayed, their analyse allow us to question if these graphic variations observed in the panels are the reflect of deeper changes in the social structure, and if so, if they can help us to characterise the dynamics of these societies.

Placing the Levantine paintings in time and space axes, we analyse the activities represented in panels paying special attention to those aspects that allow us to discuss the social complexity of these groups – inequalities, gender role, violence, activities of prestige, etc.

The anthropological approach to the Levantine paintings allows us to assess some cognitive aspects with no remains in the archaeological record. Despite of the limits in the reading and interpretation of the prehistoric iconography, we defend that the activities represented in the Levantine paintings are deeply rooted in the behaviour of these groups, so they can be very useful in order to both assess social and economic aspects and to have a better comprehension of the role of these painting in societies.

ORAL

## **13. FEMALE AND MALE: THE NARRATIVE OF LAPA DOS GAIVÕES (PORTUGAL)**

*Martins, Andrea - (Associação Arqueólogos Portugueses) andrea.arte@gmail.com*

The Lapa dos Gaivões (Arronches - Portugal) is a rock shelter with geological features that allows the formation of different scenic spaces used during recent prehistoric as stage of several narratives. The morphologies of schematic figures show a sexual distinction, framed in diverse scenes that reveal daily aspects, symbolic and real, of the communities. The feminine universe is structured in the connection with nature and with the idea of regeneration, birth and community. The Lapa dos Gaivões rock shelter would allow the aggregation of the community, in a large amphitheatre, where the scene would be punctuated in little stories and narratives of the human groups or past actions. These would aggregate the community and give social-culture cohesion. The stylistic analysis of the schematic motives, searching for defining patterns, allows the identification and morphological characterization of members of the same group. The study of singular recurrences in the site makes possible the recognition of a particular community. These typological characteristics are the distinctive element of this community, present in the female and male universes, and display different formal features. We will present the several stories of the site through the technical mechanisms that allowed the execution of an iconographic repertoire and the creation of a narrative expressed in a single moment.

ORAL

**14. BETWEEN « CULTURE OF THE PEACE » AND « ART OF THE WAR » AMONG BOVIDIAN PEOPLE OF THE SAHARAN CENTRAL MASSIFS.**

*Barbaza, Michel - (Université Toulouse Jean Jaurès) michel-barbaza@wanadoo.fr*

Central Sahara establishes, by the quality and the abundance of its rock art, a real conservatoire in the open air where extraordinary evidences of the lifestyle of the Neolithic herdsman are collected. How to understand and to interpret these rock drawings? Why images? Why the bovidian representations illustrating the daily life of the populations of the saharan Neolithic by their surprising realism, do they succeed abstract compositions and stamped with mystery, expressing the existential anxieties of "round heads" people, confronted with a world undergoing profound ecological change.

Crossing back the road of the knowledge and going back up the nature of things, from the decorated wall to its meaning, the archaeologist tries to reach the forming of the myth and to understand the profound nature. The researcher, having elaborated the meticulous surveys of the decorated wall, endeavours to create the internal organization of the sceneries and to put in prominent position the structure of the compositions. Reflection of their essentially, it allows to catch a glimpse of the fundamental explanation of the rupestral art.

Distinguishing the myth, as a trouble of the collective unconscious, from the mythological stories which it engenders, by successive touches the author brings to the foreground the reason of these surprising compositions. Making converge the methods of the prehistoric archaeology, the art history and the social and cultural anthropology, he illustrates the principles of an anthropological study of rock art. At last, confronting the results of these disciplines with the data of the saharan prehistoric ecology, he gives prominence to the possible causes of tension and conflict between the pastoral peoples, whom the art is exactly in charge of resolving.

Before the aridity and desertification work in favour of the advent of a protohistoric society with traders and warriors, the bovidian people set up the conditions allowing the institution and the preservation of a great pastoral civilization. The stories which illustrate it are lost forever; the myth which generated them, sometimes, shows through.

ORAL

**15. DIFFERENTIAL EXPRESSIONS OF IDENTITIES - A FUNCTIONAL ANALYSIS OF PREHISTORIC NAMIBIAN ROCK ART SITES**

*Lenssen-Erz, Tilman - (University of Cologne) lenssen.ertz@uni-koeln.de*

It is a well-known phenomenon of human identities that they are neither static nor narrowly limited. Even in a relatively homogenous small-scale prehistoric hunter-gatherer society there is not just one single identity which people entertain. This is a field of research that still requires methodological innovation.

There are many parameters under which identities shift, one among them is space. Rock art is perhaps the best source to investigate the different expressions of identities linked to spatial configurations since, as a rule, rock art keeps its original location in a landscape over millennia. This allows examining the relation of cultural markers to the immediate surroundings as it was chosen by the prehistoric artists. From the character of a place and the kind of rock art that was produced there one can draw conclusions concerning the different identities that were advertised in different types of rock art sites. This study also shows that rock art cannot be understood comprehensively without investigation of its spatial context.

ORAL

**16. MEMORY, IDENTITY, POSSIBILITY: A SYMBOLIC DECORATIONAL SYSTEM AS A MEDIUM OF CULTURAL REMEMBRANCE AND SOCIAL SIGNALLING IN THE NEOLITHIC OF THE CARPATHIAN BASIN**

*Sebők, Katalin - (Institute of Archaeological Sciences of the Eötvös Loránd University, Budapest, Hungary) sebokkata@gmail.com*

The presentation surveys the history of a graphic/symbolic system that appears first on clayware in the Middle Neolithic in the eastern half of the Carpathian Basin, and remains in use, evolved into diverse forms and functions, throughout the rest of the neolithic period in the area. The statistical processing of the material of Polgár-Csőszhalom, which is of one of the largest excavated settlements from the Late Neolithic in the Carpathian Basin, raised an opportunity for us to perform a comparative style analysis of a ceramic material with more than 300,000 fragments altogether. The local results were



compared with previously evaluated data sets from several coeval settlements.

The Late Neolithic in the study area is represented by a single cultural complex (Tisza culture), the archaeological material of which is characterized by the overall application of a highly complex graphic system (textile decoration). This system had evolved from a particular, primarily 'ritual' decoration system in the Middle Neolithic as an accompaniment of the extended social and economical changes that have taken place during the formation of the Tisza culture. Therefore, starting with its appearance in the Middle Neolithic Alföld Linear Pottery Culture, our goal in the first part of the presentation is to show the original functions and basic regularities of the graphic system under study.

The northern fringes of the Tisza culture's distribution area are bordered by a large and geographically not really separate interference zone, in the archaeological (especially the ceramic) material of which the amalgamation of the surrounding cultural units' ceramic traditions is a defining factor. The examination of the particulars of this situation relies on materials of two large settlements in the first place: one from the core area of the Tisza culture (Pusztataskony-Ledence 1) and another from the northern interference area (Polgár-Csőszhalom). The questions of the analysis were pointed, beside others, to the structure, reactions and behaviour of the graphic/symbolic system, as well as to the detection of its possible distortions and the changes in use in cultural stress situations. The second part of the presentation focuses on the current results of this work, offering a short survey of our present knowledge about the concepts and layers of social or cultural identity encoded in this system, the embedded possibilities and advantages in different levels of the community from the single individual to supra-regional levels, and finally, on changes in application and use as markers of the system's shifting place in different cultural contexts.

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ORAL

## **17. ABOUT SPECIFICS OF ROCK ART OF GOBUSTAN AND SOME INNOVATIVE APPROACHES TO ITS INTERPRETATION.**

*Farajova, Malahat - (Gobustan National Historical Artistic Preserve) malahat@mail.ru*

Petroglyphs of Gobustan represent an important historical source, allowing us to get notion about material and

spiritual culture of the population that inhabited the given region during various historical epochs. From this point of view the study of petroglyphs on Firuz and Firuz 2 sites of Kichikdash Mountain, Gobustan, is of special interest.

In April 2014, a field expedition was organized with the aim of studying petroglyphs on Firuz and Firuz sites. The field material, collected in the process of expeditions became a good base for further studying. With the aim of approach to the study in the context of archaeological complex, archaeological material of Gobustan preserve funds was also involved. Various techniques of taking stamps from petroglyphs, making copy and night photo-fixation were used for the analyses.

For dating petroglyphs we used AMS dating from cultural layers of Firuz and Firuz 2 sites that allowed us to define and understand the sense of petroglyphs of various periods in all their versatility.

Images of boats which were found by the author at the top of the stone, east side, attract attention. We will bring the interesting fact: at the top of the mentioned stone 97 there is a hollow, out of which a straight line is stretching down to the images of boats. We can assume that these images were executed with ritual purposes. It finds its additional argumentation due to numerous hollows with hollowed out channels that were also fixed in the territory of Gobustan preserve. Moreover, it is necessary to take into account that the majority of them are located near petroglyphs.

Images of boats in the upper part of the rock 19, west side, which were also found by the author during the expedition are of special interest.

It should be noted that the petroglyphic art of Caucasian region images of boats are met only in Gobustan.

As a result of archaeological excavations carried out near a burial place in Firuz site, stone with images of boats were found from cultural layer. The archaeological material dated from this layer allowed to confirm the assumption that Gobustan is the earliest center of navigation emergence in this region.

In this case it isn't necessary to exclude cult and semantic sense of images of boats, which were one of the most important vehicles in the economic life of Gobustan hunters.

Findings show that petroglyphs of boats on stone 19

and 97 in Firuz site can be interpreted as ritual.

In its turn, AMS dating of the cultural layer where a stone with the boat images was found, let us assume that the drawing had been executed earlier than the cultural layer was formed and respectively, it is dated back to more ancient period.

No matter what to associate the images of boats with, there is one important fact that these images really testify to the great invention of the past and their wide use in the life of Gobustan people, the first conquerors of the Caspian Sea.

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ORAL

### 18. ART OF THE BRONZE AGE STELES OF MONGOLIA

*Magail, Jérôme - (Musée d'Anthropologie préhistorique de Monaco) jm@map-mc.com*

Since 2006, the Monaco – Mongolian joint archaeological mission has been studying the Tsatsyn Ereg necropolis 500 km west from the capital Oulan-Bator. More than 400 graves of Bronze Age are distributed on 30 km<sup>2</sup>. Hundred engraved steles were found near graves and hillocks of deposits of head of horses. Tsatsyn Ereg shows with other sites of the end of the Bronze Age that there was a very powerful civilization before the vast nomad empire of Khunnu (Xiongnu). Indeed, it seems that the tribes, which occupied the territory of current Mongolia, confederated to establish the first empire of steppes. In the third century BC the empire of Khunnu opposes the new empire of China, which is going to strengthen the construction of the Great wall. There are relatively few traces of these illiterate nomads, hunters and warriors whose territory was bigger than the area of present-day Mongolia. In order to understand the origin of their habits better, customs and cosmology, the research carried out by the Monaco – Mongolian joint archaeological mission relates to remains from before this period. The engraved steles known as “deer stone” give a lot of information about weapons and thought of the nomads of the Bronze Age.

These monoliths, some as high as 4 m, have various iconic themes whose style is identical to that from eastern Mongolia to the Altai, from the Gobi to the Transbaikal. From the end of the 2nd millennium to the 5th Century BC, the artists systematically spread out the figures in the same way from the bottom to the top of each stele:

- at the top, two different-sized circles are inscribed showing the sun and the moon;

- under the stars, in the middle part, stags with long rounded antlers are rushing towards the top or the bottom of the stele;

- at the base, there are different weapons, shown schematically (shields, daggers, axes and bows).

Thus, the engraved grouping is? cosmology where each theme corresponds to an area of the Universe: the sun and moon for the sky, the deer occupy an intermediate terrain and the weapons represent the terrestrial space occupied by warrior. A geometric motif, engraved at the bottom of the monument, evokes the separation between the terrestrial and underworld realms. The iconographic themes are often separated by geometric motif to mark clearly the different areas of the Universe.

The presence of small cervids, at the base of the monument, underlines their psychic role; herds of deer plunging into the world of the dead and surging up from the sepulchral space to rejoin the celestial regions. Their bodies have been deliberately elongated to expand their movements between the two cosmological extremes. Their silhouette, marked by the rounded form of their antlers and their legs folded under the stomach, is also found in the mobiliary art of the Steppe. Moulded, sculpted and engraved cervids, from the Caucasus to eastern Mongolia, show very close stylistic particularities.

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ORAL

### 19. SOUTH ANDEAN ROCK ART, CULTURAL CONTEXT OF SOCIO-ECONOMIC TRANSITION

*Dudognon, Carole - (University Toulouse Le Mirail 2, UMR 5608, Laboratory TRACES-CREAP, France) carole.dudognon@dbmail.com*

*Sepúlveda, Marcela - (Department of Anthropology, University of Tarapacá, Arica, Chili) msepulveda@uta.cl*

In the Andean foothills from northern Chile, rock art sites are located between 2,800 m and 3,800 m. The paintings were realized inside little rock shelters. Camelids are among the principal animals represented in the Andean rock art and most of them belong to scenes describing the process of domestication which took place 6,000 years ago in the central Andean mountainous regions. An in-depth review of three sites, comprising more than 800 figures and some thirty scenes, indicates that there

is a strong interaction between the anthropomorphic representations and the camelids. Beyond the evocative symbolism, the accuracy of the scenes allows us to identify human practices, when the archeological context is insufficiently documented.

To study these practices, a methodical reading of the scenes (rather than the individual images), allows us to demonstrate the existence of various hunting techniques and objectives, implying various technological investments. To ensure the relevance of our conclusions, we have carried out an analysis of the superpositions and a stylistic study combined with factor analysis. This leads us to a better understanding of the socio-economic situation revealed by the paintings and to the conclusion that various human groups have probably contributed to the production of these paintings.

Thus, we notice a complex socio-economic transition; the change from a hunter-gatherer lifestyle to pastoral activity seems to be a smooth transition. Hunting practices depicted in rock art are oriented towards the capture of alive animals while, at the same time, appears the representation of "structures for the seclusion of camelids". In any case, these representations demonstrate common efforts to optimize the exploitation of the wildlife resources, whereas simultaneously neighboring regions are going through a period of important innovations related to their neolithisation.

In conclusion, our analysis brings new light on the context of socio-economic transition in this Andean area. The study of a rich body of paintings allows a new approach centered on human practices.

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## ORAL

### 20. THE USE AND SCOPE OF AGUADA ICONOGRAPHY IN THE SOUTHERN ANDEAN REGION

*Gordillo, Inés - (Instituto de Arqueología - Facultad de Filosofía y Letras- Universidad de Buenos Aires) ibesalu@gmail.com*

Between the seventh and twelfth century of the Christian Era diverse populations that inhabited the southern valleys of the Argentine Northwest created a particular iconography centered in anthropomorphic- feline and fantastic images. This is the stylistic set known as Aguada

in the archaeology of the area, which is analyzed in this work.

Therefore the proposal is to go further in the analysis of the iconography shared by the different local groups, expressed through various techniques and different types of media, both movable and fixed rock art.

The research implemented for this purpose addresses several levels of design analysis, examining references, icons, composition, visual resources, perceptive effects, etc. Within the iconographic repertoire identified, we will study in particular representations which are more recurrent, those corresponding to the category of complex motifs of figurative - fantastic character as they gather iconic signs which meet imaginative combinations.

During this period -called Period of Regional Integration- various archaeological areas of the region exhibit different stylistic identities which are the result of specific historical trajectories and different situations of each society in the interaction with the others. The main styles, which are clearly identified, differ from the others by the supremacy of some of the technical implementations, the particular management of plastic and compositional resources, the dominance of certain motifs and / or representations of local models, etc. However, there are common rituals and mythical icons that pass transcend the expressive field of that group of societies, in this way showing the active contact between them and the use of a commonly shared symbolic capital. For this reason, some authors have defined this term as.

Similarly, when considering the contexts associated to these representations, we note that they had a privileged place in the sacred spaces of tombs and caves, but also managed in everyday materiality of houses and yards, in scenarios related to domestic life and ordinary experience.

The proposed conceptual approach, although flexible, argues the impossibility of separating the social practice of the material world, recognizing in the latter its capacity of agency. Therefore, to go on with the interpretation of these visual representations, besides its stylistic analysis, we need to contextualize them, considering the actions of people, things and locations that come into play with social practice.

ORAL

**21. NEW STUDIES AND INTERPRETATIONS OF CAVE ART FIGURES OF THE CUEVA DE EL CASTILLO (CANTABRIA, SPAIN).**

Ripoll, Sergio - (UNED) [sripoll@geo.uned.es](mailto:sripoll@geo.uned.es)  
Bayarri Cayón, Vicente - (Gim-Geomatics) [vicente.bayarri@gim-geomatics.com](mailto:vicente.bayarri@gim-geomatics.com)  
Latova, José - (ASF Imagen) [latova@asfimagen.es](mailto:latova@asfimagen.es)  
Pecci, Hipólito - (LEP) [poliche333@hotmail.com](mailto:poliche333@hotmail.com)  
Ontañón, Roberto - (Museo de Prehistoria de Santander) [ontanon\\_r@cantabria.es](mailto:ontanon_r@cantabria.es)

During the year 1952 Professor E. Ripoll-Perelló and his wife A. L. López were given permission from the Patronato de las Cuevas Prehistóricas de la Provincia de Santander to study the Cueva de Las Monedas in the **Monte de El Castillo**, Puente Viesgo (Cantabria). While they performed these works they had opportunity to visit the cave on several occasions and compare it with the information published by Abbé H. Breuil, assisted by H. Alcalde del Río and L. Sierra in *Les Cavernes de the Region Cantabrique*. Throughout his explorations they could see that many of the published images on the one hand did not correspond with reality and on the other they found numerous unpublished representations. In 1953, my parents decided to carry out the review of the representations described and returned with another permission from the same institution. The work was done in several campaigns and carried out the discovery of almost 300 new figures in the **Cueva de El Castillo**. Eduardo Ripoll have never published the results of their investigations and told me many years later that it was because the change of methodology that was imposed in the 1960s. A few weeks before the death of my father in the year 2006, in Barcelona, in a very solemn manner gave me a great portfolio that kept all the documentation of the Castillo and told me: publish it!

Finally a few months ago I had a clear idea and the work was developed together with a group of researchers, we ask for the mandatory permit to verify suitability of the descriptions of my father, his location in cave and above all make some new photos of certain grounds. The application of emerging technologies in digital image processing has allowed us to expand 280 my father figures to nearly 550 new figures, some of them quite spectacular. And are those present in this Congress. We are aware that over the years have been many researchers who have been studying the great cave, but so far we have not found references to demonstrations that here either does a different reading.

POSTERS

POSTER

**21. ANIMAL WITHIN REACH. THE MANUFACTURING OF STONE ANIMAL STATUETTES DURING THE MAGDALENIAN: TECHNIQUES AND MATERIALS.**

Croidieu, Emma - (UMR 7041 ArScAn - Ethnologie Préhistorique) [emma.croidieu@gmail.com](mailto:emma.croidieu@gmail.com)

This poster outlines one of the magdalenian techniques for manufacturing zoomorphic stone figurines. The production of single figurines, by carving hard material such as stone, is documented by the exemple of nearly 300 fragments of in the round sculptures from the cave of Isturitz (Pyrénées-Atlantiques). Emphasis is placed on the technical possibilities induced by the representation of animals in opposition to anthropomorphic figurines.

The integrated technological study of stone animal sculptures, aims to better comprehend the technical processes involved in the making of these statuettes and to understand the complexity and drive behind this production in the Magdalenian socio-economic system. This analysis allows the reconstruction of the *chaîne opératoire* of statuettes, the study of their breaking as well as the development of functional hypotheses. From archetype to abandonment of the statuette or recycling. Appreciating the techniques related to stone carving in the Magdalenian will translate the technical operations and organization of production in terms of behavior, and to characterize the representational systems in place such that the economic, cultural or social development of these objects can be better understood.

POSTER

**22. VISUAL NARRATIVE ASPECTS OF CLIFF PAINTINGS IN FINLAND**

Niskanen, Karen - (University of Oulu) [karen.niskanen@oulu.fi](mailto:karen.niskanen@oulu.fi)

This paper presents visual narrative perspectives in the study of the late Stone Age and early Bronze Age cliff paintings in Finland, and in particular the distribution and interpretation of the various motifs. Common motifs include anthropomorphs, zoomorphs (mainly cervids), and boats. The research methodology is primarily computer applications and the emphasis on spatial information. The results suggest an important connection

between especially the anthropomorphs and the zoomorphs.

Data consist of the cliff paintings of several sites in Eastern Finland, for example, at Astuvansalmi (80 images) and at Suomussalmi (60 images). GIS analysis is used to measure the visual and spatial aspects of the motifs.

Findings at this point in the research indicate is a rather close relationship between the anthropomorphs and zoomorphs, and there is evidence that there are a set of 'rules' governing their depiction, and that visual narrative analysis provides deeper understanding of the visual elements (including the use of panels, movement, and other spatial aspects) and **how** images reflect narratives. In this study, GIS methodology provides a means of studying physical and spatial aspects of these paintings. On the other hand, visual narrative analysis examines the the rules and relationships evident in the data. Combined, the result is a new perspective on the meaningful components in the paintings in Finland.

# A12 Detecting the Land-scape(s) - Remote Sensing Techniques from Research to Heritage Management

Commission on Archaeological Prospection  
(Organiser: (Axel G. Posluschny))

Tuesday 2nd (9:00 to 13:00)  
Meeting room B01



2014 burgos  
1-7 sept.

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et Protohistoriques



XVII World UISPP Congress  
XVIIe Congrès Mondial de l'UISPP  
XVII Congreso Mundial de UISPP

ORAL CONTRIBUTIONS

ORAL

**1. WALKING OVER MAGOULAS: MAPPING NEOLITHIC TELL SETTLEMENTS IN THESSALY (GREECE) USING INTEGRATED ARCHAEO-GEOPHYSICAL TECHNIQUES**

*Cuenca-Garcia, Carmen – (1 Laboratory of Geophysical - Satellite Remote Sensing and Archaeoenvironment (GeoSat ReSeArch), Institute for Mediterranean Studies, Foundation for research and Technology, Hellas (FORTH)) carmen@ims.forth.gr*

*Sarris, Apostolos - (1 Laboratory of Geophysical - Satellite Remote Sensing and Archaeoenvironment (GeoSat ReSeArch), Institute for Mediterranean Studies, Foundation for research and Technology, Hellas (FORTH)) asaris@ret.forthnet.gr*

*Kalayci, Tuna (1 Laboratory of Geophysical - Satellite Remote Sensing and Archaeoenvironment (GeoSat ReSeArch), Institute for Mediterranean Studies, Foundation for research and Technology, Hellas (FORTH))*

*Simon, François-Xavier (1 Laboratory of Geophysical - Satellite Remote Sensing and Archaeoenvironment (GeoSat ReSeArch), Institute for Mediterranean Studies, Foundation for research and Technology, Hellas (FORTH))*

*Cantoro, Gianluca (1 Laboratory of Geophysical - Satellite Remote Sensing and Archaeoenvironment (GeoSat ReSeArch), Institute for Mediterranean Studies, Foundation for research and Technology, Hellas (FORTH))*

*Donati, Jamieson (1 Laboratory of Geophysical - Satellite Remote Sensing and Archaeoenvironment (GeoSat ReSeArch), Institute for Mediterranean Studies, Foundation for research and Technology, Hellas (FORTH))*

*Manataki, Meropi (1 Laboratory of Geophysical - Satellite Remote Sensing and Archaeoenvironment (GeoSat ReSeArch), Institute for Mediterranean Studies, Foundation for research and Technology, Hellas (FORTH))*

*Vouzaxakis, Konstantinos (13th Ephorate of Prehistoric and Classical Antiquities, Greek Ministry of Culture)*

*Rondiri, Vasso (13th Ephorate of Prehistoric and Classical Antiquities, Greek Ministry of Culture)*

*Arachoviti, Polyxeni (13th Ephorate of Prehistoric and Classical Antiquities, Greek Ministry of Culture)*

*Almatzi, Kaliopi (13th Ephorate of Prehistoric and Classical Antiquities, Greek Ministry of Culture)*

*Efstathiou, Despina (13th Ephorate of Prehistoric and Classical Antiquities, Greek Ministry of Culture)*

*Stamelou, Evangelia (13th Ephorate of Prehistoric and Classical Antiquities, Greek Ministry of Culture)*

'Magoula' is the local term given to manmade mounds on the fertile Thessalian plain, Central Greece, which

are generally associated with Neolithic settlements. These mounds or tell sites are originated by long-term and sometime multi-phase accumulation of debris produced by human occupation. Thessaly is well known for the concentration of these prehistoric sites and contains some remarkable examples. In spite of the great deal of archaeological research focused on these sites since the beginning of the 20<sup>th</sup> century, there is still a gap in the understanding of the factors behind the establishment, distribution and development of these early farmer communities. Even if there has been recently a GIS – satellite remote sensing approach dealing with the landscape distribution of these settlements, much less is known regarding the local extent of them.

This paper shows how the implementation of non-destructive and ground based geophysical techniques can provide key information related to the structural layout of tell sites. Emphasis is given to methodological aspects, the advantages and limitations of the different techniques and survey-related problems. In so doing, we present the preliminary results of the ongoing project IGEAN (Innovative Geophysical Approaches for the Study of Early Agricultural Villages of Neolithic Thessaly, implemented under the

The methods include the extensive and high resolution geophysical surveys to map and characterise in detail the extent of the sites and reveal other buried features of interest. Multi-technique geophysical instrumentation able to survey extensive areas are being used and comprise of a multi-sensor magnetometer system, electromagnetic induction instruments, multi-channel and single channel GPR systems as well as soil analyses.

The new evidence provided so far by this non-invasive approach is uncovering a previously unknown layout of prehistoric occupation which may shed light on archaeological questions related to the origin and long-lasting character of these Neolithic settlements in Thessaly.

ORAL

**2. DEVILISH DETAILS: FINE-TUNING SURVEY TECHNIQUES FOR EPHEMERAL PROTOHISTORIC REMAINS**

*De Neef, Wieke - (University of Groningen, Groningen Institute of Archaeology) w.de.neef@rug.nl*

*Van Leusen, Martijn - (University of Groningen, Groningen Institute of Archaeology) p.m.van.leusen@rug.nl*

This paper will present the Rural Life in Protohistoric Italy project, a multidisciplinary research project investigating

small protohistoric surface scatters in a river basin at the southern end of the Apennine mountain range (Calabria, Italy). Our aim is a better understanding of the detection, preservation, and interpretation of small Bronze/Iron Age sites, both on a landscape and a site-specific scale. Our investigations are predominantly methodological and include high-resolution re-surveys of surface remains, multiple geophysical techniques, test pits, and pedological studies. With the fieldwork stage of our project finished, we can present some preliminary results and propose a method for the study of small-scale protohistoric land use in similar Mediterranean landscapes. Ephemeral protohistoric remains are recorded in most Mediterranean landscape archaeology projects, yet they are rarely investigated beyond the mapping stage. In our research area, the Raganello basin in northern Calabria, the majority of the 250 known archaeological sites consists of small (less than 10m diameter) concentrations of poorly preserved handmade pottery, dating to the Bronze and Iron Ages (2000-800 B.C.). These were mapped during more than 15 years of field walking surveys by the Groningen Institute of Archaeology and occur throughout the landscape, from the foothills surrounding an (uninvestigated) coastal plain to the mountainous hinterland. Although this extensive site corpus offers potential for the study of protohistoric land use and rural settlement dynamics, the legacy survey data lacks the detail needed for solid interpretations.

In this paper, we will demonstrate how detailed studies on a small scale increase our understanding of site-specific function and formation, while at the same time being incorporated in a landscape-scale approach. Our targeted site studies integrate datasets from high-resolution re-surveys of known surface scatters, geophysical detection techniques, detailed re-studies of problematic survey material categories, and minimally invasive ground-truthing through corings and test pits. We can extrapolate these local data to a larger scale by sampling representative examples of different site types. This typology is based on landscape zones and properties of material categories. Furthermore, the landscape level of investigations includes large-scale magnetic prospection in different parts of the research area, combined with geomorphological and pedological studies in order to explain post-depositional processes and site preservation. A LiDAR dataset is used for GIS-based analysis of slope processes.

To illustrate our approach we will present a case study of a dense rural settlement pattern in a particular section of the foothill zone, datable to the Final Bronze Age (1100-950 B.C.). Re-surveys of previously investigated

areas, combined with re-studies of finds categories, have already increased the number of FBA scatters by more than a third. Magnetic gradiometry prospection revealed the presence of rectangular building-sized anomalies dispersed throughout the area, whereas test pits have confirmed the temporal and spatial association between FBA surface remains and these rectangular structures. The implications of these results for regional heritage management, which is still very site-oriented, will be raised.

ORAL

### 3. A NEEDLE IN A HAYSTACK“ WETLAND ARCHAEOLOGICAL RESOURCES AND THE QUEST FOR MORE REPRESENTATIVE ARCHAEOLOGICAL RECORD

*Koivisto, Satu - (University of Helsinki)  
satu.m.koivisto@helsinki.fi*

The majority of archaeological sites situating in wetland environments have been found already when being destroyed, through drainage, dredging or peat cutting. The huge scientific value of these sites is a well-known fact (e.g. Keller 1866; Clark 1954; Coles & Lawson 1987; Coles & Coles 1986; Coles & Coles 1996), but the management of the resource of wetland landscapes is problematic, mostly because of the lack of appropriate mapping and prospection techniques. The saturated sediments covering the deeply-buried archaeology decrease the chances of detection and render several of the most common survey and remote-sensing techniques insufficient. The unusual preservation conditions for organic materials within these sites yield valuable tools for archaeological reasoning and interpretation.

The environmental changes through the Holocene have altered landscape and its ecosystems profoundly. Especially in Finland, situating in the northeast shore of the Baltic Sea, the post-glacial isostatic rebound, local topography and climate history have affected dramatically on the initiation of mires (Ojala et al. 2013; Seppä 2002; Korhola 1995). Based on these factors, Finland is one of the most mire-rich countries in Europe. Surprisingly, wetland archaeological research has been quite scarce in Finland, and these extensive peatland and alluvial landscapes have not been properly understood, explored or documented for archaeological purposes. The aim of my presentation is to move forward from the current inactive state of affairs and I strive to further understanding on the prospection and management strategies in wetland environments. The results



of an ongoing project will be introduced, where three electromagnetic techniques were applied in order to test whether a Stone Age wooden fishing structure (c. 3200 BCE) would produce strong enough signal to be detected with the methods used. To validate the geophysical data and further understanding on the hunter-gatherer fishing methods, the work was followed by trial excavations, documentation, radiocarbon dating and palaeoenvironmental evaluation.

More research, experiences and testing with different methodologies are essential in securing the preservation and research potential of the exceptionally informative but vulnerable archaeological resource. Such approaches are also essential in evaluating the adequacy of archaeological sampling strategies and interpretation, as well as in expanding our knowledge of the human past.

ORAL

#### 4. MORPHOMETRIC ANALYSIS TO EXPLORE THE SURROUNDINGS OF THE MELKA KUNTURE PREHISTORIC SITE

*Maerker, Michael - (Heidelberg Academy of Sciences and Humanities) mmaerker@unifi.it*

*Mussi, Margherita - (University of Rome La Sapienza) margherita.mussi@uniroma1.it*

*Melis, Rita - (University of Cagliari) rtmelis@unica.it*

The area of Melka Kunture (central Ethiopia) is one of the most important clusters of Paleolithic sites in Eastern Africa. The archaeological record spans from ca. 1.7 Ma onwards, with a number of stratified occurrences of Oldowan, Acheulean, Middle Stone Age and Late Stone Age industries, together with faunal remains and human fossils. However, the archaeological sites are affected by present day processes. These processes are mainly triggered by the climatic conditions and specific Paleo-landscape forms and features in the nearer surroundings of Melka Kunture and the upper Awash catchment. Hence, the main aims and objectives of this study are the assessment of the present day geomorphological and hydrological processes as well as the detection of Paleo-landscape pattern.

Based on fieldwork, aerial photo interpretation and a detailed DEM analysis we derived a geomorphological map of the Melka Kunture area. Furthermore, we assessed the major landscape forming process using physically based models and a detailed Terrain Analysis. For this study we utilized the SRTM-X with 25m resolution and ALOS/PRISM DEM with 10m resolution.

The study reveals the spatial distribution of present day landscape forming processes. Especially surface runoff and soil erosion processes were analysed in detail. Moreover, we identified evidences for specific Paleo-landscape pattern in the surroundings of Melka Kunture. In part these features can be explained with tectonic activity, on the other hand they indicate specific pattern of the Paleo-drainage network.

ORAL

#### 5. AERIAL MAPPING BY MEANS OF UAV TECHNOLOGY IN ARCHAEOLOGICAL SITES IN THE BRONZE AGE AND THE FIRST IRON AGE IN THE MIDDLE-VALLEY OF THE EBRO RIVER (SPAIN)

*Angas, Jorge - (3D Scanner Patrimonio e Industria, Spin-off University of Zaragoza. Group "Primeros Pobladores del Valle del Ebro" Area of Prehistory, Dpt. Sciences of Antiquity. University of Zaragoza.) j.angas@3dscanner.es*

*Pérez-Lamban, Fernando - (Area of Prehistory, Dpt. Sciences of Antiquity. University of Zaragoza.) fperezlamban@gmail.com*

*Lorenzo, Jose Ignacio - (General Direction of Cultural heritage. Government of Aragon)*

*Picazo, Jesús - jpicazo@unizar.es (Area of Prehistory, Dpt. Sciences of Antiquity. University of Zaragoza. Group "Primeros Pobladores del Valle del Ebro.") jilorenzo@aragon.es*

*Rodanes, José María - (Area of Prehistory, Dpt. Sciences of Antiquity. University of Zaragoza. Group "Primeros Pobladores del Valle del Ebro.") jrodanes@unizar.es*

*Uribe, Paula - (PostDoc Researcher "Torres Quevedo", MINECO. Group URBS, Dpt. Sciences of Antiquity. University of Zaragoza.) uribe@unizar.es*

*Bea, Manuel - (PostDoc Researcher "Torres Quevedo", 3D Scanner Patrimonio e Industria, Spin-off University of Zaragoza & MINECO. Group "Primeros Pobladores del Valle del Ebro" Area of Prehistory, Dpt. Sciences of Antiquity. University of Zaragoza) manubea@unizar.es*

The present development of technology and social immediacy does not allow establishing a unique and complete documentation methodology for every kind of archaeological project, which are very variable in their aims and characteristics. Therefore, the way in which documentation technology is applied to archaeological sites, either for research or for didactics, is a complex issue.

In our project, we employ new documentation technologies and procedures for the research of the settlement patterns in the middle Ebro valley during the Late Pre-

history. We are testing and comparing different methodologies in Bronze Age sites (Los Collados, ca. 1900 cal BC) and Early Iron Age (El Morredón and Cabezo Morrudo, ca. 800-500 cal BC). Each of these sites represents diverse chronologies and social organization structures. Therefore, they have different characteristics (preservation, size, structures, surrounding environment...). Moreover, these sites have been subjected to archaeological excavations with very dissimilar aims and methods. With the new documentation technologies we aim to obtain high quality and homogeneous information from these sites and possibly even to detect new features. Also this information must be the basis for the integration of the already known archaeological data from the different sites in order to be able to interpret them correctly and to create high quality and attractive didactic information and products.

One of the latest steps in the documentation of archaeological environments consists of aerial documentation, by means of an UAV device. This system refers to an Unmanned Aerial Vehicle that can be remotely controlled and its working system can be semi-autonomous or fully autonomous, by using a GNSS (Global Navigation Satellite System).

The use of this technology consists of the creation of a photogrammetric measurement platform that allows the digitalization to obtain the 3D model of each one of the selected archaeological sites from aerial images. This platform must operate autonomously by pre-programming the necessary flight paths. After the takeoff, this UAV system is able to follow a programmed flight path over each site according to the GPS coordinates of the pre-programmed route. The incorporation of a high resolution calibrated RGB and NIR camera models results in the obtaining of high graphic resolution models.

Moreover, the results given correspond to the scientific and informative criteria of the project. Thereby, a series of photographs has been obtained, which by means of photogrammetric and topographic techniques has generated a three-dimensional model of each one of the documented environments (achieving the generation of textured triangulated models and high metric and graphic quality orthophotos). The last chapter in the process of aerial documentation has enabled these results to be utilized also to provide an aerial spherical 360° - a view of each and every one of the environments of the archaeological sites in the middle-valley of the Ebro river.

ORAL

## **6. GEOPHYSICS AND PREVENTIVE ARCHAEOLOGY: COMPARISON WITH TRIAL TRENCHING ON THE CSNE PROJECT (FRANCE)** **DEPAEPE, PASCAL - (INRAP) PASCAL.DEPAEPE@INRAP.FR**

*Hulin, Guillaume - (Inrap) guillaume.hulin@inrap.fr*

*Bayard, Didier - (Ministère de la Culture) didier.bayard@culture.gouv.fr*

*Koehler, Alain - (Inrap) alain.koehler@inrap.fr*

*Prilaux, Gilles - (Inrap) gilles.prilaux@inrap.fr*

*Talon, Marc - (Inrap) marc.talon@inrap.fr*

Many cases are published about benefits of remote sensing techniques in preventive or rescue archaeology. Although these non-invasive techniques offer undeniable advantages such as a rapid coverage for a relatively low cost, important limits occurred. A good knowledge of these limitations is important in order to precisely estimate the reliability of remote sensing techniques. The Canal Seine-Nord Europe (CSNE) project offers a good opportunity to compare geophysics and trial trenching on a preventive archaeological project. This project is located north of France and consists in a 106 km long channel on a surface of 2500 ha. This channel will be used to link the fluvial network of the Seine River to the northern Europe network in order to increase fluvial transportation.

In 2009, about 60 ha of magnetic and electric surveys were done by Geocarta for the developer contractor of this project (Voies Navigables de France). After this first step, trial trenches, regularly spaced on the same area, were realised as the French law requires. These trenches covered 10 % of the whole area and were carried out by Inrap (Institut National de Recherches Archéologiques Préventives).

At the end, thirteen archaeological sites were discovered on this zone. Six of them were detected by trial trenching and not by geophysics. Six were detected by trial trenching and were partially visible on geophysics. Only one was discovered just by geophysics. Comparison between the two approaches shows that only ditches were detected by geophysics. In the case of the different sites discovered on this area, the most important archaeological features were protohistoric and roman graves as well as protohistoric dwellings built on post holes. Four excavations were realised and three of them concerned these archaeological features which were totally undetected by geophysics.

This example clearly shows that geophysics can not be used as a unique technique for archaeological evaluation in this context. The main limiting factors are the size of archaeological remains and the soil itself. This latter is constituted by silts which are particularly common in the northern part of France. Using geophysics on this type of soil has for consequence to totally ignore an important part of archaeological features whereas a lot of them offer a high scientific interest. Although trial trenching give a view on a limited area, in most of the cases, this approach remains the most efficient way to characterise an archaeological landscape and take the best decision concerning future excavations.

ORAL

### 7. A DEVELOPMENTAL SEQUENCE? HERITAGE MANAGEMENT TO RESEARCH TO HERITAGE TOURISM AT A MIDDLE BRONZE AGE SETTLEMENT IN CYPRUS

*Fogel, Aaron S. (Center for Advanced Spatial Technologies, University of Arkansas, USA) aaronfogel@gmail.com*

*M. Lowe, Kelsey (School of Geography, Planning and Environmental, The University of Queensland, Australia) k.lowe4@uq.edu.au*

Recent road works outside the village of Alampra, Cyprus exposed several archaeological features believed to be associated with the Middle Bronze settlement of Alampra-Mouttes (c1900-1650BCE). Previous investigations of Alampra in the late 1970s and early 1980s by Cornell University included localised excavation of the site and wide scale pedestrian survey of the surrounding landscape. Our study focuses on the salvage of the recently disturbed features exposed during the road works and the management implications for continued development. Additionally, geophysical investigations were implemented to assess the existing interpretations of the site by Cornell University. The geophysical results revealed numerous undocumented subsurface features which were later verified through excavation in our second field season. Thus, what was once a simple salvage operation has developed into a robust archaeological research program. This archaeological initiative has raised the level of interest in local heritage by the community due to perceived economic opportunities that relate to heritage tourism resulting in an evolving conservation ethic.

POSTER SESSION

ORAL

### 8. EXPLORING ARCHAEOLOGICAL LANDSCAPES WITH UAV. LIMITS AND FUTURE PROSPECTS

*Stefan, Dan - (Institute of Archaeology Vasile Pârvan Bucharest) danstefan00@gmail.com*

For the general public, archaeology remains difficult to be perceived outside its main investigation method, the archaeological excavation. Nevertheless, new fields of archaeological exploration have emerged once technology evolved; landscape archaeology, geo-archaeology, geophysics, remote sensing are only several domains allowing the detection and characterisation of archaeological structures located in subsoil, based on non-invasive methods. Representing a special branch of archeometry, these investigations, precede, limit or even replace excavation, being more efficient and less expensive. A special place, with an ever more increased weight factor in the interdisciplinary archaeological research, has been given to aerial archaeology, a research direction opened since the beginning of the 20th century.

Last three-five years' advancement in technology and IT has made possible the emergence of a novel type of flying platform, capable to transport optical sensors (photo and video cameras in the visible domain or multispectral), but also geophysical sensors. High efficiency brushless motors, batteries with high discharge energy, developed in the Lithium-Polymer technology, very resistant and light structural materials based on carbon fibre and, last, but not least, the expansion of microcontrollers and their associated programming technique are some of the main ingredients based on which multirotor flying platforms were built; these machines are capable to execute remote controlled or completely autonomous aerial missions and carry loads of up to 3kg for longer periods. The terminology of this quite new domain is in full evolution. The internationally accepted denomination is that of Unmanned Aerial Vehicles (UAVs), but also that of drones.

For archaeology, the UAV technology offers almost all the advantages of traditional aerial systems (either satellite or aircraft with pilot), at a fraction of their costs, with a remarkably increased flexibility. The capacity to restage, for as many times as necessary, an aerial mission, during the same day or in various seasons, taking advantage of different light conditions, various stages of vegetal growth, presence or absence of melting snow or humidity in soil

(in order to detect contrasts of thermic gradient caused by buried archaeological vestiges), from various altitudes and with different shooting angles, in visible or near infrared spectrum or with magnetic sensors, recommend UAVS as highly adjusted to archaeological applications. Recorded data come directly from sensors and may be processed differentially, with the purpose of detecting archaeological structures or for the creation of 3D digital models of the terrain.

The author will present technical information regarding building UAVs for various archaeological applications, discussing the limits of the method and its further developments, using results from various personal archaeological projects in Romania.c

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#### POSTER

### 9. GEOPHYSICAL SURVEY ON ?EL MAZO DE LA CASTAÑERA? (CANTABRIA, SPAIN): LOOKING FOR OPEN-AIR DOMESTIC REMAINS

*Carmona Ballester, Eduardo - (Universidad de Burgos) edu-carmonaball@gmail.com*

*Vega maeso, Cristina - (Universidad de Cantabria) cvega-maeso@gmail.com*

*López Jiménez, Oscar - (GIPSIA SL) oscarlj@gipsia.com*

*Martínez calvo, Victoria - (GIPSIA SL) gipsia.sl@gmail.com*

The work is focused on a geophysical survey developed on *El Mazo de la Castañera* (Cantabria, Spain) where there are located 7 caves with archaeological remains from Paleolithic to Early Middle Age. On one of them, *El Abrigo de la Castañera*, it has been conducted a research project directed by one of us (CVM). In fact, this site is the only one that provided a well contextualized data which have proved an intensive occupation during Chalcolithic and Bronze Age. The mentioned research project aimed to explore the potential archaeological record located on the nearby of the *Abrigo de la Castañera*. Especially data about open-air habitat were necessary because there is a notorious absence of this kind of sites on Cantabrian region. The lack of habitats is linked to the low visibility of archaeological remains related to peasant communities from recent Prehistory (post holes, pits, thin deposits, etc.). These kind of remains are difficult to detect with traditional survey because the environment has permanent vegetation coverage. In consequence, a different method should be employed.

In order to achieve this goal a geophysical survey was

requested to GIPSIA SL. To get data the procedure employed was an inductive electromagnetic survey. We worked on a 9 ha area that it was divided on 6 different zones (M1 to 6). The data and its interpretation are presented by georeferenced surface maps. These maps provided images of some anomalies after we have analyzed and processed the data. The aim of this method is to distinguish evidences of abnormal accumulations integrated into non-anthropogenic sedimentary soils. There are two types of maps where results are expressed: Electric conductivity and magnetic susceptibility.

The results show several potential evidences. More precisely, there are traces of anomalies which have some kind of geometrical design or sedimentary filling with archaeological potential. The detection of non-angular structures, with low intensity, is pretty difficult. Therefore, we had to present the results with high contrast in order to observe these traces. The results were different between zones. The most interesting were located in M1, M4 and M6. They show circular anomalies, with several sizes, that are grouped in some specific areas. It was also documented huge sedimentary packages with a high archaeological potential in several cave mouths.

The anomalies detected suggest that it's possible to find archaeological structures related to open-air domestic zones in the future. The research has documented several "hot spots" where we will focus the next phase. This is an important point: the geophysical survey has allowed to detect non-visible evidences to traditional methods and to take decisions to design the next research strategies.

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#### POSTER

### 10. ELECTRICAL RESISTIVITY TOMOGRAPHY (ERT) GEOPHYSICAL PROSPECTION AROUND THE CAVES OF OJO GUAREÑA COMPLEX (MERINDAD DE SOTOSCUEVA, BURGOS, SPAIN)

*Bermejo, Lucía - (EPEH Escuela Interuniversitaria de Posgrado en Evolución Humana, C/ Don Juan de Austria, nº 1, 09001 Burgos, Spain / CENIEH Centro Nacional de Investigación sobre Evolución Humana (CENIEH). Paseo Sierra de Atapuerca 3, 09002 Burgos, Spain) lucia.bermal@hotmail.com*

*Ortega, Ana Isabel (CENIEH, Centro Nacional de Investigación sobre la Evolución Humana, Paseo Sierra de Atapuerca 3, 09002 Burgos, Spain - GEE, Grupo Espeleológico Edelweiss, Diputación Provincial de Burgos, Paseo del Espolón 34, 09001 Burgos, Spain) anaisabel.ortega60@gmail.com*  
*Guérin, Roger (Sorbonne universités, UPMC Univ Paris 06,*

UMR 7619, METIS, F-75005, Paris, France) roger.guerin@upmc.fr

Parés, Josep María (CENIEH, Centro Nacional de Investigación sobre la Evolución Humana, Paseo Sierra de Atapuerca 3, 09002 Burgos, Spain) josep.pares@cenieh.es

Benito-Calvo, Alfonso (CENIEH, Centro Nacional de Investigación sobre la Evolución Humana, Paseo Sierra de Atapuerca 3, 09002 Burgos, Spain) alfonso.benito@cenieh.es

Martín, Miguel Ángel (Grupo Espeleológico Edelweiss, Ex-cma. Diputación Provincial de Burgos, C/Paseo del Espolón s/n, 09071, Burgos, Spain. mamartinmerino@gmail.com

Aracil, Enrique (Análisis y Gestión del Subsuelo, S.L. c/ Luxemburgo, 4; portal 1, oficina 3; 28224-Pozuelo de Alarcón, Madrid, Spain) e.aracil@ags-geofisica.com

Maruri, Unai (Análisis y Gestión del Subsuelo, S.L. c/ Luxemburgo, 4; portal 1, oficina 3; 28224-Pozuelo de Alarcón, Madrid, Spain) u.maruri@ags-geofisica.com

Porres, J.A. (Área de Ingeniería del Terreno. Dpto. de Construcciones Arquitectónicas e I.C.T. Escuela Politécnica Superior. Universidad de Burgos, 09001 Burgos, Spain) caict@ubu.es

Ojo Guareña is one of the largest cave complex in Spain, consisting of a total of 110 km of 14 interconnected cavities, which has an impressive record of Prehistoric activities from the Middle Paleolithic until the Iron Age. The diversity and variety of the sites include, among others, living areas in cave vestibules, rock art, human bones, grave goods, archaeological objects inside several passages and more than 600 prehistoric human footprints (Ortega et al., 2013). In 1970 this complex was listed as Spanish Cultural Heritage and in 1996 as Castilla y León Natural Heritage.

Exploration Tomography was carried out in Ojo Guareña karstic Complex in order to better identify the morphology of caves entrances and passages containing archaeological remains. This geophysical survey was sought to study Kaite and Palomera Caves, both of which have sheltered human occupation at least since Upper Palaeolithic according to the archaeological prospection data (Ortega and Martín, 1986). Fieldwork consisted in the elaboration of Electrical Resistivity Tomography (ERT) profiles of different lengths and arrays. The data provided by 4 ERT profiles have detected and characterized the cave entrance sedimentary thickness and the so far unknown endokarstic morphologies filled with terrigenous sediments. This work helps us to better understanding the entrances of this large karstic system in relation with the use of caves, and to estimate the presence of new infilling archaeo-sedimentary records.

POSTER

## 10. USING RADAR- AND MULTISPECTRAL REMOTE SENSING TO DELINEATE PALEO-LAKE-LEVELS IN THE LAKE MANYARA BASIN BACHOFER, FELIX - (UNIVERSITY OF TUEBINGEN) FELIX.BACHOFER@UNI-TUEBINGEN.DE

Quénéhervé, Geraldine - (University of Tuebingen) geraldine.queneherve@uni-tuebingen.de

Märker, Michael - (Heidelberg Academy of Sciences and Humanities) michael.maerker@geographie.uni-tuebingen.de

Hochschild, Volker - (University of Tuebingen) volker.hochschild@uni-tuebingen.de

The surroundings of Lake Manyara in northern Tanzania are the focus of several paleo-archeological investigations, since the location is close to Olduvai Gorge, where paleo-anthropological findings can be traced back to *homo habilis*. In the catchment of Lake Manyara two hominin-bearing sites (0.63 and 0.78 Ma), lots of vertebrate fossils and handaxes from different periods were found (Frost et al., Journal of Anthropological Sciences, vol. 90, 2012). Understanding the development and extent of the lake is crucial for understanding the regional paleo-environmental settings of the Quaternary. The oldest lacustrine evidence are the so called lower Manyara Beds (about 1.03 to 0.633 Ma) which are exposed close to the town of Makuyuni (Schwartz et al., Quaternary Geochronology, vol. 7, 2011) and thereby in a distance of more than 27 km to today's shoreline. Casanova and Hillaire-Marcel (Quaternary Research, vol. 38, 1992) documented more recent evidence for paleo-lake highstands. They applied <sup>14</sup>C and Th/U series dating on stromatolites which can be found at paleo-shorelines in a shorter distance to today's Lake Manyara. They identified ages up to 90,000 BP and one uncertain age of 140,000 BP.

To delineate the sediments of the Pleistocene Manyara Beds we used multispectral ASTER scenes (23.08.2006; VNIR & SWIR) to calculate mineral indices with relative band depth techniques. The results were validated with WorldView-2 high resolution satellite data and field reference. For the delineation of the paleo-shorelines we applied radar remote sensing, as well as terrain analysis methods to contribute to a better understanding of the development of the lake. We used the Next ESA SAR Toolbox (NEST) for the processing six TerraSAR-X Stripmap scenes (Level 1B; Polarization: HH and HH/VV). Each scene was terrain corrected and backscatter intensity (sigma nought) was processed. While the paleo-shorelines are hardly noticeable in optical remote sensing im-

ages, their morphological structure is highlighted by an intense backscatter signal. For the successful extraction of the linear paleo-shorelines and terraces a canny filter was implemented in a Python-script. For the resulting lines the corresponding elevations were extracted from a SRTM-X digital elevation model (30 m resolution) data covering nearly the whole Manyara Basin.

The Lower Manyara Beds were successfully delineated with ASTER multispectral data. Several distinct paleo-shorelines were detected with height levels between 10 m and 80 m above today's lake level of Lake Manyara. The results coincide to a high degree with field reference data collected during four field campaigns.

With multispectral band rationing techniques it was possible to extract the maximum visible extent of the Lower Manyara Beds and therewith a preliminary maximum lake level which is located more than 27 km east of today's shoreline. With TerraSAR-X images paleo-shorelines were successfully detected, which could not be delineated in detail by optical remote sensing techniques. The most elevated paleo-shoreline is with an elevation of 80 m above today's lake level on the same elevation as the lowest possible outlet of the endorheic Lake Manyara. Therefore an overflow into the neighboring Lake Engaruka and Natron / Magadi basins seems likely.

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## POSTER

### **12. THE POTENTIAL OF MAGNETOMETRY TO SURVEY IBERIAN SETTLEMENTS: REVEALING THE HIDDEN URBANISM OF "LOS VILARES" (CAUDETE DE LAS FUENTES, VALENCIA)**

*Cuenca-Garcia, Carmen – (1 Laboratory of Geophysical - Satellite Remote Sensing and Archaeoenvironment (GeoSat ReSeArch), Institute for Mediterranean Studies, Foundation for research and Technology, Hellas (FORTH)) carmen@ims.forth.gr*

*Sarris, Apostolos - (1 Laboratory of Geophysical - Satellite Remote Sensing and Archaeoenvironment (GeoSat ReSeArch), Institute for Mediterranean Studies, Foundation for research and Technology, Hellas (FORTH)) asaris@ret.forthnet.gr*

*Consuelo Mata Parreño (Department of Archaeology, University of Valencia) consuelo.mata@uv.es*

This poster shows the results of a magnetometer survey carried out at 'Los Villares', an Iberian site located in a hill-fort near the municipality of 'Caudete de las Fuentes', in the Utiel-Requena district (Valencia, Spain). The aim of

the survey was to map the extent of buried structures in the area using non-invasive methods. The project is a collaboration between GeoSat Research (Greece) and the department of Archaeology of the University of Valencia (Spain).

The site has been identified as the ancient city of Kelin, where its extensive chronology expands from the beginning of the Iron Age (about 680 B.C.) to iberoroman times (75 B.C.). Kelin became the capital of a large Iberian territory and developed its own coinage (II century B.C.). Some studies have suggested that the site was destroyed as a result of a corrective measure applied by Rome to those Iberian cities that supported the defeated Sertorian side during the civil war. The twenty three excavation campaigns carried out by the University of Valencia between 1956 and 2002 have focused on two main areas at the site containing a number of houses, covering a total of approximately 1000 m<sup>2</sup>. The excavations retrieved a great deal of findings relating to the economy of the community living at Kelin as well as the recording of several phases of the internal structure and architecture of the excavated houses.

A magnetometer survey was undertaken by a team of three people over two days in December 2013, using a single fluxgate gradiometer Bartington 601. Ten survey grids of 20x20m were recorded covering approximately 4.800 m<sup>2</sup>.

The survey revealed a series of both strong magnetic responses and linear negative magnetic anomalies which seem to indicate the location of square and rectangular houses. These structures cover the whole area surveyed and seem to be distributed along a series of perpendicular and longitudinal negative or weakly positive magnetic responses which may show the distribution of roads or perimetral walls. The intensity of the strong magnetic anomalies may be associated with substantial burnt features such as mud-brick walls or other structural materials of the houses. This interpretation would seem to agree with the possible final destruction of the site. Other linear negative magnetic anomalies may be produced by the mud-brick walls that were not affected by the fire or the contrast produced by stone foundations of the houses.

The approach used in this study has proved the great potential of magnetometer survey to map the urban layout of Iberian sites with a final destruction phase in a non-invasive and cost-effective manner. Two days' survey and a small team were enough to get a complete view of the

buried structures at the site and therefore, an approximation of how Kelin looked like before its destruction. Further work intends to implement other geophysical techniques at the site to complement the magnetic results in the non-excavated area. For example, ground-penetrating radar may provide further details on some of the internal structures or information about the depth of burial of the structures.

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POSTER

**13. AFFORDABLE, LOW-COST TECHNIQUES FOR THE DOCUMENTATION OF CULTIVATION STRUCTURES IN THE ARID ATACAMA AREA (N. CHILE)**

*Parcero-Oubiña, César - (Instituto de Ciencias del Patrimonio (Incipit), Spanish National Research Council (CSIC), Spain) cesar.parcero-oubina@incipit.csic.es*

*Güimil-Fariña, Alejandro - (Independent researcher) alejandro.guimil.farina@gmail.com*

*Mañana-Borrazás, Patricia - (Instituto de Ciencias del Patrimonio (Incipit), Spanish National Research Council (CSIC), Spain) patricia.manana-borrazas@incipit.csic.es*

*Fábrega-Álvarez, Pastor - (Instituto de Ciencias del Patrimonio (Incipit), Spanish National Research Council (CSIC), Spain) pastor.fabrega-alvarez@incipit.csic.es*

*Borie, César - (Departamento de Antropología, Universidad de Chile) cesarborie@gmail.com*

*Pino, Mariela - (Departamento de Antropología, Universidad de Chile) marielitapino@gmail.com*

*Hayashida, Frances - (Department of Anthropology, University of New Mexico, USA) frances.hayashida@gmail.com*

*Salazar, Diego - (Departamento de Antropología, Universidad de Chile) maaconsultores@gmail.com*

*Troncoso, Andrés - (Departamento de Antropología, Universidad de Chile) atroncoso@gmail.com*

The poster will summarize the methodological process for the detailed documentation of a vast complex of late Prehispanic agrarian elements (fields, irrigation canals) in the Atacama Desert (northern Chile). As opposed to the usual conditions for prospection in temperate regions, where the visibility of archaeological features is usually poor and confusing, here the extreme dryness of the landscape allowed an extraordinary preservation and visibility of fields, canals and other constructions.

The approach was initially based on a combination of visual interpretation of high resolution satellite images (GeoEye 1) and fieldwork for mapping the layout and shape of most of the elements (canals, groups of fields, settlement areas). For the accurate documentation of

smaller or densely built areas, an SFM-based photogrammetry approach was carried out, based on the use of a low cost UAV (Dji Phantom) and a consumer-grade compact digital camera for the acquisition of low altitude aerial images that allowed the generation of 3D models and orthoimages of some areas. Finally, ground based photogrammetry was also used to capture and represent some elements in greater detail.

The main result has been the construction of a highly detailed and accurate map of a complex group of archaeological structures, which has been used since for the analysis and interpretation of the area, and also for the design of new fieldwork seasons.

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POSTER

**14. USING AIRBORNE LASER SCANNING AND HISTORICAL AERIAL PHOTOS TO IDENTIFY MODERN AGE FORTIFICATIONS IN THE MINHO VALLEY, NORTHWEST IBERIA**

*Blanco-Rotea, Rebeca - (Technological Research Institute, Santiago de Compostela University, Edificio Monte da Condesa, USC Campus Sur, 15782, Santiago de Compostela, Spain) rebeca.blanco.rotea@gmail.com*

*Fonte, João - (Institute of Heritage Sciences (Incipit), Spanish National Research Council (CSIC), San Roque 2, 15704 Santiago de Compostela, Spain) joaofonte@gmail.com*

*Güimil-Fariña, Alejandro - (Independent researcher) alejandro.guimil.farina@gmail.com*

*Mañana-Borrazás, Patricia - (Institute of Heritage Sciences (Incipit), Spanish National Research Council (CSIC), San Roque 2, 15704 Santiago de Compostela, Spain) patricia.manana-borrazas@incipit.csic.es*

In the Institute of Heritage Sciences (Incipit), Spanish National Research Council (CSIC), we have developed a transdisciplinary research project to study the Modern Age (17<sup>th</sup> century) fortified landscapes in the Galician-Portuguese border. In recent years, different techniques based on geospatial technologies for landscape analysis have allowed us, among other things, to identify and visualize some of these fortifications, to analyse their conservation status and to understand their relationship with other fortified elements. Among these techniques, we include the photogrammetric restitution of historical aerial photos and airborne laser scanning data.

The research of this fortified landscape was based on documentary and bibliographic sources, archaeologi-

cal prospection, architectural survey, photo-interpretation, the formal analysis of archaeological space, where we include the movement and perception analysis, the stratigraphic analysis or the use of a number of representation systems.

Many of these fortifications from the Minho valley present significant conservation problems, since in some cases they are built on earth, wholly or partially destroyed after the war or hidden under dense vegetation. Some of these fortified structures were identified in the documentary sources, but are not visible nowadays or in the field or even on recent aerial photos. In these cases, the archaeological work has been done with the photo-interpretation of historical aerial photos from the 1950s and the use of airborne laser scanning data.

This poster will summarize the workflow and results of the application of these geospatial technologies to the Galician-Portuguese border fortified landscape. For our purposes, the application of airborne laser scanning data has allowed us to identify the archaeological features that were hidden by vegetation. We were then able to document the exact location of some fortifications, to check their condition and, above all, to make them visible, enhancing the visualization of certain structures. Similarly, the use of historical aerial photos, has allowed us to identify some fortifications that are now disappeared, or to check the deterioration that many have suffered from the 1950s to the present.

The landscape is a complex construction in which different meanings, different human actions and various historical layers intersect on a natural space. For its identification, documentation and assessment is necessary to use multidisciplinary approaches and to apply different tools. In this case, conventional archaeological work has been combined with other strategies that have improved our understanding of the Galician-Portuguese border fortified landscape, recovering the memory of some of the fortifications that form part of it and that were apparently lost.



# A13 Quality Management of Cultural Heritage: problems and good practices

Commission on Prehistoric and Protohistoric heritage sites management  
(Organiser: M. Quagliuolo)

Tuesday 2nd (9:00 to 13:30)  
Meeting Room: B02



2014 burgos  
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ORAL

## 1. QUALITY MANAGEMENT AT WORLD HERITAGE PREHISTORIC AND PROTOHISTORIC SITES: CHALLENGES

*Quagliuolo, Maurizio (HERITY International) herity@dri.it*

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ORAL

## 2. LA DESTRUCCIÓN DEL PAISAJE EN MURUJUGA (AUSTRALIA OCCIDENTAL)

*González Zarandona, José Antonio - (Universidad de Melbourne) jose.gonzalez@unimelb.edu.au*

Murujuga (Australia Occidental) está considerado como el sitio arqueológico más grande del mundo. Murujuga forma parte del archipiélago Dampier y ha sido objeto de estudio de algunos de los más ilustres arqueólogos en Australia e incluso de Francia. Según algunos de estos expertos, el área contiene más de un millón de grabados. No obstante, desde la década de los años sesenta, este paisaje cultural se ha visto afectado por el establecimiento de diversas compañías, en su mayoría mineras, que han transformado el paisaje y destruido algunos de los grabados únicos que se encuentran al aire libre. Desde entonces la perspectiva común sobre Murujuga ha sido desmantelada por los diversos grupos que reclaman propiedad sobre el área.

Desde hace una década, diversas gestiones del patrimonio se han visto introducidas para poder minimizar el impacto que las compañías le han asestado al paisaje. Algunas de estas gestiones han involucrado a los habitantes de la región, mientras que la gran mayoría de las iniciativas y exploraciones arqueológicas han denigrado y desestimado el valor social que la comunidad indígena tiene sobre el lugar. Los métodos y teorías que se han desarrollado no han sido suficientes para poder explicar y prevenir el daño que las compañías y el neocolonialismo le han inflingido a Murujuga. Por lo tanto, es necesario reseñar los métodos hasta ahora implementados para poder dislumbrar una solución a este conflicto.

Murujuga es al mismo tiempo un sitio arqueológico, un lugar sagrado, un parque nacional y la base de media docena de compañías. En conjunto representa diversos significados a nivel social, cultural y económico. Hasta el momento no existe un solo plan de gestión cultural que se adecúe a las necesidades de todos los involucrados: industria, arqueólogos, población indígena y turismo. No obstante, los estudios hasta ahora realizados han ar-

rojado diversos resultados, los cuales apuntan a la importancia de este sitio arqueológico como el más grande del mundo. Así mismo, la variedad de estilos y técnicas de grabado ponen de manifiesto el valor patrimonial de Murujuga.

Murujuga sólo podrá ser gestionado de manera favorable si se aplican los principios que prevalecen en la Carta de Burra (1999). No obstante, los cuatro valores que definen a un sitio patrimonial (estético, científico, histórico y social) han sido desplazados en favor del valor económico que el área representa para el puñado de compañías que están establecidas en Murujuga. El futuro para este sitio arqueológico sigue siendo incierto y hasta el momento sólo unas cuantas personas están trabajando para que Murujuga sea reconocida a nivel mundial, como uno de los sitios Patrimonio de la Humanidad.

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ORAL

## 3. ATAPUERCA, UN SISTEMA DE GESTIÓN EN RED

*Vicente Domingo, Javier - (ExDirector Gerente del Sistema Atapuerca) javiervicentedomingo@gmail.com*

Los descubrimientos de la Sierra de Atapuerca y el afán divulgador del Equipo Investigador han generado un flujo visitantes.

El modelo de gestión es un modelo en red, cuyo epicentro son los Yacimientos Patrimonio Mundial, complementado en un radio de quince kilómetros por una red de centros.

Esta red se sustenta en la conjunción de la actividad pública y la iniciativa privada: la primera representada por la Junta de Castilla y León, y la segunda por el Equipo Investigador

El Sitio arqueológico:

La Sierra de Atapuerca contiene vestigios fósiles de los primeros seres humanos que se asentaron en Europa y constituye una fuente excepcional de datos sobre el modo de vida de nuestros antepasados. Esta descripción inspira los argumentos del programa de visitantes:

- Agua y cuevas: el karst de Atapuerca
- Hábitat y paisaje de la Sierra
- El azar de los hallazgos
- El proyecto científico
- Atapuerca, enciclopedia de la evolución... 1,3 millones de años de ocupación

Desarrollo didáctico:

- Los argumentos se actualizan con nuevos descubrimientos y como los guías han excavado se expresan

como protagonistas de los hallazgos

- Las visitas son gestionadas por la Fundación Atapuerca

Infraestructuras públicas:

- La Administración regional garantiza la protección del Sitio mediante instalaciones de recepción y vigilancia.
- Dicha Administración y los Municipios más próximos a la Sierra facilitan el flujo de visitantes mediante dos Centros de Recepción y un Parque Arqueológico.
- En la ciudad de Burgos se localizan dos grandes infraestructuras: el CENIEH y el MEH.

Infraestructuras privadas:

- La Fundación Atapuerca tiene su sede operativa en Ibeas de Juarros.

Marco regulador:

Atapuerca dispone de marco normativo propio:

- Figuras de protección patrimonial: los Yacimientos son BIC desde 1991 y su entorno es Espacio Cultural desde 2007.
- La figura de gestión integrada de los centros en red: el Sistema Atapuerca creado en 2009.

El reto de la gestión equilibrada: problemas y soluciones. La gestión de visitas tiene en cuenta las directrices de UNESCO (mantener un equilibrio adecuado entre la conservación, la sostenibilidad y el desarrollo social), pero el equilibrio no es aún perfecto:

- La conservación: No plantea especiales problemas, porque el acceso a las excavaciones está restringido a los investigadores. Las restricciones a la visita son de dos tipos:
  1. Número máximo/día (2.000 visitantes) en determinadas fechas.
  2. La climatología.
- La sostenibilidad: el modelo de centros en red facilita este objetivo por el efecto 'bombeo' de visitantes entre Yacimientos-Parque Arqueológico y el MEH. Los ingresos cubren el 40% de costes.
- El elevado índice de autofinanciación no revierte al sistema.
- El desarrollo: este factor persigue que los bienes del Patrimonio Mundial puedan generar actividades que contribuyan al desarrollo de las comunidades del entorno.
- A este respecto, en el territorio se opina que la gestión de visitantes aporta muy poco al desarrollo económico local.

Conclusión

- La gestión no se circunscribe al Sitio sino que se extiende a todos los centros del sistema, lo que plantea

problemas de coordinación.

- Es positivo que la Administración regional delegue la gestión de visitas en la Fundación Atapuerca, pero lo hace bajo unas pautas rígidas de funcionamiento.
- Para la captación de visitantes es esencial la existencia de un Equipo Investigador que permita mostrar Atapuerca como un campo de trabajo de excelencia científica.
- El mapa de infraestructuras está completado.

ORAL

#### 4. PERCURSO DOS MUSEUS DE ANGOLA, AS PERSPECTIVAS E SUA CONTRIBUIÇÃO NO DESENVOLVIMENTO DO PAÍS-MUSEU NACIONAL DE ARQUEOLOGIA-BENGUELA)

*Paulo Valongo Luiz Oosterbeek, loost@ipt.pt*

ORAL

#### 5. ARCHAEOLOGICAL RESEARCH AND LAND - ART FOR PUBLIC ARCHAEOLOGY IN A FINAL BRONZE AGE HILLTOP SETTLEMENT OF CASTELO VELHO DA ZIMBREIRA (MAÇÃO-PORTUGAL)

*Delfino, Davide - (Instituto Terra e Memória (ITM Mação); Câmara Municipal de Abrantes; Grupo do Quaternário e Pré-história do Centro de Geociências da UC, CGeo) davdelfino@gmail.com*

*Gheorghiu, Dragos - (Doctoral School, National University of Arts (Bucharest) Instituto Terra e Memória, I.T.M.-Mação) gheorghiu\_dragos@yahoo.com*

Since 2010, the Land and Memory Institute and Museum of Prehistoric Art in Mação has developed a research about the occupation of the territory and the inhabited dynamics in the Final Bronze Age, particularly focused on Castelo Velho da Zimbreira and its relations with the landscape. A prior collaboration in 2009 with the National University of Arts in Bucharest, which resulted in a land art designed to simulate the two wall lines of the settlement, was continued in 2013 within the cooperation in the TimeMaps project ([www.timemaps.net](http://www.timemaps.net)).

The settlement consists of two terracing walls set on a hill with a 360° panorama over a vast territory. The settlement belonged to a series of synchronical hilltop settlements, all set at strategic points along a quartz belt that defined a specific territory. The purpose of the art intervention was 1) to see the visual impact of the walls from the territory, 2) to delimit the area of the settlement, 3) to transmit the in-

formation to the public with the help of the Land Art. This Public Archaeology action to highlight the archaeological structures with a temporary and non invasive performance was followed by the stimulation of the local community which become aware of their heritage. For example, an experiment with fire carried during the nighttime, to observe the intervisibility between the various settlements, offered a new a dimension of the sites and attracted various audience (120 people in one night); old local people are also protagonist, telling various legend site-related. Another strategy will be to bring to life the ancient structures by creating a series of 3D reconstructions as Android applications, so that tourists could view them during visit at the site or when visiting TimeMaps, the European platform.

The involvement of a various public is possible in a direct way (as Master's and doctoral students, the local community members of different age ranges, and local officials), and in an indirect way (as tourists and passing motorists from the nearby highway who have at least noticed the Land Art on the settlement and posted it on various blogs). This as shown that even in areas of apparently no tourist attraction it is possible to keep alive the memory and the function of archaeological monuments by combining the results of archaeological research with art.

Protecting an archaeological monument is not just preventing it from being destroyed. It also means preventing it from being forgotten. The experience of Land Art in 2009 and current TimeMaps experiments show that is possible to bring to life a Bronze Age settlement by to the eyes or the local community, by combining science and art

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ORAL

**6. CONSERVATION, PRESERVATION AND SITE MANAGEMENT AT THE NEANDERTHAL SITES AT VELDWEZELT-HEZERWATER, BELGIUM**

*Bringmans, Patrick M.M.A. - (The 'Veldwezelt-Hezerwater' Neanderthal Research Centre - Belgium)*  
*Patrick.Bringmans@hotmail.com*  
*Vermeersch, Pierre M. (Catholic University Leuven - Belgium)*

The Hezerwater valley, in the brickyard quarry at Veldwezelt-Hezerwater (Lanaken, Province of Limburg, Belgium), had been an advantageous location for Neanderthal settlement throughout the late Middle and Late Pleistocene. In order to deal with the expected archaeological finds in a structured way, the 'Veldwezelt-Hezerwater Middle Palaeolithic Project' was started by the Laboratory of Prehistory – Catholic University Leuven. During the 1995-2003 period, several stratigraphically separated Ne-

anderthal sites were excavated. Each year an 'open-day' was organized for the general public. In total, more than 10,000 people paid a visit to the Veldwezelt-Hezerwater excavations. The massive response of the general public started the process of making the archaeological sites accessible on a permanent base.

Once the decision had been made to go beyond conserving the Veldwezelt-Hezerwater sites in situ, the choice had to be made as to the nature and extent of the enterprise undertaken. Any disturbance of or alteration to the site would compromise its integrity and would inevitably destroy contextual information. An adequate infrastructure would have to be developed. Properly planned modern walkways could lessen the deleterious effects of increased foot traffic through the site, avoiding climbing, sitting, or standing on remains. Important milestones in the development of the heritage site were: (1) the successful excavations, (2) the opening of 'The Neanderthal-Road' on September 10, 2006, (3) the fact that the site became a listed archaeological monument on December 7, 2007, (4) the presentation of the heritage plan in 2009, (5) the decision by the Flemish Government to grant a major subsidy for the development of the site on August 28, 2013, (6) the start of the project in February 2014 and finally (7) the opening of the heritage site in the summer of 2014.

As the process of discovery is one of the most important aspects of on-site experiences, the visitors of Veldwezelt-Hezerwater do not get an instant overview of the site when they enter. Instead they gradually discover the site by following different routes. The path itself has a continuous clear width and a smooth surface, which has no steep gradients. The insertion of information panels and railings was carefully designed. Given the necessity of bridging great differences in altitude the visitor gradually goes 'back in time'. The story that is told, is that of the Neanderthals. In addition to the main storyline, there are also other themes, including the development of the landscape, climate change and aspects of palaeoanthropology. The preservation of the original quarry walls and surfaces, is realized by means of roof constructions, which are integrated into the surrounding landscape. However, these structures, which give a specific character and identity to the Veldwezelt-Hezerwater site, are visible from the surrounding landscape, and take a 'landmark-function'.

The massive response of the general public to the archaeological excavations at Veldwezelt-Hezerwater resulted in the creation of a heritage site. The preservation of the original quarry walls and surfaces, was realized by

means of roof constructions, which were integrated into the surrounding landscape.

ORAL

## 7. ARCHAEOLOGY BETWEEN RIVERS AND INTEGRATED MANAGEMENT OF TERRITORY - EXTREME SOUTH OF SANTA CATARINA, BRAZIL

*Bitencourt Campos, Juliano - (UNESCO) jbi@unesco.net*

*Zocche, Jairo José - (UNESCO) jjz@unesco.net*

*Pereira Santos, Marcos César - (UNESCO)*

*marcoscesar@unesco.net*

The use and management of natural resources by pre-historic human groups resulted in a range of landscape and material remains that partly reveal their daily life.

This presentation aims to show the results of the studies fulfilled in the research project "Archaeology between rivers: From the Urussanga to the Mampituba", developed by the group Pesquisa Arqueologia e Gestão Integrada do Território of the University of the Extreme South of Santa Catarina. We intend to understand how prehistoric and historic human groups, living and permeating in the region, have interacted with the settled spaces and its social consequences.

The investigated area covers a polygon of 4800 km<sup>2</sup> (80 x 60 km), located in southern Santa Catarina between the mouths of the rivers Urussanga and Mampituba and between the Atlantic Ocean and the mountain formations (Aparados da Serra).

ORAL

## 8. COMMUNICATION STRATEGIES OBSERVED IN PORTUGUESE PRESS TO SAVE ROCK ART OF VILA NOVA DE FOZ CÔA (PORTUGAL)

*Bellmunt, Cinta - (IPHES - Institut Català de Paleoecologia Humana i Evolució Social, Tarragona, Spain) cbellmunt@iphes.cat*

Several unusual factors made possible the conservation of Foz Côa's rock art engraved, currently Human Heritage. In this valley, in 1994, it was building both a hydro-electric power station and a reservoir that could have submerged the archaeological heritage: the ensemble of rock art engraved most important in the world.

Luckily, the capacity of a group of researchers, the archaeologists, managed to mobilize different powers and

to build different international alliances. They strengthened their power of influence against politics.

Furthermore, a great social dynamic occurred. The school of Vila Nova of Foz Côa started a protest movement never seen before in Portugal. The Prehistory became the favourite subject of the children. A lot of activities were organized to save the engravings and they received support from everywhere. The Portuguese society, in general, was mobilized also. The case became a national problem and the head of the state went to Foz Côa. Mário Soares understood the value of the engravings and short time later the constructions were stopped definitely. It was the only time in the history that a reservoir was stopped, even the construction was in progress, to make finally an archaeological park. The action of the Portuguese government was very rare.

The media impact was very important. The journalists were very involved. From the beginning they paid attention to the issue. The archaeologists turned into their principal source of information because they didn't hide the information, contrary to the electricity company, who hidden it. The exceptional value of the engravings was the argument most used and the recognition of international organizations corroborated it.

The media has a function very important but it wasn't the unique reason. In this work we review the different factors involved and the strategies of communication used to save the engravings.

The materials analysed are the contents of 150 news published in the Portuguese press between November 1994 and December 1995, the later was the year of the conflict. This has been complemented with personal interviews to protagonists and experts.

The objective it was to observe in the Portuguese press the strategies of communication utilized to stop the construction: protagonists, arguments, point of view in the news, etc.

POSTER SESSION

POSTER

**9. QUALITY MANAGEMENT OF CULTURAL HERITAGE: PROBLEMS AND GOOD PRACTICES ARE REPLICAS UNDERESTIMATED OR OVER-RATED? THE EXPERIENCE THROUGH ANALYSES OF MAGDALENIAN PORTABLE ART.**

*Avila Filho, Roberto - (Universitat Rovira i Virgili / Muséum national d'histoire naturelle) robertt.avila@gmail.com*

The nineteenth century conceded to the museums much of the assignments we delegate to them today, organizing in the main European capitals collections of old cabinets and new acquisitions, coming from overseas colonies, the Mediterranean coast and the Near East. In which was considered the "golden" century of museums, these institutions were settled as places of scientific interest. The museums of the nineteenth century were recognized as centers of study and taught, getting tagged, not only by numerous and successive achievements regarding to the identification, classification and cataloging of items in their holdings, but also as institutions concerned with its conservation, safety and best presentation to the great public. A tradition got established and still remains; but to what extent?

The present communication arises as parentheses of a master thesis that intend to link two disciplines that should never be kept separate: archeology and museology. From the analysis of Magdalenian portable art collections of the Dordogne, France, some issues have emerged. The profile of these collections presents, in most cases, "moulages"; namely, replicas of pieces of prehistoric art often considered unique. Portable art artifacts require special care of scientific and museological character, according to its most peculiar condition: the pieces bear within themselves the symbolism and significance that the prehistoric man gave to their own objects and world. For obvious reasons of mechanical nature the original artefacts cannot be in several places at the same time and for purposes of conservatory nature, wherever as possible, the transport of the original pieces should be avoided, reasons why the manufacture of replicas is used since the dawn of archeology. Over recent years experts have appropriated computer graphic technology coming from other disciplines to record artifacts with the utmost precision and with the least budget as possible; however, not every ancient methods should be set aside, since the digitalization does not replace the playful action. Therefore, apart from being

part of the science history, casts can be considered one of the recording ways in prehistoric art, issue widely discussed until nowadays, mainly in light of technological advancements.

Thus, through this particular experience of the author and from the comparison between a sample of original pieces and their equivalent copies, this communication aims to expose the examination of the scientific value of the exhaustive analysis of replicas and the educational value from the exhibition of such casts to the public. Following the same thought, many museological/archaeological reflexions emerged on the behalf of numerous problems diagnosticated during the analyses.

The conclusions came, materially, as the enlightening for two questions: could experts use replicas in scientific research itself? Can the casts be used reliably in disclosing knowledge to the public?

POSTER

**THE DOCUMENTATION OF THE PICTOGRAMS IN THE MINE OF KRZEMIONKI OPATOWSKIE.**

*Grzelczyk, Maciej - (Institute of Archaeology, Cardinal Stefan Wyszyński University in Warsaw (master's student)*

*maciej\_100@interia.eu*

*Jakubczak, Michał - (Institute of Archaeology, Cardinal Stefan Wyszyński University in Warsaw (PhD student)*

*michal.jakubczak87@gmail.com*

*Arczynski, Tomasz - (Institute of Archaeology, Cardinal Stefan Wyszyński University in Warsaw (graduate)*

*arczynski.t@gmail.com*

*Jedynak, Artur - (The Archaeological Museum in Krzemionki (curator) artur.archo@krzemionki.info*

*Moko, Klaudia (Institute of Archaeology, Cardinal Stefan Wyszyński University in Warsaw (student)*

The flint mine of Krzemionki Opatowskie is one of the greatest prehistoric mining complex in Europe and one of the most known Polish archeological site. We would like to emphasize the aspect of this site, which until now seemed to be neglected in the scientific discourse, which are the pictograms performed with the use of charcoal.

The poster will be a presentation of the outcome of the project's first phase, which is concerned on charcoal pictograms of the mines walls. Some of them, called "objaniska", are the remains of lighting up torches, others were created with meaningfully. Our main concern is not the interpretation of those images, but the will to display problems which concern both documentation and con-

servation, along with the prospects and threats. A significant amount of the pictograms was destroyed during the construction of the touristic route, and most likely during the excavation of the shafts and corridors.

Currently it was possible for us to document over 60 pictograms. The second phase of the project, which started at the beginning of this year, will center upon creating new, precise plans of the undergrounds, because the only existing plans derive from the 60', and do not include almost half of excavated area of mine. Now we come up against new difficulties, which is the choice of adequate measuring techniques. In spite of using total station, creating plans is still difficult and time consuming procedure, because of the hard conditions occurring in the mine. At the same time high humidity, dusting and low corridors height, render impossible the use of 3d scanning. Our research is also an attempt to find the most preferable way, and a compromise between speed and precision in the documentation.

We hope, that accurate planigraphy and analysis of pictograms in the mine of Krzemionki Opatowskie, will allow a broader interpretation and deriving of the meaning.

# A14 The water as generator of networks

Commission on Theory and method in Landscape archaeology-Archeogeography  
(Organisers: Sandrine Robert, Felipe Criado Boado)

Friday 5th (9:00 to 13:00)  
Meeting Room B06



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ORAL

## 1. L'IMPORTANCE DES COURS D'EAU DANS L'ORIENTATION, LES DÉPLACEMENTS ET LES COLONISATIONS DES GROUPES DE CHASSEURS CUEILLEURS DU PALÉOLITHIQUE SUPÉRIEUR EUROPÉEN.

*Djindjian, François - (Université de Paris 1 Panthéon Sorbonne & CNRS UMR7041 Arscan) francois.djindjian@wanadoo.fr*

En Europe, les territoires géographiques sont cloisonnés par les massifs montagneux à travers lesquels les cours d'eau ouvrent des corridors ou abaissent des cols qui offrent des itinéraires de circulation aux groupes de chasseurs cueilleurs. Ces itinéraires sont en nombre limité car imposés par la géographie des bassins fluviaux.

Plusieurs exemples caractéristiques de voies de passage suivant des cours d'eau sont décrits ici:

- le passage de la haute-vallée du Danube au Rhin puis au Doubs et à la Saône par la porte de Bourgogne,
- le passage de la Saône à la Loire par la Dheune, la Bourbince et l'étang de Longpendu,
- le passage du bassin de la Saône au bassin de la Seine par la vallée de l'Ouche et l'Armançon,
- la colonisation du massif central par le Nord en remontant la Loire et l'Allier
- la circulation le long de la Saône puis du Rhône jusqu'à la mer et inversement en fonction des variations climatiques qui ferment le passage au niveau de l'extension maximale du glacier alpin du Rhône pendant le dernier maximum glaciaire,
- l'entrée et la sortie du bassin de Pannonie principalement par le Haut-Danube, l'Elbe, la porte de Moravie (Oder), la porte de Poprad, les portes de Fer, la Morava méridionale puis le Vardar, et la Save (col de Postjona),
- les voies de circulation à travers les bassins fluviaux de la Meseta espagnole,
- la colonisation septentrionale au Magdalénien supérieur par les vallées de la Meuse, du Rhin et de l'Elbe.

Les mêmes itinéraires de colonisation ont pu être utilisés dans un sens comme dans l'autre à différentes époques par différents groupes.

Les distances franchies dépendent de la superficie des territoires liés à la mobilité des groupes et à leurs systèmes de gestion des ressources alimentaires dans le cycle annuel. Pour les groupes de l'Aurignacien, du Gravettien et du Magdalénien, leur grande mobilité dans un territoire de plus de 500000 km<sup>2</sup> nécessite une connais-

sance intime de sa géographie et des moyens d'orientation par des amers qui sont des confluences de rivière et des reliefs caractéristiques.

Pour les groupes du Solutréen et plus généralement des industries du maximum glaciaire, leurs circulations estivales vers le Nord nécessitent de longs déplacements marqués par des bivouacs et des grottes ornées.

L'art pariétal en habitats d'abri sous-roche comme en grotte profonde joue un rôle de balisage et de marquage du territoire.

ORAL

## 2. LONG QUIET RIVERS? THE ROLE OF THE CORRIDOR RHINE-SAÔNE-RHÔNE IN THE SETTLEMENT DYNAMICS AT THE END OF THE UPPER PALAEO-LITHIC IN THE JURA ARC REGION.

*Béreiziat, Gérard - (UMR 5199 - PACEA - Université Bordeaux 1, avenue des Facultés, 33405 Talence 1)*

*gerald\_bereiziat\_web.de*

*Floss, Harald - (Eberhard Karls Universität Tübingen, Institut für Ur- und Frühgeschichte und Archäologie des Mittelalters, Abteilung Ältere Urgeschichte und Quartärökologie, Schloss, Burgsteige 11 D-72070 Tübingen ) Harald.Floss@uni-tuebingen.de*

Scene of an intensive occupation at the end of the last glaciation, the Jura Arc region has numerous testimonies of the passage of the last hunter-gatherers. The occupations, mostly in cave or under shelter, are situated in the specific geomorphologic environment between a mountainous context in the East and the natural axis of the Rhine-Saône-Rhône corridor in the West. If this fluvial corridor has been an important field of reflection for the historical periods, its impact is more difficult to argue for the Upper Palaeolithic due to the relatively recent interest in lithic raw material procurement and migration strategies.

Relating natural raw material sources to the archaeological sites, a techno-economical approach to the lithic material opens up to the spatial dimension of the Palaeolithic occupations. Several studies (Béreiziat, 2011, 2012; Floss, 2000, 2014; Hussain and Floss, *in press*, Terberger *et al.*, 2013) have already shown the importance of the fluvial axis for the diffusion of raw materials but a general comparative approach for the whole Jura Arc is still lacking. On the base of the results of the last 10 years of studies in an innovative research field, this communication aims

at showing the connections between the sites and natural raw material sources situated along the rivers Rhine, Saône and Rhône.

New reflections on these procurement strategies will be illustrated by the analysis of exogenous flints in the assemblies of the Jura Arc. The cases of Senonian (Côte chalonaise), Tertiary (Mont-les-Etrelles) and Bohnerzjaspis (Freiburg im Breisgau) flints put new lights on the modalities of this strong communication axis after the last glaciation.

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ORAL

### 3. LA GESTION DE L'EAU DANS LE CHEMIN DES TROUPEAUX DANS LE SUD DU BRÉSIL

*Herberts, Ana Lucia - (Scientia) scientia.ana@terra.com.br*

Le chemin des troupeaux est une route ouverte au XVIII<sup>e</sup> siècle pour faciliter le transport des du bétail, des chevaux et des mulets de leur lieu d'élevage vers les distributeurs, dans la région sud du Brésil. Cet article vise à analyser la gestion de l'eau dans la formation et l'utilisation de cette route.

Le développement de la recherche a été réalisé à travers l'application de stratégies méthodologiques mises en oeuvre dans l'analyse et l'interprétation du corpus documentaire et des vestiges matériels : recherche documentaire (sources écrites, cartographique et iconographique) dans diverses archives du Brésil et à l'étranger, prospection archéologique systématique d'un échantillon de tronçons du chemin, enregistrement des témoins archéologiques du Chemin et de ses structures routières sur une fiche spécialement élaborée à cette fin, application de la photointerprétation d'images de satellite, développement d'une base de données et structuration d'un Système d'Informations Géographiques (SIG).

La nécessité de trouver les endroits plus appropriés pour la traversée des cours d'eau a influencé le tracé de l'itinéraire de la route. Dans d'autres cas, pour échapper à la traversée des rivières principales, on a privilégié le passage par des petits ou grands affluents des bassins versants, ou des fonds peu profonds. La recherche de l'endroit idéal pour traverser le réseau hydrographique révèle des connaissances empiriques, nécessaires pour trouver les meilleures solutions. Les deux principales contraintes à prendre en considération étaient le relief et les caractéristiques du cours d'eau.

L'articulation entre la route et l'hydrographie locale passe aussi par la nécessité de construire des structures de drainage de type drains et fossés. Les fossés étaient associés à l'évacuation des eaux pluviales, tandis que les drains, aménagés dans les murs de pierres, permettaient le passage de l'eau de pluie. Dans le cas des couloirs formés par des murs de pierres, les structures de drainage ont double fonction : elles permettent l'écoulement des eaux, empêchant l'accumulation de l'eau et la de formation boue. Elles aident à la conservation des murs de pierre, évitant les risques d'altération de leur structure.

Les résultats obtenus ont permis de comprendre comment le Chemin des Troupes et les couloirs délimités par des murs de pierre ont été construits, en indiquant les variables environnementales, la fonction et l'utilisation des couloirs, l'origine de la technique de construction, la disponibilité de matière principale, la main d'oeuvre probablement employée et l'origine des sources de financement.

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ORAL

### 4. THE ORGANISATION OF LATER PREHISTORIC SETTLEMENT IN A FLUID LANDSCAPE: FARMERS AND SALT-MAKERS ON THE LINCOLNSHIRE FEN MARGIN.

*Chowne, Peter - (University of Greenwich) p.chowne@mac.com*

The Lincolnshire fen margin between Bourne and Sleaford is a narrow strip (2km) of fluvo-glacial sand and gravel bounded by limestone uplands to the west and fen sediments to the east. In this flat landscape variations in sea level have resulted in marine inundation and localised freshwater flooding as silts deposited in the fenland basin inhibited the natural drainage from limestone uplands. This process of marine silt deposition and freshwater peat growth continued until the drainage schemes of the 17th century and the landscape today provides some of the richest agricultural land in England. Today most of the surface peat has been lost to erosion and buried peats have above the water table are drying out. Formerly buried land surfaces are now exposed to agriculture and hitherto unknown prehistoric activity is entering the archaeological record.

Although this area has been subject to aerial photography, fieldwalking, dyke survey and excavation, particularly in the 1970s and 1980s (Hayes & Lane 1992), it is only with the recent availability of LIDAR data that a more

comprehensive understanding of how communities adapted to the changing landscape has become possible. Current research is focussing on mapping LIDAR and aerial photographic evidence using GIS and relating this to surface artefact collections and the pattern of natural drainage and how these systems were utilised in later prehistory. Several area excavations have been carried out within the study area and date from these investigations informs the mapping (Bell et al 1999; Chowne et al 2001; Lane & Trimble 2010).

The research, which is still in progress, suggests that a series of west-east flowing streams were significant landscape features around which a complex system of fields and settlement enclosures were laid out. Each of these streams are fed by springs some of which retained their significance in medieval and more recent times with one becoming a spa in the 19th century. In the early second millennium BC the point at which the streams enter the fenland became they were the focus for barrow cemeteries. In the early first millennium BC saltmaking begins, and by the late first millennium BC extensive agricultural settlements were laid out.

The fen margin was an environmental interface, a narrow strip of land subject to sea level change and freshwater flooding. Communities adapted the natural watercourses and created their own and within the mapped cropmark complexes we can identify a degree of planning in the layout of enclosures around principle ditches. Whether this relates to the marking of boundaries or properties or drainage/water supply will be discussed in the context of the surface artefacts. These include a metalwork concentration around one of the springs suggestive of a ritual element in the landscape.

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#### ORAL

### 5. HUMAN ENVIRONMENT CHALCOLITHIC CO-EVOLUTION IN THE FLOODPLAIN AREA OF BALTALALOMIȚEI (SOUTHEASTERN ROMANIA)

*Popovici, Dragomir Nicolae - (National Museum of Romania History) mirel\_d\_n\_p@yahoo.com*

*Haită, Constantin - (National Museum of Romania History) costel\_haita@yahoo.com*

*Bălășescu, Adrian - (National Museum of Romania History) abalasescu2005@yahoo.fr*

*Radu, Valentin - (National Museum of Romania History) valipeste@yahoo.com*

*Florea, Mihai - (National Museum of Romania History) mi-haimfs@yahoo.com*

An important network related to Lower Danube Valley can be established for the Chalcolithic period, including tell type settlements. In the studied area – Baltalalomiței, the most important settlements are: Bordușani-Popină, Hârova tell and Popina Blagodeasca, located on both erosion remnants (“popine”) and edge of the lower terrace.

Two important settlements, Bordușani-Popină and Hârova tell were pluri-disciplinary investigated, from the archaeological, geomorphological, petrographical and archaeozoological point of view. Different zones of occupation were correlated on a topographic base. The study of the natural environment is performed using a percussion corer and sedimentological analysis on grain-size, clay mineralogy and magnetic susceptibility were performed.

The Chalcolithic occupation is represented by succession of houses, both destructed by fire and unburned, and their stratigraphic relationships revealed the organization of space. Most important is the persistence of alignments. All the houses are arranged on the same alignment and almost exactly the same place, the foundation trenches of the later construction have often partial destroyed the walls of earlier buildings.

The area between Danube and Borcea River, show important changes of the natural landscape from Chalcolithic to Iron Age and Middle Ages. The succession of alluvial deposits from the Chalcolithic period to present riches up to 9 m, as reflected by <sup>14</sup>C dating on core sediments, and documents different sedimentary ambiances. On the basis of five percussion corings, located on a transversal transect, a preliminary model of the sedimentological evolution is drawn for this zone. The detailed micromorphological analyses, in thin section, of two sedimentary successions, provide important environmental data and a correlation is drawn with the specific zones of anthropic activities.

The studied sites provided large amounts of fish and mollusc remains along with mammal bones. Concerning the bivalves, gathering detailed studies realized for two tell settlements – Bordușani-Popină and Hârova tell demonstrate a strong correlation between the river level variations and accessibility of such food source. Regarding fishing the most profitable periods are in the spring, coinciding with the reproduction and the flooding but also at the low level of the river water when the ponds dry and concentrate all the fish.

The existence of seasonal and complementary food supply strategies is very likely at Hârova tell and Bordușani-

Popinã: fishing and gathering activities were the most profitable, from spring to early autumn and would have kept small livestock especially for the winter. The study of mammals provided important data on the habitats for wild mammals and feeding areas for domestic animals. The petrography of lithic inventory show strong correlations of the area with Dobrogea zone, source area for most types of raw material.

Integrating all these data, we try to understand the role of water management for the development of these important settlements.

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ORAL

## 6. SETTLEMENT IN THE MIDDLE VALLEY OF RIVER JABALÓN DURING II MILLENNIUM B. C.

*Piña Abellán, José Javier - (Universidad de Castilla-La Mancha) j.javier\_aries@hotmail.es*

Recent researchs about settlement during II millennium B. C. in Southern Plateau allows us to testify in this large territory a high percentage of human presence and a great cultural diversity. This article has the purpose to know the kind of settlement identified in the Middle Valley of River Jabalón, an strategic located in the centre of Campo Calatrava (Ciudad Real).

Reflecting history of research and physiografic features of the Valley of Jabalón in Bronze Age, implies a deep and organized methodologic analysis: looking up the archaeological chart, vising thematic cartography, reading and analyzing scientific bibliography, working in archaeological sites... To offer a real information about facts from archaeological charts, we need to visit personally all the sites. After confirming settlements of this period, I made a summary composed by worksheets in which I analysed each settlement, depending on geographical basis (the site name, kind of settlement, location, altitude, extension and municipality) and economical factors (distance between the site and water sources, routes of communication, cultivated soil, pastures, mining resources and relations between different areas). I represented the results fo my research in detailed maps and graphs, indicating the characteristics of the type of settlement.

The archaeological register identified is composed by 69 settlements (25 hilltops, 13 morras, 1 motilla and 30 small sites in plain area) always located near the water resources and lands with an agricultural use, while controlling natural routes to communicate with the valley,

the river banks and the roads which go through them. All of them are essential elements for settlement, control and an stable economical use in the valley of Jabalón. In different areas, we can observe little nuclei of population interested in exploiting certain economical resources. For example, there is an interesting distribution around salty lagoons in Moral de Calatrava.

In conclusion, during the II millennium B. C. the Middle Valley of River Jabalón was highly inhabited by important groups of population. The distribution of the settlement shows symptoms of a planned organization, hierarchical and interconnected around great nuclei or political centres, like hilltops La Encantada, San Cristóbal or Cave of Alguacil. This settlement net increased and strengthens control relations and economical exploitation between settlements and natural landscape. The main economical activity is cattle raising, specifically cattle movements. This territory, whose landscape was intensely modified by human being sand it can be culturally classified in the area of influence of La Mancha Bronze Culture, because they shave the same type of settlement, chronology and material culture.

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ORAL

## 7. LE TERRITOIRE DE LA RÉSIDENCE PRINCIFIÈRE DE VIX, UNE APPROCHE GÉOMORPHOLOGIQUE.

*Cruz, Frédéric - (ArtéHis, UMR 6298, 6 bd Gabriel, 21000 Dijon, France) fredericcruz@hotmail.com*

*Petit, Christophe - (ArScAn « Archéologie environnementale », UMR 7041) christophe.petit@univ-paris1.fr*

Les résidences princifières représentent un phénomène social inédit qui s'opère à la fin du premier âge du Fer au nord-ouest des alpes. Ce phénomène est souligné par l'apparition de riches tombes à importations méditerranéennes situées à proximité de sites de hauteurs fortifiés. Ces changements traduisent une complexification sociale inédite, une centralisation des pouvoirs et un saut d'échelle d'intégration spatiale du territoire. Ce dernier est généralement représenté par la méthode des polygones de Thiessen découlant de la théorie des places centrales. Ce modèle théorique nécessitait d'être affiné en prenant en compte les données géomorphologiques des territoires princiers.

Un test a été effectué à partir des données du site de Vix qui représente l'archétype même de la résidence princifière. Dans un premier temps, l'environnement de la partie méridionale du territoire (zone la mieux documentée

archéologiquement) a été analysé pour mettre en évidence les contraintes environnementales de l'occupation de la région. Dans un second temps, l'occupation du Pays châtilonnais par les élites hallstattiennes est observée à l'aide de la méthode des noyaux employée sur les données des sépultures tumulaires du Châtillonnais. Ce travail a permis de montrer la dynamique d'occupation du Châtillonnais par les élites depuis la fin de l'âge du Bronze jusqu'au début de la période laténienne.

La comparaison entre les données environnementales et les données archéologiques indiquent que le réseau hydrographique du Châtillonnais est un élément déterminant dans l'organisation du territoire de la résidence princière de Vix. L'importance de la Seine ne peut être expliquée uniquement par le commerce de l'étain. Ce fleuve représente avant tout une voie reliant le monde méditerranéen à la Manche. Ces travaux ont également permis de développer un modèle géomorphologique originale de ce territoire, validé par les données archéologiques et environnementales des régions voisines. Ce modèle souligne l'importance de dissocier la centralité des résidences princières du point de vue économique, religieux, etc. de leur position géographique qui n'est pas obligatoirement centrale.

ORAL

## 8. GOLD, WATER AND ARCHAEOLOGY (MINAS GERAIS/BRAZIL- EIGHTEENTH CENTURY)

*Guimarães, Carlos Magno - (Universidade Federal de Minas Gerais-Brazil) carlosmagnoguimaraes@yahoo.com.br*  
*Fernandes de Moraes, Camila - (Universidade Federal de Minas Gerais-Brazil) camilet123@gmail.com*  
*Roedel, Luísa - (Universidade Federal de Minas Gerais - Brazil) luisaroedel@gmail.com*

This article approaches the presence of the water as an indispensable element in the colonial mining in central Brazil during the 18<sup>th</sup> century.

Using data from that time period and **archaeological researches**, the approach is developed through a perspective that contemplates, on one hand, the technical nature of the process and, on the other hand, your social configuration.

What becomes evident is the participation of the water in that historical reality as an irreplaceable productive force and also as a problem and a solution.

Understanding how the mining activity was developed inside Brazil in the eighteenth century, as well as the im-

portance of the water in the dynamics of the process requires its contextualization. In this respect, it is essential to consider the context of European colonial expansion developed in the Modern Era.

It is inevitable the association between water and mining activity, because it is crucial for the nuclear activity itself, but also to peripheral and/or subsidiary activities. If their use in numerous circumstances showed positive outcomes in the society of Minas Gerais eighteenth century, water was also an obstacle to the proper conduct of mining activities, by its excess or its shortage. The water was one more element to provoke conflicts in the bustling colonial mining society.

In the context presented above the Hydraulic Archaeology is an important research tool to contributing to approach that historical reality.

ORAL

## 9. LIDAR SURVEYS OF ANCIENT WATER MEADOWS IN THE UPPER RHINE VALLEY

*Sittler, Benoit - (Landespflege Univ. Freiburg) benoit.sittler@landespflege.uni-freiburg.de*  
*Schellberg, Sabine - (KWB Fortbildungsgesellschaft für Gewässerentwicklung Karlsruhe) sabine.schellberg@wbw-fortbildung.de*

Among land use forms that have shaped our landscapes, ancient water meadows have generally received less consideration as compared to remains of medieval ridge and furrow cultivation and enclosures. In parts of the Upper Rhine Valley, the cultural landscape still includes remains of a network of ancient water meadows that featured some large parts of lowlands north of Freiburg (Eichstetten/ Kaiserstuhl) in historical times.

Based on a systematic survey using also LiDAR data available for this region, the design and functioning of this system has been documented in an integrative approach. Besides assessing the layout of this sophisticated network including head mains, ditches and carriers to divert water into pastures, the present study also used historical sources as derived from ancient maps as well as from archives to assess the historic and social context related to this specific type of land use.

The high resolution of the altimetric Lidar surveys with accuracy in the range of a few centimeters, along with

use of GIS and 3-D models proved quite insightful to understand how gravitational gradients were best used to divert water and to fine tune the levels and maintain flows. While no longer in use since the past century, this legacy of a specific type of landuse, with its complex of corresponding earthworks is also a challenging management issue for heritage protection agencies.

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POSTER

**10. REMOTE SENSING AND ENVIRONMENTAL ARCHAEOLOGY: MAPPING A RIVER SYSTEM AND PREDICTING THE LOCATION OF ARCHAEOLOGICAL SITES IN THE LEITHA-VALLEY (AUSTRIA)**

*Doneus, Michael - (Department of Prehistoric and Historical Archaeology, University of Vienna) michael.doneus@univie.ac.at*

*Fera, Martin - (Vienna Institute for Archaeological Science, University of Vienna) martin.fera@univie.ac.at*

*Zámolyi, András - (OMV, Exploration & Production, Vienna) andras@zamolyi.info*

*Draganits, Erich - (Department of Prehistoric and Historical Archaeology, University of Vienna) erich.draganits.univie.ac.at*

*Fornwagner, Ulrike - (Department of Prehistoric and Historical Archaeology, University of Vienna) ulrike.fornwagner@univie.ac.at*

The Leitha river is an important tributary to the Danube in Eastern Austria. The geometry of palaeo-channels of the Leitha river was investigated in the framework of an archaeological project analysing patterns of prehistoric settlements in this region. For such considerations the present regulated condition of the rivers are not a well suited analogue since they behave in different ways to natural rivers.

Therefore, the 600 km<sup>2</sup> large study area was thoroughly investigated using remote sensing techniques. 36 hours of aerial archaeological reconnaissance flights using RGB and infrared cameras to obtain oblique photography as well as 2.000 vertical aerial photographs were used as the base source of information. Additionally, surveying airborne laser scanning (ALS) data were used to observe traces of old river meanders still preserved in relief. After orthorectification of the relevant photographs, more than 60.000 archaeological and palaeo-environmental features were mapped in a GIS environment. The digitized palaeo-channels were analysed together with additional data such as a digital elevation model, soil maps, Quaternary thickness maps and several lithostratigraphic sections in the alluvial deposits of the palaeo-Leitha

during archaeological excavations in the southern part of the study area.

The analysis revealed more than 300 previously unknown archaeological sites and a dense network of palaeo-meanders belonging to former courses of the Leitha river. Together with the previous available data, the area contains more than 650 archaeological sites, which thus allowed to study the interaction between land use, settlement pattern and the dynamic system of the Leitha river. The constantly changing river channels and related flood hazards in the floodplains have always been an important determining factor for the selection of settlement areas. Archaeological sites, for instance, are mainly located on the rim of the Würmian terraces, at the margin of the sub-recent floodplain. Also, characteristic morphometric parameters of the Leitha river, like stream slope and palaeo-channel shape, were calculated. Fault-slip analysis, seismicity and tilted terraces of the Danube and fault scarps indicate Quaternary activity for at least some of the faults. The effects of this tectonic activity are well preserved in the palaeo-channel geometry and river profiles of the Leitha river. Well-oriented abandoned meander-belts, as an example, reveal possible tectonic tilting towards the Southeast in the Southern Vienna Basin and a palaeo-channel migration towards the same direction.

The study demonstrates that remote sensing techniques are an important source for landscape archaeology. They provide abundant important information for archaeological sites and structures, and – equally important – allow to retrieve palaeo-environmental information over large areas.

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ORAL

**11. THE RESILIENCE OF THE OLD COURSE OF THE RIVER SEINE IN THE RIGHT BANK OF PARIS**

*Robert, Sandrine - (EHESS) sandrine.robert@ehess.fr*  
*Noizet, Hélène (Paris I University) Helene.Noizet@univ-paris1.fr*

*Mirlou, Laurent (Paris I University)*

In the "Alpage" Project (diachronic analysis of the Paris urban area: a geomatic approach) a research program supported by the french National Research Agency, historical research based on GIS technology has demonstrated the impact of the old course of the River Seine (in right bank) on the urban fabric of Paris.

Recent archaeological excavations have provided valuable insights into the evolution of the alluvial plain of the river around Paris during the Holocene. The combined use of textual, mapping and archaeological data highlights the historical impact of the ancient course of the river. 910 urban block plans of Vasserot's atlas (preindustrial map) have been georeferenced and vectorised and permitted a morphological study of streets and plots.

The influence and inheritance of past flows on the feudal domains and the sewers has been analyzed. The old course influenced land use in the Middle Ages and in the modern period: in the location of pastoral and agricultural land, or culverts and sewerage systems. From the Antiquity to the present, the Seine has also determined the location of the streets of Paris. The form of the old course is one of the first fringe belt of Paris. During the flood of 1910, the Seine returned to its old bed. Cellars were flooded to the site of old course.

It is now possible to measure the resilience of a former meander on the material and conceptual space layout. The example of the River Seine shows how historical forms linked to water persist over time from prehistory to the present. Forms, structures and functions are changing but geographical convergences persist.

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ORAL

**12. TURBID WATERS AND FERTILE FIELDS. THE SACRED GEOGRAPHY OF THE INCA STATE IN THE REGION OF FIAMBALÁ, TINOGASTA, CATAMARCA, ARGENTINA**

*Orgaz Martin, Alfonso - (Escuela de Arqueología. Universidad Nacional de Catamarca) orgazmartin@hotmail.com*  
*Ratto, Norma Rosa - (Museo Etnográfico Juan B. Ambrosetti, Universidad de Buenos Aires, Argentina) nratto@filo.uba.ar*

Archaeologists have always been interested in the study of landscapes throughout the history of the discipline. Initially, research focused on the economic dimension of space where the physical environment supplied shelter, raw materials and different types of resources. In recent years, space began to be considered as a social construction that includes multiple dimensions of people's daily life. However, the concept of the human body and its use as a metaphor for understanding the functioning of social groups was not considered in the organization and structure of landscapes. Currently, the human body is considered as a cosmological symbol where there is no division between the body of man and his environ-

ment. Particularly in the Andean region, the identification of land with the human body and its association with the flow of liquids was described during Inca and colonial times, and continues to this day. In the myths of origin, different elements of nature (hills, rocks, springs, rivers) were represented. These were important in the location and structuring of the sacred geographies.

The human body was a symbolic reference for the political and social life of the Inca state. One example was the process of making *chicha* that was used in all state ceremonies. Technical gestures and artifacts were involved in the different steps of the preparation of *chicha*. Once processed and stored, three levels within the vessel or raki were formed, whose names in Quechua refer to parts of the body which are necessary for procreation: (i) the upper level is the *nawin*, which means eye but also rainwater, male strength and sperm to fertilize the farmland; (ii) the central level is the *aqha*, the *chicha* itself; and finally (iii) the lower level is the *qonchu*, a cloudy sediment representing the woman, female blood, fertility, and a fraction must be saved for the next production of *chicha* in order to accelerate the fermentation process.

We present the association between the Inca sites (Batumgasta and Ranchillos-1) and rivers with red waters of the region Fiambalá (Dept. Tinogasta, Catamarca, Argentina). Our hypothesis is that the optical characteristics (the color red) of the rivers acted as a location factor for the localization and construction of these state sites. Landscape theory is appropriate to discuss and integrate archaeological, historical and landscape evidences in Inca times. Such evidences were articulated metaphorically by the river, which crossed and joined the diverse parts of the whole.

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ORAL

**13. LARGE-SCALE PREHISTORIC AGRICULTURE IN THE ATACAMA DESERT: FROM COMMUNITY SPECIALIZATION TO STATE CONTROL**

*Troncoso, Andres - (Universidad de Chile) atroncos@uchile.cl*  
*Salazar, Diego - (Universidad de Chile) dsalazar@uchile.cl*  
*Hayashida, Frances - (University of New Mexico) fmh@unm.edu*  
*Parcero-Oubiña, Cesar - (INCIPIT-CSIC) cesar.parcero-oubiña@incipit.csic.es*  
*Fabrega-Alvarez, Pastor - es (INCIPIT-CSIC) pastor.fabrega-alvarez@incipit.csic.*

The Atacama Desert is one of the driest places on earth. In this challenging environment, past and present inhabitants have had to establish an adequate and rational management of the resource most basic to life: water. During the Late Intermediate Period (ca. 950 - 1450 AD), complex social systems developed in the Loa River Basin (Atacama Region, northern Chile), with aggregated populations which depended on a mixed farming and pastoral economy. They established an efficient use of water through the construction of complex irrigation systems and the careful management of soils and crops. Large-scale agriculture in the area served not only as the basis for biological reproduction but for the social reproduction of the community as well.

Sometime during the first half of the 15th Century, the Tawantinsuyu or Inka empire made its dominion over Atacama based on a territorial strategy which implied a highly controlled extraction model. The main attraction for the Inka in Atacama was its mineral wealth, but Inka mining operations had to be provisioned with surplus food produced at agricultural locis.

In this paper we discuss the evidence of preinka and Inka organization of agricultural production on the Loa River Basin, specifically as seen at the sites of Topaín and Panire. We aim to understand and explain the strategies developed by the local communities to manage water and agriculture under two distinct sociopolitical contexts, focusing on the technological, social and political dimensions of production and its changes from a community specialization system to a state-controlled production.



# A15a Archaeological Heritage Policies and Management strategies

Commission on Archaeological heritage policies and management structures  
(Organisers: Erika Robrahn-Gonzalez, F. Lüth, A. Cámara)

Monday 1st (14:30 to 19:30)  
Meeting Room Facultad de Derecho - "Jueces de Castilla" Room



2014 burgos  
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XVII Congreso Mundial de UISPP

ORAL CONTRIBUTIONS

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## 1. AS POLÍTICAS PÚBLICAS PARA A GESTÃO DO PATRIMÓNIO ARQUEOLÓGICO ANGOLANO

*Ziva Domingos (Gestor do Património) zivado@hotmail.com*

Depois de 30 anos marcados pela guerra, Angola sendo uma nação jovem está envidando esforços para relançar o seu desenvolvimento a fim de proporcionar uma vida de qualidade ao seu povo. Para atingir este objectivo, o Estado Angolano, desde o fim da guerra em 2002, se lançou como desafio a diversificação da sua economia usando todos os recursos disponíveis nas diversas áreas da vida económica, social e cultural.

É nesta perspectiva que a política cultural pública Angolana aprovada em 2011, reconhece o património cultural e natural, sobretudo o património arqueológico como um dos pilares do desenvolvimento sustentável de Angola com efeitos imediatos sobre a coesão interna das comunidades locais visando a construção de uma nação unida e próspera.

Apesar da existência de um rico e diversificado património arqueológico (sítios de arte rupestre, sítios de arqueologia funerária, acervo museológico, etc.) e tendo em conta as ameaças geridas pelo crescimento económico de Angola, este ideal só pode ser alcançado se de facto as políticas públicas de gestão desses bens patrimoniais forem consolidadas, desde a formação de gestores, o reforço das medidas de protecção, preservação e gestão de sítios, a elaboração das políticas de investigação e de valorização coerentes, o desenvolvimento das estratégias de gestão descentralizada e participativa que envolvem, não só as autarquias locais mas sobretudo as comunidades locais e outros parceiros da sociedade civil.

## PUBLIC POLICIES FOR THE MANAGEMENT OF THE ANGOLAN ARCHEOLOGICAL HERITAGE

*Domingos, Ziva (Heritage Manager) zivado@hotmail.com*

After 30 years marked by war, Angola as a young nation is making efforts to boost its development in order to provide a quality life to its people. To achieve this, the Angolan Government, since the end of the war in 2002, launched the challenge of diversifying its economy by using all available resources in various areas of economic, social and cultural life.

It is in this perspective that the Angolan public cultural policy adopted in 2011, recognizes the cultural and natural heritage, especially the archaeological heritage as one of the pillars of sustainable development of Angola with immediate effects on the internal cohesion of local communities in building a united nation and prosperous.

Despite the existence of a rich and diverse archaeological heritage (rock art sites, burial archeology sites, museum collection, etc.) and taking into account the threats due to the Angola's economic growth, this ideal can only be achieved if in fact the public policies for managing this heritage are consolidated, since the training of managers, the reinforcement of measures for protection, preservation and management of sites, the development of research and promotion consistent policies, the development of decentralized and participative management strategies that involve not only local authorities but especially local communities and other civil society partners.

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## 2. THE LEGAL PROTECTION OF ARCHAEOLOGICAL HERITAGE IN MOZAMBIQUE (1994-2014).

*Solange Laura Macamo (Eduardo Mondlane University, Department of Archaeology and Anthropology and the National Directorate of Cultural Heritage, Ministry of Culture, Maputo, Mozambique) solangemacamo@gmail.com*

This paper is about the legal status of archaeological heritage in Mozambique, since from 1994, when it was adopted the regulation for the protection of the archaeological heritage. The experiences resulting from its implementation will be here remarked.

Clearly, the legislation itself is not enough to stop damages to the archaeological sites. Some of the problems are related to the abandonment of sites, due to absence of site managers and lack of resources. Another concern relates to development programs, in the context of the protection of the whole cultural heritage.

The materials derive from the archaeological sites across the country, but there are also some examples where the problems of conservation have been identified: the coastal site of Chibuene (1<sup>st</sup> to 2<sup>nd</sup> millennium AD) and the Zimbabwe type site of Manyikeni (XIII-XVII century). The protected Matola site, related to the Early Farming Communities in Southern Mozambique is an example where development programs are taking place. Also, the

Mozambique Island UNESCO World Heritage site has a valuable land and underwater archaeological heritage in need of constant care.

As a methodological approach it will be shown how the regulation is implemented and the context in which the responsible preservation institution deal with the whole heritage. This includes the State role, through its cultural sector and the University.

The role of the archaeologists is considered, in relation to the relevance of their work, not only when it comes to reveal new sites, but mainly for their contribution in presenting solutions for the management of cultural heritage. This leads on the sustainable heritage conservation strategies. There are some questions arising from this reasoning: Firstly, to what extent the archaeological heritage can survive in face of development programs? Secondly, how relevant is the conservation of the archaeological heritage in the society, and how it can be valued?

To answer these, I shall access the existing practice of rescue archaeology and its contribution to archaeological research. However, this legal solution is not always possible and certainly many sites will still remain unprotected. Some experiences resulting from dissemination work are important too, to make archaeology relevant in the country.

The contribution of cultural tourism is perceived for the satisfaction of community needs living near the sites and the necessary care to avoid its negative impact on the heritage. Unfortunately, the use of sites for education and cultural tourism practice is not yet common, in Mozambique, even if there are some isolated initiatives. However, when it is properly planned, cultural tourism can help to solve the majority of heritage conservation problems and enable the implementation of the protective legal tools.

The archaeological heritage is a valuable resource like many others and it should be integrated in the development programs, through management plans.

ORAL

### 3. L'ARCHÉOLOGIE DANS LA NOMENCLATURE DES SCIENCES: APPROCHE STRUCTURELLE ET ORDRE NOUVEAU EN CÔTE D'IVOIRE KOUASSI KOUAKOU, SIMÉON - (DÉPARTMENT D'ARCHEOLOGIE - UNIVERSITÉ FÉLIX HOUPOUET-BOIGNY)

*arqueo@terra.com.br*

Philippe Jockey dans l'Avant-propos de son ouvrage intitulé *L'Archéologie* (1998) écrivait: «L'archéologie est à la mode. Ce constat, établi il y a quelque vingt ans par un archéologue de renom, est aujourd'hui plus qu'hier encore d'actualité. Pourtant, le malentendu autour duquel ce phénomène de civilisation s'est construit perdure. Il existe, de fait, dans notre société moderne, un décalage surprenant entre l'image mythique que le grand public se fait de l'archéologie, l'attrait qu'elle exerce par ce biais, et la réalité quotidienne des pratiques archéologiques.»

La perception de l'archéologie telle que caricaturée ci-dessus, traduit éloquemment l'environnement dans lequel baigne cette discipline surtout en Afrique de l'ouest francophone.

Pour mieux faire saisir ce paradoxe, nous nous attelons à décrire l'évolution de la discipline dans le contexte de la Côte d'Ivoire. L'étude s'appuie sur le dépouillement de résultats d'enquêtes auprès des populations et de textes de lois.

Cette démarche permet de comprendre la spécificité de la gestion du patrimoine archéologique du pays et le rôle que joue l'État dans ce processus.

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### 4. GESTION DEL PATRIMONIO ARQUEOLOGICO EN SITIOS DE MEMORIA. CASO CIUDAD VEJA DE CABO VERDE, PATRIMONIO MUNDIAL

*Fernandes, Hamilton - (Curadoria Cidade Velha, Patrimonio Mundial) jairfernandes40@hotmail.com*

*La República de Cabo Verde es un archipiélago de origen volcánico con limitados recursos naturales, formado por diez islas y cinco islotes, situados en el océano Atlántico, a 500 km de la costa africana de Senegal.*

El descubrimiento de Cabo Verde no fue resultado de planes de búsqueda, como el camino marítimo para

la India, ni de misiones de exploración, como las que reconocerían y levantarían planos de los litorales del continente africano.

Ribeira Grande, fue el primer asentamiento humano en el archipiélago de Cabo Verde y la primera ciudad europea del sur del Trópico de Cáncer. Fue creada inmediatamente después del descubrimiento de la isla de Santiago, alrededor de 1460, por el navegante genovés Antonio de Noli. La ciudad tuvo gran importancia estratégico y administrativo, aunque este último carácter se debió más bien al haberse fundado un arzobispado en 1533, por decisión de D. João III.

Ribeira grande ha ayudado a hacer del Atlántico una red de distribución de mercancías, plantas, animales y hombres, cambiando completamente el panorama continental. Con el descubrimiento de las Américas en 1492 y Brasil en 1550, la ciudad gana una importancia y un dinamismo sin precedente.

Cidade Velha tuvo un gran importancia como centro de tráfico de esclavos, sirviendo no solo de plaza frecuentada por comerciantes y empresas involucradas en la trata. Las primeras intervenciones arqueológicas y de restauración arquitectónica.

-Rehabilitación del Patrimonio Arquitectónico o Rehabilitación de convento de San Francisco. En estos trabajos se puso gran cuidado para dejar constancia clara de lo que constituyen restos auténticos conservados del edificio original, frente a la que son nuevos añadidos.  
o Recuperación de itinerarios arqueológicos. Con tareas de limpiezas, excavaciones, consolidaciones, acondicionamientos del camino peatonal, señalización de los restos.

Cidade Velha, ciudad de Ribeira Grande de Santiago tiene un valor universal excepcional para ser inscrita en la lista de Patrimonio Mundial de la UNESCO:

- Por ser la primera capital de las islas de Cabo Verde, producida a partir de 1462, época de inicio de la ocupación de la isla de Santiago, en el contexto del proceso de expansión marítima europea, liderada entre los SS. XV y XVII por Portugal y España y que debido a su posición estratégico, se transformó muy pronto en clave en las rutas entre Europa, África y América.
- Por haber sido la primera ciudad portuaria construida por y para el tráfico trasatlántico de esclavos.
- Por haber sido el lugar donde surgió una nueva cultura, la cultura caboverdiana.
- Por haber albergado una sociedad multiétnica.
- Por haber sido un centro de proyección de poder y

de control del océano y de las rutas de comercio ultramarino albergando, por este motivo, una estructura de funciones fiscales, militares, religiosos, siendo la primera sede de gobierno europeo y de obispado al sur del Sahara.

- Por haber sido un espacio urbano que sintetiza diferentes formas de urbanismo tardo medieval y renacentista y por haber sido en laboratorio para la introducción de productos y formas de explotación agrícolas precedentes de todos los continentes.

ORAL

## 5. FROM NATIONAL TO LOCAL LEVEL IN THE MANAGEMENT OF URUGUAYAN ARCHAEOLOGICAL HERITAGE.

*López Mazz, José María (National heritage Comision/MEC. Universidad de la República. Uruguay) lopezmazz@yahoo.com.ar*

In last 10 years National Heritage Comision start a decentralize strategy to improve local participation a cross de log management process. These experience try to cover a lake in present legal system, with high participation of different local participation in field and laboratory task.

This work expose the experience about early Gaboto Spaniard settlement (s XVI) from wiche begun de "Conquest of Río de la Plata". Other example to expose are the recent official declaration as Historic National Monument to a Paleoindian site of Cerro de los Burros. Both cases shows interesting experiences in field and legal topics, and produce original information for future public actions.

ORAL

## 6. ARCHAEOLOGICAL HERITAGE POLICIES IN BRAZIL: A NECESSARY DISCUSSION ABOUT SCIENTIFIC AND SOCIAL STANDARDS ROBRAHN-GONZALEZ, ERIKA MARION - (DOCUMENTO / UNICAMP) ERIKA@DOCUMENTOCULTURAL.NET

The Brazilian law is very strict regarding the preservation of archaeological heritage, including the different normative bureaucracies intended to create a macro regulation for the procedures of research, preservation and valorization of these heritage.

The internal regulation is also affected by all the international treaties that the country takes part in. The addition of national and international law results in the general research directives used in the country. Even though the legislations are so developed, it is insufficient for the perspective of creating standards of quality for archaeological projects and research.

In this manner, Brazil is today characterized by the huge diversity of criteria for research and for quality of its results. This is brought in perspective by the fact that the country is in an accelerated process of development, creating every month hundreds of new construction projects. In this context what happens in the country is the creation of archaeological teams that do their work in an isolated and independent manner.

The discussion of standards of quality should be of intrinsic value in the country's situation. Patterns of quality should be developed in a way to fit the growing demand for such.

This exposition aims to discuss the critical factor of success for the establishment of standards for the Brazilian archaeology, in the perspective of a practice that not only attends to the specific scientific aspects involved, but also shows itself as a strategic tool for sustainability and social development.

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ORAL

## 7. ARCHAEOLOGICAL HERITAGE MANAGEMENT POLICIES IN INDIA: A CRITIQUE

*Ray, Ranjana - (Calcutta University) prof.ranjana.ray@gmail.com*

The Indian subcontinent was inhabited since c. 2Myrs back. Remains of prehistoric, protohistoric and historic cultural remains are strewn all over the landmass of South Asia. Cultural heritage both tangible and intangible are identified and recorded by Anthropologists and Archaeologists. Ideas and concepts encompassing Socio-political, philosophical and religious thoughts, arts, literature and scientific achievements of ancient and medieval periods form parts of an Indian heritage. Conservation of resources both tangible and intangible as resources, cultural and otherwise and circulation of such knowledge is mandate for heritage management. With the British colonialism developed the legislation for preservation and management of antiquities. Heritage management has attained global perspective with the intervention of UNESCO. Several policies and mandates for preservation of Nationally and ar-

cheologically important monuments and sites have come up in recent years. At the same time public awareness building activities have also come up. The paper will critically discuss and assess the present day legislation, public policies and systems of archaeological heritage management that have come up in India. Archaeological heritage management policies both from the perspectives of anthropology and archaeology will be covered.

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ORAL

## 8. A CONTRIBUTION TO THE UNDERSTANDING OF ARCHAEOLOGICAL HERITAGE POLICIES IN PORTUGAL

*Oosterbeek, Ivo - (GQP-CGC (uID73 FCT); Instituto Terra e Memória; Benefits & Profits Lda) ivoosterbeek@gmail.com*

The care for the preservation of antiques has accompanied the Portuguese political sphere since before the 20th century, but it has especially grown in enactment and public recognition in the last quarter of the 20th century. Since the end of the Portuguese dictatorship (1974), heritage policy making in Portugal has been mainly constricted to the adoption of international recommendations in its legislation, as well as the regulation of professional activity (namely in archaeology).

Though the examination of the legislation would suggest the adoption of public-friendly strategies in heritage management, the ever-shaping structure of the Portuguese governments in the past decades regarding the cultural sector have not allowed for the establishment of stable cultural programs concerning heritage awareness strategies.

As per non-governmental entities: NGO's dedicated to cultural awareness have been diminishing in the last two decades; Higher Education institutions maintain their focus on scientific research rather than social engineering; and private companies in the heritage sector (mainly archaeology and conservation professionals) mostly operate as subcontractors in the construction sector.

In this paper, we aim to review the Portuguese legislation applicable to the archaeological heritage, discuss the concept of 'archaeological heritage' and its uses, and present an analysis of the main contributions of each institution-type (Government bodies, Universities, among others) regarding archaeology research and archaeological heritage.

ORAL

**9 PUBLIC AND PRIVATE GOOD PRACTICES: THE MIAA PROJECT (ABRANTES, PORTUGAL)**

*Delfino, Davide (Abrantes Municipality and Instituto Terra e Memória) davdelfino@gmail.com*

*Oosterbeek, Luiz (Instituto Politécnico de Tomar and Instituto Terra e Memória) loost@ipt.pt*

In 2008 as was initiated a project to create a regional museum of archaeology and art (M.I.A.A.), organized by the Municipality of Abrantes, based on a rich collection including a large archaeological and artistic private collection of archeology and art (Estrada Collection), as well as a public collection of archaeology and two artists donations. Stakeholders of the project and of the future Museum are Estrada Foundation, Fine Arts Faculty of Lisbon University, Polytechnic Institute of Tomar and Land and Memory Institute.

The core component is the private collection, about 4000 artifacts, whose founding owner took charge of the first research, authentication and restoration expenses, all done under public guidance involving several laboratories in Portugal and abroad. The management of this project of research and enhancement of archaeological heritage was paid in a large part by private resources, rendering accessible to the wider public a private archaeological heritage collection, and relying on public structures for guidance and control (higher education and municipality).

The public interest is safeguarded not through full public ownership, but through the management process and a series of regulations to secure full access to research and public accessibility as well. In the process, strong strategies to denounce expose and combat illegal heritage activities are being implemented, including on issues such as sites robbery diggings, forgeries or illegal trading. The paper discusses this experience, its positive results in terms of compatibility between public and private interests and also the difficulties encountered so far.

ORAL

**10. A BETTER FUTURE TO THE PAST: LARGE SCALE DEVELOPMENT PROJECTS AND THE PROTECTION OF ARCHAEOLOGICAL HERITAGE IN ROMANIA**

*Bors, Corina - (National History Museum of Romania (MNIR), Bucharest) corina.bors73@gmail.com*

*Damian, Paul - (National History Museum of Romania*

*(MNIR), Bucharest) pauldamian60@gmail.com*

About 25 years ago a new reality emerged in Romania: the large-scale rescue/preventive archaeological excavations occasioned by the construction of industrial and infrastructure development projects. The National History Museum of Romania (MNIR) was involved since the very beginning in coordinating such archaeological projects set in given circumstances and took part in all the major preventive archaeological projects related to infrastructure and industrial developments undertaken up to know in Romania. The paper will provide an overview on the most important results obtained throughout such archaeological projects, but also to the lessons learned by this important practical experience. On the same time the paper will refer to the changes in the Romanian legislation and current archaeological practice, but also will point out to the necessary improvements still required for implementing a better archaeological management strategy for protecting the archaeological heritage considering the European standards and guidelines.

ORAL

**11. THE ROLE OF CIVIL SOCIETY IN PRESERVATION OF ARCHAEOLOGICAL HERITAGE IN THE REPUBLIC OF MOLDOVA**

*Musteață, Sergiu (president of the Association of Historians of Moldova) sergiu\_musteata@yahoo.com*

In this paper the author is discussing the role of civil society in preservation of the archaeological heritage in Republic of Moldova. Republic of Moldova signed the European Convention on Archaeological Heritage Preservation (revised version) in 1998, ratified it in 2001 and only starting with November 2002 it entered into force. But, the national law on archaeological preservation was voted by Parliament in September 2010 and entered in force in March 2011. So, after a long period of debates and initiatives Republic of Moldova has its own law on this field. The leading role in this process had the National Association of Young Historians of Moldova. This NGO initiated in 2009 an advocacy project in the field of cultural heritage preservation. As main goal and result was the elaboration a new law on archaeological heritage preservation, based on European an International Convention and actual trends in the field of archaeological heritage preservation.

**Introduction**

The National Association of Young Historians of Moldova – ANTIM, founded in 1997, is a non-political, non-profit association, which has the public benefit as a purpose. By establishing the ANTIM, its founders primarily wanted to meet a social need, by promoting national and international collaboration of young people that stimulates research activities and helps to preserve our cultural national inheritance. ANTIM is an organization that succeeded to affirm itself through multiple projects that cover various area of historical research. It is widely recognized for its scientifically and practical activities, for the initiation and organization of many symposiums, conferences, summer schools and some more ample academic activities. Among ANTIM successful activities was the 2009-2010 project “**The policy of archaeological heritage preservation in the Republic of Moldova: reality and necessity**”, supported by Soros Foundation-Moldova and Swedish Agency for Development and International Cooperation – SIDA. The project included one year advocacy campaign – regional and national meeting, conferences, mass media information activities, publication of leaflets, posters, collection of laws, writing a project of new law on archaeological heritage preservation and its public discussion, including with international experts, etc.

### **From a project idea to a project law**

Republic of Moldova got its Independency in August 1991. Its first Law on cultural heritage preservation was approved in 1993 - the law on monuments' preservation. This law is very general and it was poorly developed in relation to archaeological heritage. The most difficult problem was not just the content of the law, but inefficiency of the state bodies to implement it. For example the National Register approved in 1993 was published only in 2010.

During last two decades Republic of Moldova has signed many international treaties, and from those 10 International and European Conventions on cultural heritage Republic of Moldova signed in 1998 the Granada and Valletta Conventions. But, signing these Conventions did not change the situation of Moldova in the field of cultural heritage preservation. So, after a decade of our Independency a group of scholars from Academy of Sciences of Moldova initiated a new project on cultural heritage preservation, which was not supported by the Government.

In 2005 a group of archaeologists prepared a first law draft project on archaeological heritage preservation, which was discussed for five years in various circles - civil, academic, and even political. In 2009, the National Association of Young Historians of Moldova, as part of Advocacy

project, took the initiative to update and promote the draft law project by involving its initial authors and other domestic and foreign archaeologists, managing to propose to the Ministry of Culture an updated version in line with contemporary requirements. This project received important feedback and support from colleagues in the United States, Germany, Romania and elsewhere.

Project's main purpose was to promote efficient policies for heritage conservation, having the following objectives:

Setting a sustainable partnership with local public administration for the elaboration and implementation of some policies to protect the archaeological heritage.

Development of a coherent long-term national strategy, which would count generally the preservation of cultural and historical heritage and the archaeological heritage, especially among national priorities.

Improvement of national legal framework, by adoption of some laws regarding the protection of archaeological heritage.

Discussions with the decision makers about the opportunity of establishing a viable and accountable structure in the field.

The project was launched on 15<sup>th</sup> of May 2009 at the Round Table “Museum policies in Republic of Moldova”, with the participation of a wide audience, including specialists from museum network of the country. Immediately after the launch of the project, the working group drafted the activities agenda and tasks were distributed among members. Simultaneously, letters were sent to representatives of local public administration of northern districts that were invited at the first seminar of the project. From the beginning were elaborated the leaflet and project's poster, which presented the main information about the project and facilitated the informing of the public about the purposes, objectives and further activities.

During the period May 2009 – May 2010, according to the action plan, were performed a range of activities, structured in three main directions:

**The analysis and evaluation of protection policies of archaeological heritage.** The project has been accomplished in two successive stages: at regional and national level. In first stage, we organised three regional meetings (north, centre and south), attended by approximately 100 representatives of local public administration and

district museums. At these meetings was discussed the real situation of each district and were searched solutions to improve the situation. Also at these meetings were presented the objectives and the activities of the project and were discussed the projects of national strategy and the law for archaeological heritage preservation in Republic of Moldova. The first meeting took place in Bălănești on 16<sup>th</sup> of June 2009, the second in Chisinau on 1<sup>st</sup> of October and the third in Cahul, on 8<sup>th</sup> of October 2010.

#### **Lobby and promotion of cultural policies changes.**

In the second stage were organised working meetings with the representatives of Government and Parliament where was discussed the situation of the archaeological heritage in Republic of Moldova. The project director and a few members of the working group (Gh. Postic, E. Sava, I. Ștefăni) had some meetings in October with Mr. Foca, the then minister of culture and discussed about the problems of cultural heritage situation, especially the archaeological heritage. The Draft Law was presented by the Ministry of Culture and further supported by the Government through a decision submitted in Parliament. On the Round Table, on 9<sup>th</sup> March 2010, were discussed the Law Draft of archaeological heritage preservation with members of parliamentary Committee for Culture, Education and Mass Media. The project working team found a real support from the Parliamentary Committee, being ensured of supporting this project to be included in Parliament agenda. Further, after receiving the opinions about the law draft from the Parliamentary Committee, the working group met again with the representatives of Juridical Committee and Committee for Culture, Education and Mass Media, where were embodied some details. Final conclusion was that most of the opinions of the parliamentary committees were positive and the suggestions are beneficial for the law draft. The final conference, that took place on 20<sup>th</sup> of May 2010 and had 40 representatives from different governmental institutions, including from Ministry of Culture, General Prosecutor, Ministry of Internal Affairs, Hall of Chisinau, universities and others. Representatives from Ministry of Internal Affairs and General Prosecutor showed interest towards the problems that were discussed and stated the availability for further collaboration and exchange of information in the field of cultural heritage preservation of Republic of Moldova.

**Mass media campaigns.** The project was supported by an information campaign to raise the public awareness on the necessity to adopt an efficient protection policy for archaeological heritage. So, we made a series of radio shows, we published a lot of articles in the national written mass media about the problems discussed in the project (copies of the articles are attached). Also, we de-

veloped and distributed leaflets, posters and two compilations of normative acts and international conventions that facilitated the disclosure of the population about the problems approached in the project. On 13<sup>th</sup> of April 2010, was organized a round table with the participation of Mr. Vitalie Josanul, officer in heritage police of Neam county, who presented the experience of Romania in fighting against the violations that leads to damages or destructions of historical heritage. The approached subject attracted the Mass Media interest and was highly mediated.

The Law on Archaeological Heritage Preservation was adopted by a unanimous vote, including the vote of the communist faction which traditionally being in opposition does not support any democrat initiative, by the Parliament of Republic of Moldova on 17<sup>th</sup> September 2010 and enacted by Presidential Decree on 24<sup>th</sup> November 2010. The Law entered into force three months after its publication in the Official Gazette (*Monitorul Oficial*) of 3<sup>rd</sup> December 2010. Therefore, from 3<sup>rd</sup> March 2011, the Republic of Moldova has had a new preservation system for its archaeological heritage.

This Law is the first of its kind in the legislation of Moldova and was elaborated according to own experience, experts' recommendations, Valletta Convention (1992) and ICOMOS Charter (1990). The Law on Archaeological Heritage Preservation of the Republic of Moldova contains 48 articles grouped into 11 chapters. The Law on archaeological heritage preservation opens new perspectives for Moldovan society to improve the situation in the field, and to fight black archaeology and illegal trafficking of antiquities. With this Law the Republic of Moldova aligns itself to other European countries and honours, first of all, its commitments taken with signing the Valletta Convention, and second, other European and International field Conventions.

The preparation, discussion and the lobby process for the project law on preservation of archaeological heritage undertaken by an NGO initiative and supported by the democratic Government a serve as a good practice example of partnership between civil society and state bodies. However, a durable cooperation between these two parts is required in order to improve the situation in the field of archaeological heritage preservation.

**Acknowledgements:** This research is part of the Project "Current trends in archaeological heritage preservation: the national and the international perspectives", supported by CNCS –UEFISCDI, PN-II-ID-PCE-2011-3-0610. Institute of Archaeology of the Romanian Academy, Iasi branch, Romania.



# A15b Management and use of science data from preventive archaeology: quality control

Commission on Archaeological heritage policies and management structures  
(Organisers: P. Depaepe, A. Engovatova)

Thursday 4th (9:00 to 13:30)  
Meeting Room Facultad de Derecho - "Jueces de Castilla" Room



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ORAL

## 1. CONTRÔLE SCIENTIFIQUE ET QUALITÉ DES DONNÉES ARCHÉOLOGIQUES À L'INSTITUT NATIONAL DE RECHERCHES ARCHÉOLOGIQUES PRÉVENTIVES (INRAP) EN FRANCE

*Augereau, Anne - (Inrap) anne.augereau@inrap.fr*

*Koehler, Alain - (Inrap) alain.koehler@inrap.fr*

En France, la réalisation des interventions de diagnostics archéologiques et de fouilles fait l'objet d'un contrôle scientifique et technique par les services du ministère de la Culture qui sont aussi les services prescripteurs des opérations. Les rapports d'opérations sont ensuite évalués en commission scientifique. Mais la qualité des données récoltées sur le terrain est l'affaire de l'opérateur. C'est lui qui définit et contrôle les moyens, les méthodes et les techniques utiles à l'atteinte des objectifs de la prescription ; c'est lui qui est responsable de la qualité des informations archéologiques. La qualité de ces dernières doit s'évaluer à toutes les étapes de l'opération, du terrain à l'analyse scientifique, et toujours au regard des protocoles d'échantillonnage définis qui fondent la représentativité des séries ainsi recueillies.

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ORAL

## 2. PREVENTIVE ARCHAEOLOGY AND SCIENTIFIC RESEARCH: ALLIES OR ENEMIES?

*Demoule Jean-Paul - (Université de Paris I, France) jpdemoule@orange.fr*

While the term heritage normally refers to the transmission of property within a family, the term Cultural or Archaeological heritage refers to a national or ethnic community. Although national identities in the modern sense of the term only appeared in the early 19th century, there have for some time been two different conceptions of the State in the western world. In countries based on Roman law such as France, the State, even if it is disliked, is central to the conception of society. In "common law" Anglophone countries, and especially the USA, the State has never been completely legitimate. This view was further reinforced in the nineteen-eighties through the domination of Milton Friedman's free-market ideology and neo-liberal governments. In their sense, there is no real society any more, only a juxtaposition of consumers, buying or not buying goods and services in a market controlled by an "invisible hand". This situation has direct consequences for scientific researches in the field of

preventive archaeology, sometimes called « developer-led archaeology ». For economic liberal ideology, developers are not economic agents threatening our shared archaeological heritage, who should pay for excavation to conserve it: they become "clients" who chose between different producers, in this case the private companies doing archaeological excavation. This view has had disastrous consequences in terms of research, since many excavations carried out through Cultural Resource Management have never been studied or published. It also has ethical and political consequences for our conception of our common past.

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ORAL

## 3. ARCHÉOLOGIE PRÉVENTIVE EN FRANCE : QUELLE DÉMARCHE QUALITÉ ?

*Depaepe, Pascal - (INRAP) pascal.depaepe@inrap.fr*

L'archéologie préventive est une discipline relativement récente, mais qui s'appuie sur les démarches de l'archéologie académique. Cependant plusieurs paramètres les différencient : le temps limité de la fouille et les stratégies d'échantillonnage que cela implique ; et la concurrence financière entre les équipes d'archéologues. Cette communication vise à dresser un premier bilan de 10 ans d'application de la loi française sur l'archéologie préventive, en pointant les acquis positifs et les points négatifs.

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ORAL

## 4. SCIENTIFIC CONTROL OF STANDARDS OF RESCUE ARCHAEOLOGY IN RUSSIA

*Engovatova, Asya (The Institute of Archaeology of the Russian Academy of Sciences) - engov@mail.ru*

There are approximately 60,000 registered archaeological sites (40% of Cultural Heritage sites). Over 1500 archaeological projects are undertaken annually in Russia.

Rescue archaeology projects undertaken in Russia have risen significantly, now accounting for over 70% of all archaeological research in Russia.

The principle recent trend is a sharp increase in the proportion of rescue archaeology projects undertaken by non-State companies. Since 2006 the number of projects undertaken by private companies has more

then trebled. By 2012-2013 their share of the overall number of projects had risen to around 40%.

The pace of change is largely due to Russia's taxation system. Economic reform has enabled tax-breaks stimulating the growth of non-State business. Yet State organisations (museums, universities, affiliates of the RAS) enjoy none of these tax breaks. The playing field is not level - making it more attractive for both the contractors and the clients of such works to use non-governmental agencies.

This situation raises the serious question of the scientific control of such works.

Background: archaeological research can only be undertaken within Russia with official permits – the "Open List" permit, issued by the Culture Ministry. The first phase of control of archaeological works is the Culture Ministry's consideration of applications – the "Rules For Issuance, Suspension and Termination of Open List Permits" (under Governmental Decree 127, 20<sup>th</sup> Feb 2014).

The next stage of control applies when applications are referred to the Scientific Council for Field Studies of the Russian Academy of Sciences (RAS). RAS verifies applications for compliance with approved procedures in principles of fieldwork, research methodology, and the professional competence of the proposed team. Permits are issued only to specialists with relevant qualifications and fieldwork experience (or involvement in fieldwork, for first applications).

All approved Open List projects must submit a Scientific Report to the Scientific Council For Fieldwork, to demonstrate compliance with scientific practice and fieldwork procedures, and this report must meet specified criteria. Inadequate attention to the Scientific Report constitutes grounds for rejection of the Open List application. Open List applications may also be rejected for applicants who have failed to submit a Scientific Report for previous projects.

Common rules for fieldwork emerged in the previous century, establishing mandatory reporting in established parameters, laid down in the "Procedural Regulations for archaeological fieldwork and compilation of scientific reports". The Institute of Archaeology follows these requirements scrupulously. The regulations apply equally to Rescue Archaeology, and there is no simplified version – to ensure that research standards prevail. Recently attempts were made to pass rules applying to observational researches, but they apply only in cases of

research into damaged archaeological sites.

The result is that the standards of archaeological research are in the hands of the RAS, which passes its findings to the Culture Ministry – as specified by Federal Law N 245-FZ (July 23<sup>rd</sup> 2013).

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ORAL

### **5. TROIS CAS DE PROSPECTIONS RELATIFS À DES DIAGNOSTICS ARCHÉOLOGIQUES EN CÔTE D'IVOIRE (2008-2010): LES ENTREPRISES D'EXTRACTION MINIÈRE LEVIER POUR UN NOUVEL ORDRE ARCHÉOLOGIQUE EN CÔTE D'IVOIRE ?**

*Kouassi Kouakou, Simeon - (Département d'Archéologie Université Félix) [arqueo@terra.com.br](mailto:arqueo@terra.com.br)*

L'archéologie préventive n'est pas encore appliquée mais commence à être pensée en Côte d'Ivoire. En témoigne la réceptivité, croissante, des autorités chargées de la prescription des Etudes d'Impact Environnemental et Social (EIES) de l'Agence Nationale de l'Environnement (ANDE) et du département de l'Environnement, Assainissement et Hydraulique du Bureau National d'Etudes Techniques et de Développement (BNETD). Ces à ces deux structures du pays qu'il revient de faire prendre en compte le volet culturel ou archéologique, selon les directives opérationnelles des bailleurs de fonds dont la Banque Mondiale, lors de l'élaboration des Termes de Références (TDR) des EIES.

En attendant que les archéologues soient associés dans les normes, c'est-à-dire sur la base de la loi et des décrets d'application nécessaires aux travaux, certaines entreprises qui opèrent dans le domaine des mines commencent à accepter des interventions d'archéologues.

Les résultats des prospections, soulignent l'importance des sites et vestiges répertoriés. Ils montrent en outre, l'opportunité qu'offrent de telles initiatives pour la recherche scientifique et l'enrichissement des fonds des musées du pays.

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ORAL

### **6. WHAT DO WE WANT TO SAVE? A CASE STUDY OF RISK ANALYSIS AND QUALITY CONTROL IN THE PORT OF RIO DE JANEIRO, BRAZIL**

*Robrahn-Gonzalez, Erika Marion - (DOCUMENTO / UNICAMP) [erika@documentocultural.net](mailto:erika@documentocultural.net)*

Archeological research done in the port region of Rio de Janeiro has revealed the presence of a complex and well preserved juxtaposing of building structures in the city's underground. Dated from the 17<sup>th</sup> century, when Rio de Janeiro became the center of political occupation for the Portuguese Crown, these remains are representative of colonial and post-colonial Brazilian history.

The port region of Rio de Janeiro is currently undergoing intense urban remodeling with a large volume of ongoing engineering work. In this context, the archeological research we have been developing over the last years in an area equivalent to five million square meters in the heart of the Rio de Janeiro port has two major main challenges, namely:

What do we want to save, considering both scientific and sociopolitical perspectives?

Which methodology and technological tools can help the current and future management of this archaeological underground heritage?

How can we integrate, in real time, the different group of interest and stakeholders involved (including the archaeological heritage management organs and construction entrepreneurs) in light of our need for high dynamics and speed in decision making?

How can we make this knowledge more tangible for society as a whole?

This exposition aims to analyze the development of these researches in the port of Rio de Janeiro and their current results considering these challenges, including aspects of attaining goals, quality control and risk analysis.

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ORAL

## 7. RESEARCH TOOLS FOR REGIONAL QUALITY ASSESSMENT AND PROTECTION

*van Leusen, Martijn - (Groningen Institute of Archaeology)  
p.m.van.leusen@rug.nl*

A *proactive* preventive archaeology, at a regional scale, must rely on the provision of adequate information about the current state of the archaeological resource (taken to include not only the known but also the unknown remains). It must also be adequately informed about the processes that are now operating to damage or destroy that resource.

As a by-product of research recently conducted by my team in the Raganello Basin (northern Calabria,

Italy) we can now report on 'good practice' developed in the detection and assessment of a protohistoric rural landscape that had previously been completely overlooked in both the upland and lowland parts of the study area. It will be argued that the piecemeal destruction of ancient rural landscapes poses a special challenge to heritage managers because of the dispersed nature of the resource and the threats, and that regional quality assessment strategies based on a general classification of landscape types should be put in place so that the limited management resources can be directed where they have the most beneficial effect.

# A15C Cultural resources, management, public policy, people's awareness and sustainable development

Commission on Archaeological heritage policies and management structures  
(Organisers: Ranjana Ray, Vidula Jayswal)

Thursday 4th (14:30 to 19:30)  
Meeting Room Facultad de Derecho - "Jueces de Castilla" Room



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ORAL

## 1. PEOPLE'S AWARENESS AND SUSTAINABLE DEVELOPMENT: CHALLENGES AND OPPORTUNITIES ON A CONTINUOUS ARCHAEOLOGY IN BRAZIL

*Robrahn-Gonzalez, Erika Marion - (DOCUMENTO / UNICAMP) erika@documentocultural.net*

In Brazil at the environment licencing of new project, actions intending to increase the participation of the affected communities are a constant. There are a wide range of actions possible but those can be exemplified mostly with public hearings aiming the directed impacted communities of the project in this way creating a debate, documentation and awareness of the impacts of the work, control measures and risk analysis.

The participation of society in such processes has caused several movements directed the theme of environmental management and also created a new demand on cultural aspects. This projects involving society brought to surface the people's fight to understand their roles in society as well as their cultural and historical heritage.

As a result, a new area of actions was created for Archaeology where studies must not only reveal aspects connected to the country's past, but must also include historical and cultural aspects of the current communities. In response to this, researches in Brazil have adopted the principle of shared work with the cultural groups that live in the spaces where these researches are conducted.

Therefore the community has become a partner and an integrating part of the research projects whose goals are, among others, the construction of a critical history produced together with the interested parties and with the intention of valuing and promoting their cultural diversity.

This exposition aims to analyze researches developed in Brazil from the perspective of Continuous Archaeology, integrating communities with their past through the concept of Cultural Environment. This exposition will also analyze the results obtained in the sustainable management of cultural heritage in search of an archaeology of the present.

ORAL

## 2. THE ARCHAEOLOGICAL PROJECT OF BAIXO SABOR: AN OVERVIEW AND FUTURE CULTURAL MANAGEMENT PERSPECTIVES.

*Soares de Figueiredo, Sofia - (ACE- Odebrecht/Bento Pedroso Construções e Lena Construções) sofia.csf@gmail.com  
Dordio, Paulo - (ACE- Odebrecht/Bento Pedroso Construções e Lena Construções) paulo.dordio@bsace.pt*

The hydroelectric project of Baixo Sabor is the largest one currently undergoing in Portugal and will submerge an area of around 3,000 hectares in Northeast part of the country, namely in the Trás-os-Montes region. The consequent impacts on the landscape have led to an unprecedented and ambitious archaeological survey- The Plan of Heritage Protection (PSP)- that has attracted major investment and involved both private and public entities.

Although the construction began in 2008, the Plan of Heritage Protection has only been fully established in 2010 and has worked different dynamics in the territory, from Pre-history to the present day. The project main goal, in terms of how it has been designed, is to develop the so-called salvage or the integration of preventive archaeology into wider scientific studies, making it possible for a profound knowledge related with one of the most isolated regions in the country to emerge. Over the past four years, an unexpected cultural heritage has been identified in the Sabor valley; in fact, the area stands as the location of a few unique sites in Europe.

This paper has three main goals. The first is to establish a balance in terms of the implementation, management and outcomes of the Plan of Heritage Protection, characterized as one of the largest archaeological projects ever to be carried out in Portugal, and involving over 200 professionals and 15 specialized companies dealing with heritage. The second is to evaluate the role undertaken by the different entities involved in the process, which are both private and public. Our third aim, and considering that the Plan of Heritage Protection is coming to an end, is to outline a cultural and heritage sustainable development strategy, one that is able to generate social and economic benefits for local population.

ORAL

### 3. STONE - CARVING IN VARANASI (INDIA): PAST & PRESENT PRACTICES

*Jayasawal, Vidula - (Jana-Prava, Centre for cultural studies and research, south of Samneghat, Varanasi) vidula.bhu2@gmail.com*

One of the oldest cities and also a rich cultural centre of India, Varanasi provides good opportunity to study traditional crafts. Stone chiseling in Varanasi had glorious past, and is still practised. Description of ancient text and archaeological findings corroborate the antiquity, while the carving centers of today evince utility of this craft in the modern society.

The two prevalent traditions which stand distinctively apart from each other fulfill quite divergent needs of the society, and are performed by two different set of chiseler. The one with undisrupted continuity and wide practice is confined to making of daily utility articles, like pestle, quern, simple components of architecture (patia), etc. While the other is a specialised chiseling art through which icons and decorative composition are produced. It is this category which forms subject of the present theme. Since, it goes hand in hand with the changing custom, conventions, and economy of the society on one hand and quantum based mastery of craft skill on the other. The field studies carried out by the author, both at the archaeological sites, and the main culture making centres of modern times, in Varanasi region, bring forth various important aspects of the craft.

Starting from the acquisition of raw material, - suitable stone for carving, for instance, is an important factor, - governing both, the execution skills and price of the finished produce. Similarly, the technological knowhow and mastery is another aspect of craftsman ship, which is primarily a family skill transmitted from father to son. However, individual artistic amplitude also plays significant roles in earning reputation of a sculpture workshop. Needless to mention, that the socio-economic status of the craftsman, as well as, the customers adds substantially to the make up of any craft, a lithic chiseling is no exception. The need base growth of craft centres if clubbed together with techno artistic mastery does help a craft earn high reputation which, result in the uplift of the economic status of the craftsman, who in turn can further enrich their skill and imagination.

Policies which could promote need of the craft produce and sustain artistic amplitude of craftsmen with eco-

nomie packages may put a barrier to the erosion of traditional crafts of South and Southeast Asia.

ORAL

### 4. A STUDY OF THE ARCHAEOLOGICAL SITES OF THE BIRBHUM DISTRICT, BENGAL? ITS MANAGEMENT AND SUSTAINABLE DEVELOPMENT

*Basu, Asmita - (Academy for Professional Excellence - APEX) asmita.basu2011@gmail.com*

Extraordinarily rich, vast and diverse cultural heritage in the form of built heritage, archaeological sites and remains since the ancient times are the symbols of both cultural expression and evolution. Ancient temples have been considered as the major sources of various religious faiths, philosophical aspects, cultural and architectural heritages. Birbhum, the land of the red soil" is also referred to as "the land of the brave" in West Bengal and a significant temple town in Eastern India. Several brave kings have dominated Birbhum since the beginning. Remnants of civilizations add profound historical importance to the region. Culturally rich and studded with a number of temples and heritage sites, Birbhum has been an important area of study. Temples of this region combine harmony and symmetry with a high quality of outer embellishments. The lack of interest and comprehension of the past and heritages is turning into a threat for the future generations. Manifestations of Archaeological sites expressed in cultural forms are losing their traditional essence in a rapidly transforming world with modern lifestyles ushering in an era of industrial growth and economic development. In the present scenario sustainable development has become an important challenge to deal with particularly in the age of modernization. It is of utmost importance in this situation to maintain a correlation and cooperation between archaeological heritage management and the new age principles of management.

The present study aims to highlight the growing challenges and possible remedies of sustainable development of archaeological sites through a case study of the temple sites in the Birbhum district of West Bengal, India. The materials have been collected through the field work in this region. Some important temple sites have been selected for the purpose of the study namely- the Temple sites of Supur, Ghurisha and Jaydev -kenduli on the bank of the Ajay river. Different tools of strategic management has been used to analyse the data such as SWOT analysis, competitive advantage analysis etc in

order to achieve sustainable development of the region. As a result we can understand how the application of strategic management principles in the present scenario can help to strike an appropriate match between the internal and external environments which leads to a positive effect on the sustainable growth and development of the region.

In conclusion we may say that the cohesion between the two disciplines namely- archaeology and strategic management will not only lead to the sustainable development of the archaeological sites but also to the economic growth and development of the region. Unprotected monuments and heritages in danger can be revived with the help of building a bridge with the Corporate as well as other Government and Non- Government agencies. Financial support and infrastructure development could be the key support obtained from the corporate world for the sustainability of the sites.

ORAL

## 5. A STUDY OF PREHISTORIC CULTURAL HERITAGE AND MANGAMENT IN ORISSA, INDIA

*Debasis, Kumar Mondal - West Bengal State University)*  
*anth.debasis@gmail.com*

Orissa in India has rich cultural heritage rooted to prehistoric period. There is a continuous habitation of prehistoric people from Lower Paleolithic to Mesolithic, Neolithic and Chalcolithic periods.

An in-depth observation has been made in the prehistoric sites of Shigarh in Angul district and knuar in keonjhar district, in Orissa, India. Shigarh is a site yielding continuous evidence of Paleolithic to Neolithic culture, whereas knuar is a Chalcolithic site. The two sites were studied in view of evaluating the prehistoric culture of the area, the present human activity and causes of destruction due to natural process as well as ignorance. An archaeological site of historic period may be protected but the prehistoric sites are usually neglected in India. The present study is an approach to study the prehistoric culture of Angul and Keonjhar districts in terms of geo-physical setting. The different agents-natural and human activities causing destruction of sites are also examined in the study.

The present study is an approach to make plans and for steps to be taken for protection of these prehistoric sites. the protective measures taken in global context and

their figibility in the area under study is highlighted in the present study.

ORAL

## 6. HERITAGE OF SKILL IN MAKING CLAY ORNAMENTS IN INDIA

*Chakraborty, Koyel - (Anthropological Survey of India)*  
*kchakraborty88@gmail.com*

*Ray, Ranjana - (Emeritus Professor, Calcutta University) Prof.*  
*ranjana.ray@gmail.com*

Personal adornment is a part of cultural heritage for human being. There is an ample evidence for the use of various kinds of ornaments from the prehistoric to present day. Ornaments made out of clay emerged as early as Neolithic times in India. Indus Valley civilization yielded large number of ornaments made out of clay. A study of clay made ornaments has shown a typological continuity in design and decorations. Clay ornaments, specially the bangle and amulets not only have decorative value but are also connected to a some kind of ritualistic practices. In modern days clay made ornaments have taken a large area in the fashion world. There is a great demand for clay ornaments. Craftsmen have special skill in making the terracotta ornaments. There are ear pieces, neck pieces, pendants and bangle made out of terracotta. It is interesting to note that though in India potters are a caste group who make pots and idols out of clay but the craft of making clay ornaments are now taken up by different caste groups as well. Main reason for this may be the demand. However special skill and knowledge is required for making the clay ornaments. Present study would highlight the aesthetic and ritual values of this unique heritage that is still cherished by Indians and by people from the other countries as well.

ORAL

## 7. INDIGENOUS KNOWLEDGE AND SKILLS OF THE BHOTIYA WOMEN OF UTTARKASHI

*Subhadra, MitraChanna - (Delhi University) channa.subhadra@gmail.com*

The woman of the pastoral sheep herding communities on the upper Himalayan ranges have nurtured skills of wool processing, knitting and carpet weaving from the distant past. they have developed skills passed down the generation for making beautiful items out of raw wool



that is given to them by the men of their community, who herd sheep and go long distance trading as a livelihood. The women, who are tabooed from going to the pasteur, receive the wool in the village and know how to process, spin and dye the wool and then either knit or weave carpets out of them. they have nurtured these skills as household work and are today able to use it for commercial purposes and find a ready market for many of their items. These conditions to market is giving them cash income and is supportive of their social transaction such as, gift giving. The women are able to sustain their traditional role playing and augment in the changing circumstances while keeping alive their traditional craft and skill. Although they sell their product in the market, every item of production is still collected by them from primary sources and is part of their natural environment. This community is one of the several that have traversed the natural geographic barrier of the Himalayan range for centuries, ferrying resources from one region to another, using the natural passes made by the river gorges. These age old practices have continued till almost the present time but are today threatened by climatic change and man made changes in the environment.

This paper will discuss the inter phase of indigenous knowledge, traditional skill and a cash economy in the back drop of a subsistence mode of living and long sustained life was that have evolved in relation to a particular habitat and livelihood pattern. It will also touch up on the transformation brought about by climatic and technological changes.

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ORAL

## 8. MUSICAL HERITAGE OF NORTHEAST INDIA: AN ANTHROPOLOGICAL OVERVIEW

*Choudhury, Manimugdha - (Assistant Professor, Department of Anthropology, Dibrugarh University, Dibrugarh-786004, India) choudhury.imax.manimugdha@gmail.com*

Comprising of seven states, viz, Assam, Arunachal Pradesh, Meghalaya, Nagaland, Mizoram, Manipur and Tripura, the North-East India forms part of the East Himalayan region which extends from Sikkim eastwards and engulfs the Darjeeling Hills of West Bengal. With its long border extending over 4800km, it occupies an extremely strategic position and it is connected with the mainland India by a narrow corridor of foothill land in North Bengal. Such terrestrial location of North East India makes it into an isolated pocket which is one of the important causes for alienation of its population. The location of

this region is important as it shares international borders with Bangladesh, Bhutan, China, Myanmar and Tibet. All the seven sister states of North East India are inhabited by a number of ethnically and linguistically diverse native tribes which have their own distinct traditions of art, culture, dance, music and lifestyles.

Music is an art with unending ramifications and innumerable psychological and cultural affiliation which has always played a crucial role in human society. The general musical form of North East India stamps the characteristics of the whole region. The racial admixture of the various groups of people, settled in this region has tremendously contributed to the folk music of the different groups of population. Each group of the region maintains its own peculiar musical traditions.

The music of North East India constitutes an emotional bond among peoples of different levels of culture. So the folk and other type of music of the North Eastern part of India is the spontaneous musical expression of the masses of this region among different tribes and sub-tribes. Most of the people of this region are agriculturists and reside in the rural areas. The music of the tribal people of this region is always associated with a dance, along with vocal and instrumental music. They cannot even dream of any form of dance without vocal and instrumental music. Folk music of the region is generally performed in chorus accompanied by musical instruments of varied types.

This paper is a humble effort in depicting the diverse musical heritage of the variegated North East India.

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ORAL

## 9. SAURA PAINTING : TRIBAL ART OF ORISSA

*Mondal, Munmun - (University of Calcutta, India) moonmoon131413@rediffmail.com*

Orissa is rich with tribal cultural assemblage. Sauras are one of the oldest tribes of India. Saura tribal paintings are mainly 'wall murals' in their houses based on religious and ceremonial themes. Sauras are among the most ancient tribe in India and find mention in the Hindu Epics of *Ramayana* and *Mahabharata*. Aborigines of Saura tribe bear close racial affinity to proto-austroloid tribes that dwell most part of the central and southern India. Saura Art is mainly found in Rayagada, Gajapati and Koraput districts of Orissa. The Saura wall paintings are called *italons* or *ikons* (or *ekons*) and are dedicated to Idital (also *edital*) the main deity of the Sauras. These paintings draw

upon tribal folklore and have ritualistic importance. One of the integral elements of **Saura paintings** are the geometrical shapes that are used to create bold borders for the center-piece that is invariably drawn in fine lines. No features are drawn on the human face but the characters can tell us stories with their 'gestures' even without the facial expressions.

Ikons make extensive use of symbolically pregnant icons that mirror the quotidian chores of the Sauras. People, horses, elephants and the sun and the moon and the tree of life are recurring motifs in these ikons. Ikons were originally painted on the walls of the Saura's adobe huts. The paintings' backdrop is prepared from red or yellow ochre earth which is then painted over using brushes fashioned from tender bamboo shoots. Ekons use natural dyes and chromes derived from ground white stone, hued earth, and vermilion and mixtures of tamarind seed, flower and leaf extracts. Ikons are worshipped during special religious and cultural occasions such as child-birth, harvest, marriage and the construction of a new house.

Saura art is very colorful and is one of the obscuring local traditional craft practiced in Orissa, India. My present paper intends to study the antiquity and characteristics of this local art of Orissa with special reference to its preparation, processing and execution with social content.

ORAL

## 10. CULTURAL RESOURCE MANAGEMENT OF THE VANISHING IVORY CRAFTSMANSHIP OF MURSHIDABAD, WEST BENGAL, INDIA

*Saha, Sudipa - (Ph. D. Student, Calcutta University) sudiparalap@gmail.com*

India is a country of rich cultural heritage both tangible and intangible. This reflects in its countless age old indigenous craft traditions. Among those ivory craft had a long antiquity date back to the time of Indus civilization and continuously practiced still the complete ban of it in 1990. Several centers of ivory carving developed at various places of India. Among them Murshidabad of Bengal was internationally famous for its outstanding craftsmanship. However, the high demand of ivory articles in different parts of the world led to the ruthless killing of the elephants. The cultural use of the natural heritage for a long time became a major threat to each other. When the conflict became severe in nature and caused the depletion of the very existence of the elephant then the

art had to be sacrificed for the sake of the survival of the nature's creature. As such: in 1989 an international ban on ivory trade had completely stopped the practice of the ivory craft in India. There are other heritage crafts of India which are still fighting with the kind of conflict for their existence like conch shell carving, sandal wood carving, rose wood carving and so on. The question is whether the craftsmanship of these kinds of crafts can be saved by a sustainable use of natural raw material/ alternative material or not? If possible then how it can be done? The ivory carving industry of Murshidabad was confined within the hereditary carver family belonging to the *Bhaskar* community. After the ban they tried to survive by applying their skill and knowledge on carving of some alternative materials like, sandal wood but now a days only very few of them are in their hereditary profession. Here in this research work an attempt has been made to find out the probable causes of the disappearance of the craftsmanship and to formulate a fruitful safe guarding policy for revitalisation of the outstanding craftsmanship.

ORAL

## 11. MASK OF CHHAU- A TRIBAL HERITAGE THROUGH THE AGES IN WEST BENGAL: AN ETHNO-ARCHAEOLOGICAL STUDY IN CHARIDA GROUP OF PEOPLE

*Bhattacharyya, Banani - (The Ramkrishna Mission Institute of Culture, Centre for Indological Studies & Research, Kolkata) banani303@yahoo.co.in*

A mask is an important part of theatre craft that is worn normally for performance in dramas or plays, or for amusement. Masks have been used since antiquity for both ceremonial and practical purposes. Masks are believed to embody the spirit of an ancestor, and symbolize a message of wisdom, prosperity, security, and power. It has been worn in cultures throughout the world for thousands of years. These are made of varied materials including paper, cloth, grass, leather, metal, wood etc. They are painted with symbolic designs and vivid colours. Masks and their manifold forms are a very significant mode of cultural expression.

The masks generally made here are of mythological character. The craft of mask making in West Bengal is closely related to the folk dance forms. Purulia district of West Bengal is a place where masks are found in huge variety especially wood masks. Tradition of West Bengal allows the artists to wear masks made of various materi-

als among which wood plays an important role. *Chhau* dance is a mask-dance which represents characteristics of primitive ritualistic dance in its vigour, style and musical accompaniment. Wood masks in West Bengal are the creations of the artisans who with their exclusive use of cuttings and colours give the masks a touch of their originality. The wooden masks of west Bengal have become a popular theatre craft, admired for its simplicity. The wooden mask makers are generally the wood-carvers by caste. The artisans for `Chhau` masks are mostly located in and around Charida and Bagmundi of Purulia district. *Chhau* is a performing art of dance and music which is intimately connected to Chaitra-Parva, the festival of spring celebrated in April every year. This has a special significance to the art through the rituals connected with it. The festival lasts for thirteen days in which the whole community participates. The usage of stylized masks is an important component of Purulia *Chhau* dance. This requires skilled craftsmanship which has also evolved as an art in itself and is being preserved by its community. The craft of mask making along with *Chhau* dance has been a tradition here for well over a century. Charida village in Purulia can be safely attributed the title of "The *Chhau* capital of India". This village has a long tradition of *Chhau* dance even from the days before independence. This fame of the village has not still lost its sheen after 64 years of independence. The paper describes historical background, material used, traditional methods of preparation and cultural significance of masks and also highlights the musicological, psychological and philosophical significance of these masks and focused description of the *Chhau* masks of Charida, West Bengal.

ORAL

## 12. TRADITIONAL WOOD CRAFTS AMONG THE TRIBES OF ARUNACHAL PRADESH: ISSUES CONCERNING PRESERVATION AND PROMOTION OF CULTURAL RESOURCE

*Chaudhuri, Sarit K. - (Rajiv Gandhi University) saritkchai@rediffmail.com*

Wood craft constitute one of the finest cultural heritages in the context of Arunachal Pradesh - a state sharing its border with China, Burma, Bhutan. This craft tradition is practiced by some of the major tribes of this state who reflect different cultural contours. For instance, wangchos and Noktes of Tirap district can be broadly categorised as animist (in traditional sense), whereas other tribes like Monpa, Sherdukpen of West Kameng and Khampei of Lohit districts represent Buddhist tradition. In all these

tribes, such craft tradition was emerged out of various socio-political as well as religious context. This paper will be a discursive discourse on the history as well as various forms of wood craft tradition of such tribes. An attempt will be made to understand what is happening to such cultural heritage in the context of a market driven one where such tribes are well exposed to wider realities of life. And finally it will examine what role the state and other agencies have initiate to preserve and promote this valuable craft tradition of the tribes of Arunachal Pradesh.

ORAL

## 13. BUILDING AN ETHNOGRAPHY OF LANDSCAPE--AYODHYA HILLS IN PURULIA, WEST BENGAL, INDIA.

*Bishnupriya, Basak - (Calcutta University) basak.bishnupriya@gmail.com*

This paper is part of a wider project on understanding the prehistoric landscape of Ayodhya hills, Purulia. Numerous microlithic occurrences were located in the foothills of Ayodhya range, all sharing the same geological horizon and dated to the late Pleistocene. A detailed study of the site, their location and assemblage show that the major zones of activity were concentrated around prominent natural marker like isolated hills and rock outcrops. Working within the paradigm that landscape is a culturally constructed phenomenon; I wanted to see whether any special significance could be assigned to these artefacts occurrences located close to outstanding natural features. In recent years archaeological approaches in drawing on cultural geographical and cultural anthropological understanding of landscape have shifted from an understanding of archaeological site to places in the landscape. In exploring perceptions prevalent among indigenous communities of the non European world ethnographic research has gone beyond a European construct of the landscape, thus highlighting its contextual nature. Landscape has emerged as dynamic and varied, offering archaeologists with rich insights to work with in unravelling the mysteries of the past.

The focus of this particular paper is on perceptions of landscapes surviving among the indigenous communities living in this region, in the form of ritual, ceremonies, songs, myths and legends, preserved solely in oral tradition. I am using these as critical tool not to establish any unbroken continuity with the past, but to develop an alternative vision of the prehistoric landscape, thus looking beyond artefacts concentrations which are often the only signatures remaining of the archaeological record.

# A15d The educational activities of archeology and socialization of knowledge

Commission on Archaeological heritage policies and management structures  
(Organisers: Valdir Luiz Schwengber, André Luis Soares, Ana Carolina Cunha)

Friday 5th (14:30 to 19:30)  
Meeting Room Facultad de Derecho - "Jueces de Castilla" Room



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ORAL

## 1. UNE ACTIVITÉ ÉDUCATIVE INCLUSIVE: L'IMPLICATION D'ENFANTS DANS LES FOUILLES ARCHÉOLOGIQUES RÉELLES SUR LES SITES HIS- TORIQUES

*Ramos Soares, André Luis - alrsoaressan@gmail.com  
(UFSM)*

Ce document présente les activités du Centre pour l'étude du patrimoine et de la mémoire - NEP, l'Université fédérale de Santa Maria, Rio Grande do Sul, au Brésil, dans le développement des activités archéologiques dans lequel les enfants ont participé activement au processus d'excavation dans des conditions réelles. Ce rapport est une activité éducative dans laquelle les élèves de l'école primaire dans la municipalité de São Martinho da Serra, État de Rio Grande do Sul, pourrait participer à des fouilles avec une équipe de l'archéologie. Bien qu'il existe une pratique récurrente d'actions éducatives avec des sites archéologiques simulées, où les enfants peuvent avoir accès au champ de la pratique archéologique, dans la plupart des cas, l'expérience archéologique est associée uniquement à la fouille de sites. Dans d'autres cas, plus fréquents, l'éducation au patrimoine est limitée à des conférences, des brochures, ou autre matériel explicatif.

La méthodologie de travail a laissé les formes traditionnelles de l'éducation au patrimoine dans plusieurs projets existants. Constitue de petite conférence, démonstration de matériel archéologique, son importance pour la reconstruction du passé et du quotidien, ainsi que nous aider à comprendre comment les gens vivaient en d'autres temps et lieux, leurs habitudes de consommation, ce qu'ils pensaient, etc. La différence avec notre travail a consisté à permettre aux enfants intéressés à participer à l'excavation réelle d'une maison du XIXe siècle, l'objet de l'équipe de recherche. La maison, qui a été utilisée comme un espace politique et siège du gouvernement municipal, a été utilisée par d'autres personnes, avec d'autres utilisations jusqu'à son abandon et la ruine. De l'excavation du site de poubelle de la maison, nous pouvons voir les produits déversés et ses comportements économiques, sociaux, culturels, et comme l'hygiène, les soins médicaux, de la nourriture. La participation des enfants à des fouilles archéologiques simulé est une pratique quotidienne au Brésil. Cependant, dans de rares cas, il n'est pas permis aux non-archéologues de participer à des activités sur le terrain, contrairement à d'autres pays comme les États-Unis (Pilles, 1994) ou même en France. En dépit des soins qui

doivent être prises pour la conservation du matériel archéologique, ainsi que leurs caractéristiques telles que l'emplacement, l'intégrité, la spatialité, le contexte, entre autres, sûrement la participation des enfants peut devenir dangereux. Cependant, ce qui a été observé est que, précisément parce qu'ils ont reçu une meilleure préparation et une clarification des activités d'archéologie, nous pouvons affirmer que nous avons obtenu d'excellents résultats dans les campagnes impliquant des étudiants de l'enseignement élémentaire.

Les activités de l'archéologie avec les enfants sont bien connus au Brésil. Participation à des activités de biens archéologie a fourni une grande participation des élèves tout ce que l'expérience éducative durable. Observée dans les évaluations de l'engagement affectif des enfants avec le processus de recherche.

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ORAL

## 2. THE CULTURAL ENVIRONMENT ALONG THE BRAZILIAN AMAZON RIVERS

*Brugnera, Ana Carolina (Universidade Presbiteriana Mackenzie - Faculdade de Arquitetura e Urbanismo) carolina@arqueologiapublica.com*

The objective of this article is to shed a light over how the Cultural Environment composed by several occupation scenarios of cultural landscapes of the Brazilian Amazon river channels was formed. The environment, which is formed by a group of physical and cultural manifestations, reflects the result of intangible assets, such as traditional knowledge and practices of the communities that live or have once lived there, leaving behind edifications, objects, utensils, archeological sites, etc. The culture of native dwellers, as many other societies in the national territory, results from a long-term process of Amazon occupation by a diversity of cultural identities.

However, recent transformations affecting the Brazilian Amazon, due to a globalized and more competitive economy, consider the implantation of major projects that entail social and political contradictions emerging from the relationship between State and society. Facing this scenario, it is imperative that this landscape be analysed in an integrated manner, taking into account the social diversity and not just the existing traditional societies, as well as the organized civil society, the landowners' communitary leaderships, local state governments, companies and their different onlooks regarding the subject, thus enabling and promoting the Territory

Management.

As for the premisses mentioned above, we face a methodological challenge, especially regarding the application of concepts of Territory Management and Resilience to the traditional communities involved, aiming at obtaining results that will leverage sustainable actions, not only from the social and cultural point of view, but also from the economical and political standpoint. In the light of this challenge we will highlight research carried out by Brazilian research programs in the cultural environment of some communities living along the Brazilian Amazon rivers. Mapping of their archaeological, historical and cultural heritage, the sum of testimonies and involvement of local communities, including their way of life and traditional knowledge, technical and specialized analyses that will eventually lead to the interpretation of the cultural landscape – the Applied Science.

As a final goal, there are efforts to promote social inclusion and the strengthening of the native dwellers cultural identity. To achieve these goals we have been developing interaction tools, such as presential activities in the form of Workshops, and the use of social media through channels that promote interaction with research in addition to information democratization and creation of cooperation nets comprising the local community and whoever might take an interest in it.

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ORAL

### 3. SOCIOEDUCATIONAL MODEL FOR HORIZONTAL DISSEMINATION: THE CASE OF THE MIDDLE PALEOLITHIC OF EL SALT (ALCOI, SPAIN)

Jardón, Giner Paula - (Universitat de València) paula.jardon@uv.es

Pérez, Clara - (Darqueo estudio y difusión del Patrimonio SL) claraperez@darqueo.com

Most of scientific knowledge models of dissemination are unidirectionally and unequal strategies. That comes from a perception of the science as a product belonging to the archeologists, but transferred to main population. Some sociologists have pointed that contemporary worries usually are in the basis of many researches subjects. It is not a coincidence that gender approaches or sustainability questions are often focused. Why don't we ask main people about their real interests?. Why don't facilitate that citizens asks prehistorians?. The methodology for this study has been action-investigation and ethnological qualitative approaches. The theoretical frames are

Cultural Studies, Freire pedagogy and Public archaeology.

The preconception about prehistory and neandertals have been registered as a previous stage of an socioeducational intervention on the Batoi barrio of Alcoi placed near of the neanderthal site *El Salt*.

Then, researchers, neighbours, museum technicians and municipality politicians, we defined all together some educational actions. These consisted on:

- 1) interaction between prehistorians and people during the excavation processes.
- 2) work with children and young people in order to produce audiovisuals that they used for communicating to other neighbours and to students from other educational institutions in the city.
- 3) registration of ideas and questions asked from the participants.
- 4) Links between contemporary and prehistoric questions as educational and research object

A model of interaction between prehistorians and local population has been experimented and some lines for the futur have been traced. Some of these can be transferred to other sites contexts.

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ORAL

### 4. THE ANDAKATU PROJECT: AN EXAMPLE OF HERITAGE AND ARCHAEOLOGY KNOWLEDGE SOCIALIZATION

Cura, Pedro - (Museu de Arte Pré-Histórica de Mação) Opedrocura@gmail.com

Oosterbeek, Luiz - (IPT) loost@ipt.pt

Cura, Sara - (Museu de Arte Pré-Histórica de Mação) Osaracura0@gmail.com

Heritage education has assumed an increasing role in current mindsets, regardless of the different realities in terms of geography and socio-cultural frame. The Andakatu Project based in the Museum of Prehistoric Art of Mação (Portugal) is aimed at a wide audience and presents a programme, activities and contents arising from multiple archaeological research programmes conducted at the Museum and its partners (namely universities and research centres. Archaeology, being the starting point, is intertwined with various scientific and artistic aspects in order to encourage questioning, learning and citizenship through a communication based on interactive experimentation.

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ORAL

## 5. THE MANAGEMENT OF CULTURAL HERITAGE IN HYDROPOWER PROJECTS - VALLEY JAMARI, RONDÔNIA STATE

*Schwengber, Valdir Luiz - (UTAD) valdirluiz@gmail.com*

It is known the importance of preventive archeology in Brazil in recent years, considering the volume of work produced by the significant results that has been supplying to the various problems of scientific research and the dissemination of archaeological knowledge in the society. Studies conducted in the installation of power plants in the Valley of Jamari allowed the application of a Heritage Education Program and the production of teaching materials and the creation of a museum of archeology with the Federal Institute of Rondônia - Campus Ariquemes.

A total of 29 archaeological sites were excavated at the project level (PCH Santa Cruz, Jamari PCH and PCH Caanan). Of these, 21 are prehistoric sites associated with groups that produced pottery and polished stone artifacts, such as ax blades, etc.; and 8 are historical sites, which are associated with the rubber boom, the region that stretched from the 1930s until 1970. To date, we estimate that will compose the collection of the Museum of Archaeology of Porto Velho, just over 5000 artifacts, these, 4,800 excavated in prehistoric sites, and other historical sites. Remember that research continues to be done, so it is likely that this number will increase, reaching more than 6000 pieces.

The Archaeological Rescue Program, Monitoring and Heritage Education, associated with application of a term adjustment of conduct for the damage to an archaeological site allowed, besides the execution of a Heritage Education Program with schools in the region, producing a book that has as its object the dissemination of archaeological research in the State of Rondônia, with participation of several researchers who conducted and conducting research in the State of Rondônia. This material is distributed for research and educational institutions in the State of Rondônia and other federal units, as well as libraries, museums and cultural centers. The production of other bibliographical production (in print and on CD-ROM) will be distributed to public schools in the region. Moreover, we highlight the creation of a museum of archeology will be an important instrument for the intensification of archaeological research in this Amazon compartment.

The survey results revealed that pre-historic sites located in the area of ??research that we are conducting

are generally composed of fragments of simple ceramic pots without very elaborate decorations and plastic treatments, like those found on the banks of the River Madeira, for example. On the historical sites these are generally areas where they operated former rubber, which encompassed the area from obtaining raw materials to the family cemetery, which was located close to their houses. Are parts of everyday life that started the "Brazilian" settlement of this region. The archaeological licensing in accordance with the legislation establishing the preservation allows to perform a search in works that represent risks to cultural heritage. The growing participation of society in matters of collective interest stems from greater environmental awareness and equity contribute to minimizing the destruction to cultural heritage.

ORAL

## 6. HERITAGE EDUCATION STATE OF RIO GRANDE DO SUL : PROJECTS, ACTIONS AND POSSIBILITIES .

*Dias, Guilherme - (Colégio Militar de Santa Maria) guilhermediaspoa@bol.com.br*

This article aims to analyze actions in heritage education developed by the Center for Heritage and Memory Studies at the Federal University of Santa Maria developed in the period 2005-2013 and also demonstrate the possibilities of working in this field in the state of Rio Grande do Sul, Brazil.

The projects and actions analyzed in this study cover the development of local, state, national and heritage of Humanity. Are as follows: Building Models Playful as a support for the Teaching of History (2005) Heritage Education in the Municipality of Itaara, RS: War game board Guaranítica Saving equity and inclusion of the subject in the school curriculum (2007), and. (2009). The projects selected for analysis were developed by Core Studies Heritage and Memory under the coordination of Professor Dr. André Luís Ramos Soares team and were selected among others because they are as different ways of working with heritage education.

The actions developed by the projects were mainly the following results: In the project "Building Models as a Playful support for the Teaching of History" (2005) we did: - Enabled the production of models and support materials ( books that explain each part of the model ; Provided to teachers in elementary and secondary shock absorber material for the history lessons; Have you provided the trainees history course a didactic tool for the

discipline of practice teaching. In the project "Heritage Education in the Municipality of Itaara, RS: Redemption of equity and inclusion of the subject in the school curriculum" (2007) we did: Attended a partnership between City Hall and City University, favoring extension actions; Inserted the theme Equity Education in the school curriculum (for a period of 2 years); Held a survey of the heritage of the county; Promoted the involvement of teachers from different disciplines and two municipal schools; Guarani War board game. (2009); We privileged the playful teaching history; Provided support to teachers for teaching history material; Approached the theme of the heritage of history teaching.

After the analysis of the actions, our goal is to evaluate possibilities and demands in the field of heritage education in the state of Rio Grande do Sul showing the heritage education as fruitful for future teaching actions terrain research and extension. To this end we will draw an overview of state reality, with a brief history and state of preservation actions undertaken by municipalities, state and union.

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ORAL

### 7. L'ACTION ÉDUCATIVE EN ARCHÉOLOGIE FRANÇAISE : DEUX EXEMPLES RÉCENTS

*Justome, Elisabeth (INRAP) elisabeth.justome@inrap.fr*  
*Depaepe, Pascal (INRAP - UMR7194)*  
*pascal.depaepe@inrap.fr*

Parmi les missions de l'Inrap, inscrites dans le code du patrimoine, figure la diffusion des résultats de la recherche archéologique auprès des publics. Conférences, expositions, visites de chantiers archéologiques sont régulièrement organisées dans ce but. Les enfants, dans le cadre scolaire, péri ou extra-scolaire, bénéficient quant à eux d'actions spécifiques les mettant en relation directe avec les archéologues, leurs méthodes de travail, et les connaissances les plus récentes dans le domaine. Depuis 2013, les projets se formalisent sous le label EAC, obligatoire pour l'Inrap, établissement public sous tutelle de ministères, avec pour objectif de partager les actions avec plusieurs partenaires, sur un même territoire, sur un temps long et non plus ponctuel. Les différents exemples d'actions réalisées dans le nord de la France montrent que la socialisation de la connaissance archéologique est une réalité; et qu'elle fonctionne d'autant mieux que ces actions sont partagées avec les professionnels de l'enseignement et de la médiation.

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ORAL

### 8. ARCHAEOLOGICAL EXCAVATION, HERITAGE EDUCATION AND CLASS STRUGGLE: THE HOUSE OF DAVID CANABARRO IN SANTANA DO LIVRAMENTO, RIO GRANDE DO SUL, BRAZIL.

*Ramos Soares, André Luis alrsoaressan@gmail.com (UFSC)*  
*Dias, Guilherme*

This paper presents the activities of the Núcleo de Estudos do Patrimônio e Memória - NEP, the Santa Maria Federal University, Rio Grande do Sul, Brazil, in the development of archaeological activities at the home of David Canabarro a "Farroupilha" hero of the Revolution of 1835-1845. The archaeological excavation of this house generated great controversy in the local community. For one part, the representatives of Centers Gaucho Traditions wanted the space became a museum in memory of General "Farroupilha", and by other side, the social movement called "black movement" redeeming the role of this character in "Porongos Massacre", a battle in which the supporters of the revolution slaves were massacred by order of the General. In this article, we explain how the team developed archeology heritage education activities from the dispute of memory and history of the current agents around this character, at the same time to clarify the role of this person in his time and today.

The Methodology of work left alternative forms of heritage education, with teacher training and guided tours on site. It consists of activities with educators, demonstration of archaeological materials, its importance to the reconstruction of the past and daily life as well as help us to understand how people lived in other times and places, their consumption patterns, what they thought, etc. The difference of our work was to present for teachers both views about the "Farroupilha" hero, showing its pivotal role in this revolution, at the same time to demonstrate the legitimacy of the black movement in rescuing the story of betrayal that marked the end of the revolution where the slave question was peripheral issue of revolutionaries. For students of schools, we present the discussion of heroes and villains and how the interpretation of history may change over time. Children sought to make inquiries of the uses of materials in the past.

The perception of history is hardly questioned about social classes vying for the right memory, history and "truth" of the events that happened in the past. When confronted by the historical data both versions on the same character, archeology has questioned the role of research activities and their results to build the current



story. The material culture rescued this project resulted in several research also historical character, pointing out that General David Canabarro, who signed the peace among "farroupilhas" and Brazilian Empire, was also a slave until the end of his days.

Heritage education activities with teachers and students in public schools Santana do Livramento demonstrated that it is possible to perform an archeology and a problem-based education, engaging and full of questions. At the same time, led teachers and students to question their heroes and their historical characters, and the social groups that people base their lives public service.

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POSTER

**9. ARCHEOSCIENCE: AN ARCHAEOLOGY MEETING POINT**

*Rodríguez-Cintas, Àgata - (Universitat de Barcelona)*

*agata.roci@gmail.com*

*Alonso, Monica - (Universitat de Barcelona)*

*monicalonsoe@gmail.com*

*Albert, Rosa María - (ICREA/Universitat de Barcelona)*

*rmalbert@ub.edu*

*Esteve, Xavier (Universitat de Barcelona)xesteve@gencat.cat*

*Antonio Ruiz, José*

*Sans, Andreu*

*Cabanes, Dan - (Universitat de Barcelona)*

*dancabanes@ub.edu*

*Esteban, Irene - (Universitat de Barcelona)*

*irene.esteban.alama@gmail.com*

*Macià, Laia - (Universitat de Barcelona) l*

*aiamaciapl@gmail.com*

*Portillo, Marta - (Universitat de Barcelona) mportillo@*

*ub.edu*

The ways for communication are constantly changing. The immediately consequence is that nowadays, the information flows faster than years ago and it is more easily accesible to scholars.

ArcheoScience is a new Internet platform; a meeting point for researchers and anyone interested in archaeology. The aim of ArcheoScience is to provide all the tools to share and exchange the daily work in archeology. Discussion groups, events, publications, etc. can be shared to promote mutual collaboration among researchers.

One of the most interesting aspects of ArcheoScience is that it allows fostering simultaneous Online Databases (ODB). Databases are critical since they allow a direct comparison between modern samples and those coming from the archaeological record. In recent years, on-

line databases have achieved wide acceptance among researchers, since they allow easy and immediate access and can be continuously updated.

At present ArcheScience is fostering PhytCore. PhytCore is a phytolith database developed in 2010 by GEPEG (Research Groups for Paleoarchaeological and Geoarchaeological Studies) from the University of Barcelona. PhytCore includes digital images of phytoliths from modern plant material, modern soils and paleosoils, as well as archaeological material. PhytCore is structured to facilitate storage and modification of the data and the retrieving of information through one or various simultaneous queries. Phytoliths from modern material incorporate information related to the provenience of the sample as well as different ecological variables (elevation, hydrology, geology, plant cover, etc.). Archaeological phytoliths are linked to the information of the site, chronology, geographical location, level, etc. PhytCore is also open to other scholars or Research Groups who would like to participate. Researchers can share their own data without losing authorship. Sharing the fruits of the research of different teams will allow optimizing the available resources and will guarantee their continuation as well as they will ensure credibility.

ArcheoScience is directed to promote discussion between scientists to improve the quality of the archaeological research and the broadcasting of the information to all the public interested in history and archaeology. You can visit ArcheoScience at: [www.archeoscience.com](http://www.archeoscience.com)

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POSTER

**10. ARCHAEOLOGICAL RESEARCH AND HERITAGE EDUCATION IN PORT UNION / SC: CONTRIBUTIONS TO UNDERSTANDING THE PROCESS OF REGIONAL OCCUPATION.**

*Schwengber, Valdir Luiz - (UTAD) valdirluiz@gmail.com*

*Novasco, Raul - (UNISINOS) raulnovasco@gmail.com*

The Heritage Education is an inherent step archaeological research. In this sense, educational activities related to diagnostic, monitoring and archaeological excavations through which programs are carried out, we seek to establish links between the community and the existing archaeological heritage in the region. To this end, the research conducted at the archaeological excavation stage in the installation of hydroelectric Pardo in the town of Port Union, state of Santa Catarina, we obtained a lot of information about prehistoric and historic occu-

pation of that community that turned into a book, titled "a look at the process of occupation of Port Union: from prehistory to the present day."

First, educational activities were carried out with the aim of sensitizing the community to the local cultural assets. Surveys of immaterial culture, architecture, socio-economic data, and a special way with the archaeological research excavation of two archaeological sites were the main elements for the production of the book. This material was prepared with the purpose of serving as a reference source for teachers, students and anyone interested in knowing a little more about the pre-colonial and historic occupation of the region. The launch of the book "The process of occupation of Port Union: from Prehistory to the present day" held in May 2014 at the School of Basic Education Clementino Brito, Santa Cruz do Timbo, involved students, teachers, local residents, representatives of the hydroelectric plant, the Municipal Department of Education and the Regional Management of Education of Santa Catarina. During the event, plus the launch of the book, also storytelling activities were performed.

Analyzing the results of the survey, it is noted that the importance of archaeological research, be it due to a design of preventive archeology, as a result of environmental requirements, or whether it originated from an academic project, what matters is that this product is attention of the researcher and his commitment to the reality of people living around it, bringing significant issues to your life. Therein lies the value and the ethical principle of research.

# A15e Museum networking in Glocal communities: experiences in sharing and cooperation towards peer awareness and target increase in Quaternary and Prehistory Museums

Commission on Archaeological heritage policies and management structures  
(Organisers: Ivo Oosterbeek, Sílvia Marques, Ursula Thun Hohenstein)

Tuesday 2nd (14:30 to 19:30)  
Meeting Room Facultad de Derecho - "Jueces de Castilla" Room



2014 burgos  
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XVII World UISPP Congress  
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XVII Congreso Mundial de UISPP

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ORAL

## 1. ROCK ART, MUSEUM AND NETWORKING WITH TARGET PEOPLE

*Ray, Ranjana - (Calcutta University) prof.ranjana.ray@gmail.com*

*Chakrabarty, Mita - mita.chakrabarty@gmail.com (Indian Museum)*

Rock art in India goes as far back as Pleistocene period. Prehistoric rock art is widely distributed in hills and rock shelters of the country. There are ethnic communities living in the vicinity who are still practicing wall painting. Prehistoric rock art provides ideas on the contemporary artists, lifestyle, social and ritualistic aspects of prehistoric people and about the flora, fauna and environment of the prehistoric times. Folk art of the area provides with ethno-archaeological tools for reconstruction of prehistoric cultural elements. Most of the rock art sites are in areas away from the access of even of the local people. Excepting the rock art site of Bhimbetka, there is no site museum of prehistoric art in India. Bhimbetka is declared as world heritage site by UNESCO. It is a site museum managed by the Archaeological Survey of India. The surrounding landscape is maintained by the local authority. Major portion of Indian people are denied the opportunity of viewing such splendid art of prehistoric times. In this context the role of museum may be considered for connecting people to the prehistoric art. The target groups are both young and old, local and non-local, but focus is on the younger people starting from the school level. National level museums are situated in metropolitan cities. These museums usually bring prehistoric art to the notice target group. This is usually done with the projection of videos of the rock art and surroundings of the rock art site; by conducting workshops and by engaging local ethnic communities who live in the vicinity of the rock art site and who are still practicing wall art. This is done to enlighten target group on such activities of both the past and the present. Museum authorities use ethno-archaeological methods for such understanding. The present will discuss case of Indira Gandhi National Museum of Man (*Indira Gandhi Rashtrya Manab Sangrahalaya*), located in Bhopal, Central India. The museum is situated on a hill 46 Km away from Bhimbetka in the city of Bhopal. The hill has got a number of rock shelter housing prehistoric art. The museum conducts special exhibitions and workshops. Special attention is given on rock art. Target people are both local and non-local. Participants not only take a look at the replicas of the rock art at the museum but get a chance to visit the rock art sites next door. There are also interactive programmes with

the local artists. The objective is to make people aware of the national treasure in the form of prehistoric art.

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ORAL

## 2. THE CASAL DE PAZZI MUSEUM: A PLEISTOCENE DEPOSIT IN THE SUBURBS OF THE IMPERIAL CITY

*Patrizia Gioia (Museo Pleistocene - Casal De' Pazzi, Italy) patrizia.gioia@uniroma1.it*

The site of Casal de' Pazzi was discovered in 1981 during the urbanization works at Rebibbia, a district north-east of Rome, now densely inhabited. The finding of a fossil tusk of elephant gave the start to the archaeological investigation in an area of 1200 sq.m. Sands and gravels had filled a stretch of an ancient riverbed dug in the "Tufo Lionato", a volcanic rock dated about 366,000 years ago. In the deposit were discovered more than 2.000 Pleistocene faunal remains. The human presence is testified by a fragment of skull and by over 1.500 lithics. The site, dating to about 200,000 years ago, is the last witness of a series of Pleistocene deposits that punctuated the lower Aniene valley, now destroyed by the spread of the city.

The significance of findings goaded the protection and the promotion of the site, and the partnership among many institutions has made possible the realization of the current museum.

Many actions are followed to carry out a full protection of the site. A structure, specially designed, was built round about the preserved area and the deposit was restored. Museological and museographic actions followed, based on textual, verbal, symbolic and technological communication. Thus, in addition to the traditional forms of exhibition, more direct communication tools were preferred, like those of visual and/or interactive type. The aim was to make the visitor interact with information and also to keep his/her attention alive.

The outside visibility of museum is provided by two large panels with artistic reconstructions of the Pleistocene environment. Then the visitors come into a large outdoor space with a thematic garden exemplifying part of the Pleistocene flora. Here spaces equipped for hands-on labs was also created.

The itinerary includes a view of the deposit, naturally lit, from a footbridge. Then the exhibit hall is transformed in a dark room to project multimedia products that "tell" us the Pleistocene life.

After this emotional “full immersion”, in a covered outdoor space, some panels “tell” the evolution of the landscape and life in the Roman countryside during the last 3.000.000 years.

In the exhibition hall two large windows overlooks the site, and a few showcases show some of the finds, explained also by reconstruction drawings. There is also a “Pleistostation”, by which the visitors can use questionnaires, video games, movies and hypertext.

The narrative approach supported by advanced technologies seems to be particularly meaningful for a museum referred to the ancient prehistory, whose ability to tell its own story is low and where the communication is highly challenging.

The ease of understanding of the complex topics that the Museum offers, has resulted in a significant presence of public, and led to the establishment a network of relationships with the territorial, social and cultural background. Many ongoing activities are designed and planned inside the framework of the close relationships established with the urban study and research centers, mostly the neighboring ones. Thus the museum has set up contacts with the nearby Rebibbia jail, local and city environmental associations, primary school pupils and large groups of university students who carry out their internships there.

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#### ORAL

### 3. MUSEUMS NETWORK: THE EXPERIENCE OF THE ITALIAN UNIVERSITY MUSEUMS

*Corradini, Elena - (Università di Modena e Reggio Emilia), Luigi Campanella - luigi.campanella@uniroma1.it (Università di Roma) elena.corradini@unimore.it*

*Capasso, Luigi - (Università di Chieti) lcapasso@unich.it*  
*Capasso, Mario - (Università del Salento), Elisabetta De Minicis - e.deminicis@unitus.it (Università della Tuscia) mario.capasso@unile.it*

*Anelli, Vera - (Università della Tuscia) vera.aneli@unitus.it*  
*Da Rienzo, Luisa (Università di Cagliari), Ruggero Francescangeli - ruggero.francescangeli@uniba.it (Università di Bari) darienzo@unica.it*

*Galassi, Cristina - (Università di Perugia) cristina.galassi@unipg.it*

*Toni, Roberto - (Università di Parma), Giovanni Pratesi Pratesi - g.pratesi@unifi.it (Università di Firenze) roberto.toni@unipr.it*

*Vannozzi, Francesca - (Università di Siena), Ursula Thun Hohenstein - ursula.thun@unife.it (Università di Ferrara - SMA) vannozzi@unisi.it*

The framework program concerning “multimedia technologies for the networking and the valorisation of scientific cultural heritage in the Italian University Museums” is carried out by a network of twelve Italian Universities (Bari, Cagliari, Chieti-Pescara, Ferrara, Firenze, Modena and Reggio Emilia, Parma, Perugia, Roma “La Sapienza”, Salento, Siena, Tuscia), coordinated by the University of Modena. It has been recently approved and financed by the Italian Ministry of Education, University and Research. It aims at activating a network that wishes to contribute to the knowledge, dissemination and valorisation of the scientific cultural heritage by multimedia technologies through the collaboration of UMAC-University Museums and Collections International Committee of ICOM.

The final target will be a bilingual web portal realized in an innovative perspective, considering the experiences of each partner, the peculiar features of the different University Museums collections, their interdisciplinary characterization and the possible uses in a contemporary historical, social and cultural context. The first step is to monitor the cultural heritage of the twelve University Museums, in order to complete the already existing databases and align them to the cataloguing standards released by the Central Institute for Cataloguing and Documentation of the Italian Ministry of the Culture within the General Informative System for Cataloguing SIGECWeb.

Moreover, the Italian University Museums network has identified four common themes that will be on line in order to put in evidence the current or in progress researches regarding the most important university museum collections. The four common themes (Stories, Scientific instruments history, Landscape, Environment) will be developed by interdisciplinary itineraries taking into consideration historical, social and cultural contexts in order to design a new image of the museums and promote national and international synergies.

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#### ORAL

### 4. PROJECTS, PRESENT ACTIVITIES AND PERSPECTIVES FOR A UNIVERSITY MUSEUM. THE MUSEUM OF PALEONTOLOGY AND PREHISTORY ?PIERO LEONARDI? OF FERRARA.

*Berto, Claudio - (Università di Ferrara, Sistema Museale di Ateneo, Museo di Paleontologia e Preistoria ) claudio.ber-*

*to@unife.it*

*Cangemi, Marina - (Università di Ferrara, Dipartimento di Studi Umanistici) marina.cangemi@unife.it*

*Pancaldi, Roberta - (Università di Ferrara, Sistema Museale di Ateneo, Museo di Paleontologia e Preistoria) roberta.pancaldi@unife.it*

*Sala, Benedetto - (Università di Ferrara, Sistema Museale di Ateneo, Museo di Paleontologia e Preistoria) benedetto.sala@unife.it*

*Thun Hohenstein, Ursula - (Università di Ferrara, Sistema Museale di Ateneo, Museo di Paleontologia e Preistoria) hhu@unife.it*

The Museum of Paleontology and Prehistory "Piero Leonardi" is one of the university museums that belongs to the Sistema Museale di Ateneo, which coordinates and manages all the museum structures and activities at Ferrara University. It was opened in 1967 as a small academic museum available only to University students and professors but, since the late 70's, it was gradually opened to the public and all grade students, even with educational activities and tour guides. Unfortunately, the Museum is closed since 2012, when part of the building has been damaged by the 20th and 29th May earthquakes. The exhibition is divided into four parts: Vertebrate Paleontology, Human Paleontology and Prehistory, Historic Geology and Invertebrate Paleontology. The first two were settled in 1967 and partially renewed during the 80's, the last two were opened in 1997.

In particular, the Human Paleontology and Prehistory section includes, among others, a complete collection of casts of human fossils remains, from first hominids to *Homo sapiens* skulls, that comes from the most important sites of the world, a collection of bones and stone tools coming from several Italian Quaternary sites investigated by the Ferrara University and a collection of bones and tools coming from other museums and universities as a result of exchanges and trades carried out by professors during the last fifty years.

Its "forced" closure is an opportunity to reorganize the Museum and redesign the exhibition. The first step is to catalogue the entire collections following international standards in order to plan the new exposition. The museum is now part of a national network project, which involves 12 Universities with the aim to create a university museum network. This project will allow to complete the cataloguing and to set up a parallel "virtual" and online exhibition, strongly related to both the territory of Ferrara and the national network.

The online exhibition will be focused on three main topics: the first will regard human evolution, the second

Quaternary mammals and the third, strongly related to the territory, will concern the Pleistocene site of Settepolesini di Bondeno (Ferrara, Italy). Videos, 3D reconstructions and interactive applications will be used in order to help the reading and understanding of the contents and to increase the interest on these themes.

Until the museum will be restored, the Sistema Museale di Ateneo is planning to organize some temporary exhibitions opened to the public which will involve part of the collections now hosted in the closed structure. Some of these exhibitions will be implemented with laboratory activities for classes and university students, educational activities and lectures opened to the public. The Museum of Paleontology and Prehistory "Piero Leonardi" is a small, unfortunately closed, university museum, but we strongly wish to renew it through multimedia tools in order to keep it alive.

ORAL

## 5. CULTURE ECONOMICS IN PORTUGAL: WHY MUSEUM NETWORKING MATTERS IN TIMES OF CRISIS

*Marques, Sílvia - Instituto Terra e Memória; Instituto Politécnico de Tomar) sarouelala@gmail.com (*

*Oosterbeek, Ivo - GQP-CGC (UID73 FCT); Instituto Terra e Memória; Benefits & Profits Lda) ivoosterbeek@gmail.com*

The net growth in cultural institutions has been positive since the beginning of the 20th century, though its growth curve may have slowed its pace in the last years. Portuguese Museums have grown in number, and the market supply in the cultural sector has a greater diversity than ever before.

The recent economic crisis has diminished the financial availability for all economic activities, and the cultural sector, being mostly public (as in owned by public institutions), lacks the capacity to adopt certain economic strategies to face the crisis since its capital cannot flow in the stock market.

In this presentation we will analyse national financial initiatives that museums have been using in order to enrich financial availability, discuss the professionalization process of Portuguese museums, and the consequent depreciation of non-professional institutions, and discuss the opportunities brought by the adoption of museum networking.

ORAL

## 6. NATIONAL COOPERATION PROJECTS: THE CASE OF THE MUDANÇA GLOBAL EXHIBIT

*Oosterbeek, Luiz (Instituto Politécnico de Tomar; Grupo de Quaternário e Pré-História do Centro de Geociências; Instituto Terra e Memória) - loost@ipt.pt*

*Carvalho, António (Museu Nacional de Arqueologia) antoniocarvalho@mnaarqueologia.dgpc.pt*

*Piçarra, Mariano (Fundação Calouste Gulbenkian) mpi-carra@gulbenkian.pt*

*Raposo, Luís (Museu Nacional de Arqueologia) 3raposos@sapo.pt*

*Santos, Ana Isabel (Museu Nacional de Arqueologia) mna.anasantos@imc-ip.pt*

*Almeida, Nelson José (Universidade de Trás-os-Montes e Alto Douro - FCT PhD scholarship; Grupo de Quaternário e Pré-História do Centro de Geociências; Instituto Terra e Memória) nelsonjalmeida@gmail.com*

Established in 2000, the Rede Portuguesa de Museus (RPM - portuguese museums' network) constitutes a mechanism of quality assurance for Portuguese museums, in compliance with international recommendations. Since 2004, with the enactment of a general law of museums (Lei n.º 47/2004) in Portugal, RPM has been acting on the museums by assessing whether they respond to the national criteria or not in accordance to the general law, and manages a supporting platform for the accredited museums.

The Museu de Arte Pré-Histórica e do Sagrado do Vale do Tejo (MAP - local museum in Mação, Central Portugal) and the Museu Nacional de Arqueologia (MNA - National Museum of Archaeology), both accredited by RPM, have engaged in the network's cooperation program – Pro-Museus.

This was an opportunity not only to present to the public collections from a single region stored in both museums, but the occasion to discuss strategic priorities in times of financial scarcity and to conceive innovative and flexible museographic solutions.

The 'Mudança Global' exhibit resulted from the combined efforts of the staff from the MNA and the MAP, converging not only the human capital of both institutions, but the assemblage of pieces from both museums in the same exhibit, supporting a museologic narrative that could not be achieved with either collection alone.

ORAL

## 7. NETWORKING LOCAL COMMUNITIES THROUGH QUALITY MANAGEMENT AT CULTURAL SITES: THE HERITY NETWORK IN MIDDLE TAGUS AS A TOOL FOR SUSTAINABLE DEVELOPMENT

*Quagliuolo, Maurizio (HERITY International) herity@dri.it*

The HERITY international certification which was concluded in Middle Tagus (Portugal) on the first of November 2013, is a good demonstration of a sentence which was said at the First HERITY Conference from a colleague of ours, Jean Gagnepain -now unfortunately disappeared-, who directed the Museum of Gorges du Verdon at Quinson (F): "we were making quality without knowing it". This is true, but the problem is the recognition of this capacity from an external point of view, and their implementation of regular practices of quality improvement.

The HERITY certification in Middle Tagus made possible to recognize, in addition to some weaknesses, a number of skills and qualities present at museums, archaeological sites, monuments, libraries and archives and other places. Human capital is the main resource there. The challenge presently fronted by these places is to succeed in putting in common these capabilities as an opportunity for developing local identity, cooperation, internationalization issues, services, both to residents and visitors. What these places have in common is the willingness to improve, to ask for help to do it, and the transparency of the management implemented at these sites, clearly demonstrated by the fact that the HERITY international certification was requested and welcomed. The implementation of a practical system starting from this already existent network is presented in the paper as a tool for sustainable development. The 30 sites certified by HERITY in the Medio Tejo region, in middle Portugal, including the rock art sites of Fechadura and Lajeira (Sertã) and the Prehistoric Art museum of Mação can be now the protagonists of a process supporting local pride as well as internationalization instances and economy of scale, possibly under the coordination of a wider body.

ORAL

## 8. OS MUSEUS DE ANGOLA: GESTÃO ACTUAL E PERSPECTIVAS

*Domingos, Ziva - (Direcção de Museus de Angola) zivado@hotmail.com*

Durante estas últimas décadas, as instituições patrimoniais, em particular museus são, de um lado, chamados a satisfazer as necessidades dos usuários (públicos comunidades, locais) que se tornaram cada vez mais exigentes e por outro lado, enfrentar a crise econômica mundial enquanto contribuindo ao desenvolvimento local através da elevação da qualidade de vida das populações.

Para alcançar este ideal, os museus devem desenvolver estratégias novas que lhes permitem oferecer produtos e serviços de qualidade aos seus públicos-clientes respeitando o equilíbrio entre as suas missões de conservação e valorização do património cultural.

Estes desafios de desenvolvimento social tocam também os museus angolanos chamados a melhorar a sua gestão actual e suas prestações para ser capaz de satisfazer as exigências das populações locais. A gestão sustentável destas instituições passa necessariamente pela elaboração de ferramentas estratégicas e operacionais como os projetos científicos e culturais e planos de conservação preventiva completados por mecanismos de avaliação como instrumentos de orientação de projectos de renovação de museus existentes e de criação de novos museus.

ORAL

## 9. LES MUSÉES DE PRÉHISTOIRE ET DE QUATÉNAIRE. DES EXEMPLES ET EXPÉRIENCES DU NORD-EST DE LA HONGRIE

*Ringer, Árpád - (University of Hungary) bolringa@uni-miskolc.hu*

D'où est-ce que nous sommes venus, qui sommes nous et où allons nous ? Pour répondre à ces questions de la philosophie classique, il y a deux sciences, les plus compétentes. Quant à deux premières questions c'est, sans doute, la Préhistoire et à la dernière de celles c'est la Futurologie.

Aujourd'hui la Préhistoire, après beaucoup de changements dans ses paradigmes, est une science bien renouvelée. Elle synthétise les résultats de la recherche du Quaternaire, de l'éthologie humaine, de la microbiologie, de

l'activité cérébrale et de la paléolinguistiques etc. Ainsi elle est devenue d'une science pratique, en jouant un rôle actif de créer de notre vision moderne de l'homme. Si les expositions de Préhistoire et de Quaternaire sont bien organisées, elles peuvent donner des inspirations sur l'émergence admirable de l'homme et sa culture au cours du Pléistocène et Holocène. Elles peuvent s'aviser les visiteurs de la route grandiose, fut mise par l'humanité pendant 2.5 millions d'années, et les s'aviser de leur responsabilité pour garder la culture d'origine préhistorique, et entretenir l'environnement naturel du Quaternaire pour le future.

Dans le Nord-est de la Hongrie la Montagne de Bükk, riches en attractions touristiques, depuis 1911 est un important centre de la recherche préhistorique en Europe. Parmi une centaine des stations préhistoriques il y a trois célèbres grottes, notamment la Szeleta, la Subalyuk et celle d'Istállósk.

Depuis 1999 la Fondation pour la Culture de Szeleta, en collaboration du Musée Herman Ottó de Miskolc, de l'Agence de Développement Urbain de Miskolc et du Parc National de Bükk ont élaboré les plans de quatre musées ou des centres d'accueil liés aux grottes précédentes.

Jusqu'aux nos jours ne sont établis qu'un petit Musée de Subalyuk, au village Cserépfalu, près de la grotte Subalyuk et un Archéoparc privé à la localité Szilvásvár, en relation de la grotte d'Istállósk. Quoique le concours du plan du Centre d'Accueil de Szeleta, près de la ville Miskolc, ait gagné, sans financement il doit attendre à réaliser.

Au lieu de ce dernier l'on a réussi à bâtir un centre d'accueil 'Musée de la Mer Pannon', à côté du Musée Herman Ottó, au centre de Miskolc, dont une partie de l'exposition s'occupe de l'évolution humaine est de ses environnements quaternaire. Cette attraction est bien populaire et donne lieu à l'enseignement pour les lycéens et les étudiants.

Conclusions :

- C'est assez simple à faire accepter le but et le plan de ces établissements par les Bureaux de concours, quoique les attractions de ceux ne soient pas préférées.
- Après avoir gagné du financement, l'on peut distinguer en deux points différents du futur des musées et des centres d'accueil:
- la construction des bâtiments et les expositions sont plus simples;
- que les entretenir.
- L'entretien des musées et des centres d'accueil sont



beaucoup de plus sûr, si ils se rattachent au réseau hon-  
grois des musées, ou si ils sont liés au tourisme. C'est  
l'enseignement qui fait forcer leur attrait.

- Sans doute, l'organisation d'un réseau international de  
ces établissements peut-être le devoir de l'UISPP, où les  
communications et les collaborations pourront aider de  
faire développer même le tourisme archéologique.

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## POSTER

### EXPERIENCE OF ARCHAEOLOGICAL DIDACTICS AND MUSEAL INTERACTION ON THE PALAEOLITH- IC OF THE PRADIS PLATEAU (ITALY, PN)

*Romandini, Matteo - (Università degli Studi di Ferrara, dipar-  
timento di Studi Umanistici, sezione di Scienze Preistoriche  
e Antropologiche. Corso Ercole I d'Este 32, I-44100. Direttore  
del Museo della Grotta di Pradis, Clauzetto, P.zza IV Novem-  
bre, 6, I-33090. Italy.) matteo.romandini@unife.it*

*del Missier, Flavio - (Sindaco Comune di Clauzetto; Via Fabricio,  
10, I-33090. PN. Italy.) sindaco@com-clauzetto.regione.fvg.it*

*Cescutti, Giuliano - (EX Sindaco Comune di Clauzetto), Chiara  
Aviani - info@ecomuseolisaganis.it (Associazione Lis Aganis  
Ecomuseo Regionale delle Dolomiti Friulane. Maniago. Via  
Venezia, 18, I-33085. PN. Italy.) giuliano.cescutti@gmail.com  
dal Bello, Valentina - (Associazione Lis Aganis Ecomuseo  
Regionale delle Dolomiti Friulane. Maniago, Via Venezia, 18,  
I-33085. PN. Italy.) info@ecomuseolisaganis.it*

*Terlato, Gabriele - (Università degli Studi di Ferrara, diparti-  
mento di Studi Umanistici, sezione di Scienze Preistoriche e  
Antropologiche. Corso Ercole I d'Este 32, I-44100. Italy.) ga-  
briele.terlato@gmail.com*

*Zunnui, Elisa - (Università degli Studi di Ferrara, diparti-  
mento di Studi Umanistici, sezione di Scienze Preistoriche e  
Antropologiche. Corso Ercole I d'Este 32, I-44100. Italy.) elisa.  
zunnui@student.unife.it*

*Scaramucci, Sem - (Università degli Studi di Ferrara, dipar-  
timento di Studi Umanistici, sezione di Scienze Preistoriche  
e Antropologiche. Corso Ercole I d'Este 32, I-44100. Italy.)  
semscara@yahoo.it*

*Peresani, Marco - (Università degli Studi di Ferrara, diparti-  
mento di Studi Umanistici, sezione di Scienze Preistoriche  
e Antropologiche. Corso Ercole I d'Este 32, I-44100. Italy.)  
marco.peresani@unife.it*

At 500 meter above sea level, in the heart of the Carnic  
Pre-Alps lies the beauty and tranquillity of the Pradis pla-  
teau. Hundreds of karstic cavities, wild nature and a spe-  
cial charm, makes this enchantingly place rich in history,  
culture and ancient traditions.

Since Palaeolithic, Neandertals and Sapiens, exploited  
the natural sources of this area. Both our ancestors, we  
demonstrate, were using shelter in these caves carved in  
the rock by the Cosa and Rio Secco streams.

Caves in the Pradis area were important as source of  
knowledge for the Prehistorical man hunting activities:  
like Verdi caves, that were opened as a tourist attraction  
since 1965 or Clusantin caves that hosted small groups of  
Epigravettian marmot hunters. Neandertals occupations  
are recognizable in the Rio Secco cave, an archaeological  
treasure still under excavation, that testifies the transition  
of the last Neandertal cave-bear hunters and the firsts  
anatomically modern human of the Italian North-East.

Thanks to the work of the Cultural Committee and the  
Speleological Group of Pradis the "Museo della Grot-  
ta", that started as permanent collection in 1969, was  
opened to the public in 2001.

Since then, in 2013 a new awareness of the full potential of  
the museal collections, ensued from all the years of expe-  
rience of the Cultural Association of Pradis and the Town  
of Clauzetto administration and from the achievements of  
two archaeological test-pits directed by Dott. Marco Pere-  
sani of the University of Ferrara in 2001 and 2002.

Raised all the funds needed, in June 2005 the first "Ar-  
chaeological research laboratory" started, adopting the  
principles inspired by the newborn "Ecomuseo delle  
Dolomiti Friulane - Lis Aganis", and working in close  
collaboration with the University of Ferrara. The first two  
month laboratory at Grotta del Clusantin recorded the  
attendance of more than 600 participants. The achieve-  
ments granted the setting-up in spring 2007 of a section  
in the local museum displaying the finds recovered in  
this shelter and lead in 2008 to the first popular/scientific  
publication, an introduction to the results obtained.

The presence of a large glade across from the Clusantin  
cave, favoured the launch of the "Prehistory Days", a cul-  
tural and tourism event, targeted to children and fami-  
lies, in order to promote the archaeological specificities  
of the Pradis Valley. These activities, core of the scientific  
communication process, qualified by a correct philologi-  
cal accuracy, related to modern methodologies and dis-  
coveries in the field of archaeological research and evo-  
lution of man and its behaviour.

Archaeological laboratories, that took place from 2005  
until now in the Clusantin and Rio Secco cave, permitted  
to organize, during the opening months, daily guided

tours for the public and schools, with the possibility of participation at the archaeological activities, and several conference sessions part of the project "The last Neandertal in Friuli". Nowadays the museal activities of cultural enhancement of the territory and scientific research represent a key attraction to the Pradis Valley, acting in this scenario as a promotion hub for the whole territory.

# A15f Educational, informative and disseminative strategies in prehistoric museums and archaeological sites

Commission on Archaeological heritage policies and management structures

(Organisers: Aurora Martín, Rodrigo Alonso Alcalde. With commission on Prehistoric and Proto-historic heritage sites management)

Friday 5th (9:00 to 13:30)

Meeting Room "Salon Actos" Museo de Evolución Humana



2014 burgos  
1-7 sept.

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de Sciences Préhistoriques  
et Protohistoriques



XVII World UISPP Congress  
XVIIe Congrès Mondial de l'UISPP  
XVII Congreso Mundial de UISPP

ORAL CONTRIBUTIONS

ORAL

## 1. ICE AGE EUROPE – NETWORK OF HERITAGE SITES

*Weniger, Gerd-Christian (Neanderthal Museum) weniger@neanderthal.de*

*Hieke, Katrin - (Projekt 2508) hieke@projekt2508.de*

The Ice Age Europe Network ([www.ice-age-europe.eu](http://www.ice-age-europe.eu)) established in 2013 tells the story of ice age people in Europe and our common heritage in space and time. 18 archaeological sites with important Pleistocene heritage and affiliated museum or visitor center from seven European countries are members. They attract in total nearly two Million visitors per year and are managed by around 300 staff members.

The network was established by the initiative of the partners themselves, who also provide for the basic funding from their own resources to ensure the sustainability of this long-term project. The network's aims are to raise awareness on the conservation of Ice Age heritage and to develop valorisation programs, to exchange best practice for site management and museum display and to encourage collaboration of all kinds, e.g. in the field of science, management, pedagogy, tourism and governance. As a new umbrella brand, the network opens the possibility of reaching well established as well as new target groups across Europe.

First experience from collaboration and from recently started subprojects will be presented.

ORAL

## 2. MUSEUM OF HUMAN EVOLUTION: TABLETS, SIGNGUIDE, CHILDREN'S GAMES AND VIRTUAL VISITS.

*Alonso Alcalde, Rodrigo (Museo de la Evolución Humana) ralonso@museoevolucionhumana.com*

*Martín Nájera, Aurora (Museo de la Evolución Humana) amartin@museoevolucionhumana.com*

The technology advances produced during the XXI century have caused one transformation in methods and in tools to communicate knowledge. We have carry out a set of actions that we would like to join new technologies and diffusion of the contents of the museum and the site in Atapuerca Range Mountain.

Guide visit whit tablets: individual visitors have the possibility of visiting the museum with a tablet, in which they can access to a large sort of contents and didactic games complementary to the ones that we have at the permanent exhibition at MEH.

Signguides: in collaboration with other institutions that work at the field of elimination banners of communication, signguides have been design, special for people suffering hearing disorder. In this same line we have carried out other actions (tours for people with a reduced mobility, visits with support materials for people vision disorders, etc.) in order to get an accessible museum for everybody.

Children's interactives: Children required special educational attention, which is the reason why there is a special area at MEH where through informatics games and using Kinect technology children and young people get closer the human evolution in an interactive and educational way.

Treasure Map: for families a special map has been produced. Children have to answer to a battery of questions during the marked tour by the MEH. In this way children are the ones that guide their parents and at the same time they take part in the learning process of their children.

Virtual visits: a bank with virtual visits to the temporal exhibitions is being created. In this way we abolish the short-lived feature of these exhibitions and their contents is always accessible through the museum's website.

All this actions are allowing us to complete and update the expository discourse at the museum at the same that boost the establishment of the new technologies at MEH.

ORAL

## 3. HOMÍNIDOS Y HOMÍNIDAS: UNA EXPOSICIÓN SOBRE LA EVOLUCIÓN HUMANA

*Barciela Durán, Patricia (Domus- Museos Científicos Coruñeses) patricia@casaciencias.org*

*Armesto Ramón, Francisco (Domus- Museos Científicos Coruñeses) patricia@casaciencias.org*

*García Visos, Bibiana (Domus- Museos Científicos Coruñeses) bibiana@casaciencias.org*

Dadas las muchas y variadas noticias relacionadas con la evolución humana, la Domus, el museo de A Coruña

dedicado al ser humano, siguiendo en la línea de dar respuesta a los temas de actualidad que suscitan el interés de los ciudadanos, ofrece una exposición sobre nuestros orígenes y la historia evolutiva de las características que nos hacen más humanos, y de las que presumimos.

Desde la antigüedad el ser humano se ha contemplado a sí mismo como el "elegido", creado a imagen y semejanza de los dioses; la aparición de las nuevas ideas evolucionistas no cambió el sentir general de la población, pues la humanidad ha querido seguir considerándose como un objetivo de la evolución, creyendo que si las especies vivas se pudieran ordenar de menos a más, el ser humano ocuparía la cumbre de la perfección. Por eso, como siempre nos hemos creído el ombligo del mundo, el camino de aproximación a esta exposición sobre evolución humana pasa por plantear una ruptura con los prejuicios, falsas creencias y errores que la rodean, pero de forma amable y lúdica, que invite a la curiosidad, pensamiento crítico y al escepticismo informado.

Y de aquí el subtítulo de la exposición, La familia presumida, entendiendo que a la especie humana le gusta resaltar aquellos atributos que considera los más importantes hitos evolutivos de los homínidos.

"Homínidos y Homínidas" es una exposición divulgativa, interactiva e interdisciplinar, dirigida a personas de todas las edades, que combina el rigor de los planteamientos y afirmaciones con el carácter lúdico y popular de las realizaciones museográficas. Se aborda la evolución humana desde una perspectiva que permite incluir las características biológicas más determinantes del desarrollo evolutivo, buscando la motivación, el interés, la sorpresa, la diversión o la reflexión de los visitantes.

Para desarrollar los contenidos se ha recurrido a diferentes soluciones museográficas, experiencias interactivas, mecanismos, módulos informáticos, maquetas o escenografías. Se presentan además réplicas de piezas emblemáticas que sirven para hablar sobre cada una de las cuestiones de la evolución humana que se abordan. Así, cada unidad expositiva está formada por: una pieza emblemática, un módulo interactivo, una cita que ofrece una visión interdisciplinar, y un texto con varios apartados.

Las piezas emblemáticas tienen su espacio destacado dentro de cada unidad expositiva, ya que se trata de reproducciones de importantes hallazgos paleontológicos y arqueológicos. Son, por ejemplo, varias piezas halladas en el yacimiento de la Sierra de Atapuerca (los llamados Elvis la pelvis -pelvis de Homo heidelbergensis -, cráneo

del niño de la Gran Dolina –especie Homo antecessor, descubierta en Atapuerca-, Miguelón -Cráneo 5-, o Excalibur -un hacha de mano-), una reproducción de la pintura rupestre de una mano en negativo de la Cueva El Castillo (Santander) o las huellas de homínidos de Laetoli, Tanzania.

La exposición aborda los siguientes temas: genealogía, la postura erguida, la locomoción bípeda, la pinza de precisión, visión estereoscópica, el volumen cerebral, la adquisición del lenguaje, pensamiento y razonamiento simbólico, la dieta omnívora, el cuidado de las crías, el desarrollo tecnológico, la organización social, y la expansión geográfica.

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## ORAL

### 4. EUROPEAN COOPERATION PROJECTS: THE MAÇÃO MUSEUM STRATEGY FOR ACTIVITY AND EXPOSURE ENHANCEMENT

*Oosterbeek, Ivo - (GQP-CGC (uID73 FCT); Instituto Terra e Memória; Benefits & Profits Lda; Museu de Mação) ivoosterbeek@gmail.com*

*Marques, Sílvia - (Instituto Terra e Memória; Instituto Politécnico de Tomar; Museu de Mação) sarouelala@gmail.com*  
*Cura, Sara - (GQP-CGC (uID73 FCT); Instituto Terra e Memória; Instituto Politécnico de Tomar; Museu de Mação) Osaracura0@gmail.com*

*Pereira, Anabela - (GQP-CGC (uID73 FCT); Instituto Terra e Memória; Museu de Mação), belaborralheiro@gmail.com*  
*Cura, Pedro - (GQP-CGC (uID73 FCT) Instituto Terra e Memória; Museu de Mação) Opedrocura@gmail.com*  
*Teixeira, Vitor - (Benefits & Profits, Lda.) benefitsprofits@gmail.com*

*Oosterbeek, Luiz - (Instituto Politécnico de Tomar; GQP-CGC (uID73 FCT); Instituto Terra e Memória) loost@ipt.pt*

Since its reopening to the general public in 2005, the Mação Museum has developed a series of diversified activities in order to promote heritage awareness regarding its collections (mainly archaeological) as well as the archaeological sites in its vicinity (megalithic monuments, proto-historic enclosures and rock art complexes).

Though the scope of the museum's educational program would be constricted by the museum's low budget, this issue was resolved through the establishment of a partnership network, including Higher Education institutions (Instituto Politécnico de Tomar, Universidade de Trás-os-Montes e Alto Douro), non-governmental institutions (CEIPHAR, ITM and ACIAAR), and local enterprises

(Benefits & Profits), allowing the Museum to diminish production costs in its activities.

The success of this networking strategy was then enhanced by the financial and artistic complement of the recurrent candidacy in European cooperation projects regarding the cultural sector. The Culture Programme allowed for the Mação Museum to widen its range of educational and dissemination projects, not only through the co-funding of those projects and enrichment of the already growing network of partners, but also by introducing in the museum a range of artistic experiences, which complement the archaeological nature of the museum's main collection, while being more "public friendly".

In this presentation we will approach the Museum's dissemination strategy through the enrichment of partnerships and the growing range of activities, celebrated via the cooperation solutions provided by European tools. We will stress which educational projects and partnerships were brought about by the different European Projects the museum has applied to (EuroPreArt, ArtRisk, ArtSigns, Transformations, GestArt), and the importance those projects and partnerships have acquired in the Museum's educational program.

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#### ORAL

### 5. THE EDUCATION PROGRAM OF MUSEUMS OF LA GOMERA (CANARY ISLANDS, SPAIN): BUILDING HERITAGE IN THE COMMUNITY

*Hernández-Marrero, Juan Carlos - (Museo Arqueológico de La Gomera (Cabildo Insular de La Gomera) museoarqueologico@lagomera.es*

*Cabeza-Marrero, Jaime - (Grupo de Investigación POSASUe. Dpto. Didáctica e Investigación Educativa, Universidad de La Laguna.) jacmarrero@gmail.com*

For a few years and at the same time as the islands' museums opened, a space of convergence of different local agents -such as work teams, projects, neighbours, entrepreneurs, or heritage and education professionals- has been created in La Gomera. All these people have shared working methodologies involving participation processes and networking.

The education program of museums of La Gomera emerges in this context as a practical tool that organises and explains any educational action taken in the islands' museums. It is thus included in this convergence of lo-

cal agents, establishing new links and routes towards achieving island collectivity regarding cultural heritage education and learning.

This plan begins with an analysis of the social, economic, historical and cultural context of the island and it is structured through the educational aims and principles of museums. Then, it establishes some action ambits in which the educational actions are grouped according to the social context where they operate. Thus, every field has an own Educational Program that is addressed to a particular population; educational aims; adapted contents; methodological proposals and critical assessment criteria and procedures for every activity.

These action ambits are:

- 1) IN-Museum: it covers the set of activities about the museum's physical space (contents and the building itself), focusing on exhibitions and addressed to visitors and museum's workers.
- 2) Schools: addressed to formal education (compulsory and non-compulsory). It includes actions in educational institutions and teachers' counselling, such as educational workshops (anually biological anthropology workshops, archaeological excavations, etc...).
- 3) Collectives: this area of action -as vulnerable as important- allows accessing a part of the adult island's population that is organised. The most relevant activity is the museums' forum, an annual event that shows to the citizens what the museums have done during the year.
- 4) Tourism: addressed to tourists as well as to those people that have some relationship with this strategic sector in La Gomera.
- 5) Environment: this field needs to entirely consider the natural and cultural heritage, being the island territory a key concept of action.

The research projects that are carried out in the museums -or those in which they participate- provide information that nourishes the contents of the education program, while -at the same time- the education program supports an increasing rol of the community participating on researches.

Carry out this education program does not involve a higher number of educational actions, but it involves museum networking using any resource available in the island (its scope of work necessarily exceeds the limits of the museum's building); an action agenda; an organisation facilitating the actions' balanced perspective regarding each area of action; and working with and towards all the community, without risk of any kind of discrimination.

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ORAL

**6. INVESTIGAR PARA TRANSMITIR CONOCIMIENTO: LA EXPERIENCIA DEL ARKEOLOGI MUSEOA DE BIZKAIA EN LA COMUNICACIÓN DEL CONOCIMIENTO DERIVADO DE INVESTIGACIONES ARQUEOLÓGICAS.**

*García Camino, Iñaki (Arkeologi Museoa/ Diputación Foral de Bizkaia) inaki.garcia@bizkaia.net*

Los Museos son por definición instituciones “comunicativas” que ponen en relación los objetos y sus contextos (en nuestro caso arqueológicos) con la sociedad. Por ello la transmisión del conocimiento que proporcionan las colecciones que custodiamos nos parece una labor fundamental y ello se realiza a través de diversos medios.

- la exposición de referencia que muestra la historia de Bizkaia a través de los datos proporcionados por las investigaciones arqueológicas.

- las exposiciones temporales que inciden en determinados aspectos del pasado, especialmente en aquellos que son objeto de las últimas investigaciones y discusiones científicas.

- las publicaciones que pretenden acercar al público interesado, aunque no necesariamente versado, los debates y discusiones que giran en torno a temas de la arqueología actual.

- cursos y conferencias como una oportunidad que favorezca el encuentro entre arqueólogos.

- programas didácticos adecuados al currículo escolar.
- talleres diversos para familias sobre excavaciones, alimentación, vestidos o vivienda a lo largo de la historia.
- visitas guiadas especiales que conecten el Museo y sus colecciones con los yacimientos de donde proceden, resaltando el concepto de Museo Territorio.

Se evaluarán estos resultados y se planteará también la necesidad de vincular estrechamente investigación y comunicación como parte de una misma realidad, lo que no es tan frecuente dado que todavía existe una división de funciones entre los responsables de la investigación (científicos) y de la comunicación (periodistas).

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ORAL

**7. THE ATAPUERCA EDUCATIONAL WORKSHOPS: A MODEL ADAPTED TO SCHOOL CURRICULUM**

*Alberto San Martín Zapatero (Sierractiva SL.) alberto@sierractiva.com*

Many schools come to visit Atapuerca. Students are a large audience. That's why our team works to design educational workshops adapted to school. In our workshops children acquire the main educational competences. We want prehistory is transversal to other areas of knowledge.

Many disciplines are practiced at Atapuerca. This is the reason why the didactic team considers it crucial the development of different types of workshops for different types of subjects. Equally important is the adaptation of the workshops to the students' age groups.

In addition to the academic objectives, we also want to promote the conservation of this archeological treasure in the minds of our children.

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ORAL

**8. EDUCATIONAL USE FROM A NEANDERTHAL SITE. THE ROCA DELS BOUS AND THE NOGUERA LEARNING SCHOOL.**

*Antoni Bardavio Novi (Campo de Aprendizaje de la Noguera) c5901117@xtec.cat*

*Sònia Mañé Orozco (Campo de Aprendizaje de la Noguera) smane@xtec.cat*

*Paloma González Marcén (Universidad Autónoma de Barcelona) Paloma.Gonzalez@uab.cat*

The Noguera Learning School (<http://www.xtec.cat/cda-noguera/>) is an educational service of the Department of Education of the Regional Government of Catalonia. It is located in the town of Sant Llorenç de Montgai (Lerida). It receives students of different compulsory and post-compulsory educational stages. It also takes part in the initial education of students of the Degree in Prehistory and the Degrees in Child and Primary Education Teacher Training, as well as the Master Degree in Compulsory Secondary Education Teacher Training, all from different universities.

Its main objective is to learn about both prehistoric life, as well as archaeological research. Ever since its foundation in 2005, it works co-ordinately with the team members of the Study Centre for Prehistoric Archaeological Heritage (CEPAP) of the Autonomous University of Barcelona. This team is in charge of the excavations of the Neanderthal site of Roca dels Bous at Sant Llorenç de Montgai, in the area where the Pre-Pyrenees Mountains meet the plains of the region of Segrià in the Ebro Valley. The disciplinary development of archaeology, “thought

archaeology”, has been reflected on the role of archaeology within the school framework leading to different teaching models included in the teaching-learning of history. Therefore, “taught archaeology” responds to this epistemological evolution.

In the case that is hereby described, the site of Roca dels Bous (with its work in progress system, that proposes a permanent visualisation of the current status of the excavations) allows, during the didactic visit of non-university students, the following inductive sequence for the analysis of the objects and structures that have been located during the excavation; descriptive analysis, typological comparative analysis, functional analysis and the formulation of interpretative hypotheses regarding the context of origin.

The school students that take part in patrimonial education proposals, such as the proposal associated to the visit of the Roca del Bous site, in an active and experimental manner (the visit is extended with activities at the Didactic Archaeological Park, with regard to the processes of acquisition of historical knowledge, as well as empathy activities based on the reproduction of typical prehistoric situations which we call Didactic Experimentation in Archaeology), develop a series of values and attitudes that promote critical analysis tools.

The proposal of the Noguera Learning School at the site of the Roca dels Bous intends to develop, based on the knowledge about the organisation of Neanderthal societies that inhabited this location, the capacity to understand a historical and social reality, its evolution, successes and problems, which leads to resorting to the multi-causal and systemic analysis to judge the social and historical problems and facts from the point of view of a critical comprehension of history, permanently compared to our modern society

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#### ORAL

### 9. EDUCATIONAL STRATEGIES IN ARCHAEOLOGY. SOME APPLICATIONS IN THE PROTOHISTORIC SETTLEMENTS ON THE LOWER REACHES OF THE EBRO

*Genera i Monells, Margarida (Departament de Cultura de la Generalitat de Catalunya  
UNED, Centro Asociado de Terrassa-Barcelona) mgenera@gencat.cat*

Based on the conviction that all archaeological research projects should include not only a specific section devoted to the protection of the remains, but also one for

the social dissemination of the scientific results obtained, in this congress we will explain the general lines along which our work in the Ebro-Siurana river basins has been carried out in recent years.

We will refer in particular to two of the archaeological sites we excavated in 1976: El Puig Roig del Roget in El Masroig (Priorat) and the settlement of Sant Miquel in Vinebre (Ribera d’Ebre), some 70 km from the present-day mouth of one of the largest fluvial arteries on the Iberian Peninsula. Their occupation is related to the mining operations in the Priorat basin and the management and transportation of the area’s geological resources between the 7th and the 1st centuries BC.

Both sites are currently being prepared to be opened to the public and, in the case of El Puig Roig, a classroom is also being installed in the town hall. Likewise, in parallel with the fieldwork, we have prepared various activities for children. This is because we believe that the dissemination of our heritage, presented in a suitable manner, is without doubt the best way of returning to society the investment, in both human and financial resources, in a specific archaeological site and that which will bring the greatest benefits in educational and cultural terms. With this aim, a series of publications has been prepared using the unique objects found during the excavations.

They are to be used as an educational resource with the objectives of transferring to young people the knowledge obtained by scientific means and engendering among them an interest in interdisciplinary study and research. It is hoped that this will also stimulate their ingenuity and artistic creativity, in addition to encouraging the study of the finds made in that area.

One of our main challenges is, therefore, to disseminate the history of the territory itself and to encourage an appreciation of and sensitivity towards its 2 archaeological heritage and natural environment, in order to improve the conservation and protection of the legacy of our ancestors within its own landscape.

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#### Oral

### 10. NUMANTIA: AN EDUCATIONAL PROJECT WITH FIVE YEARS OLD CHILDREN FROM SORIA (SPAIN).

*López Torres, Esther - (Universidad de Valladolid) esterlop@sdc.uva.es  
Íñigo Fernandez, Aurora - (Universidad de Valladolid) ainigof@gmail.com*



This paper focuses on the analysis of the design, development and results of a small educational project around "Numantia's Celtiberians" conducted with 24 children from 3rd course of Early Childhood Education at CEIP Fuente del Rey in the city of Soria, over a complete quarter of the year 2012-13. Its main objective was bringing the historical and cultural heritage from their own environment to the schoolchildren to make easier, through experimentation and play, and in particular the visit to Numantia, the understanding of historical time, and hence of all historical references that are outside the classroom such as museums, archaeological sites, symbols, heritage interpretation centres, etc. (Santisteban and Pagès, 2006).

Several studies have shown that difficulties on learning the historical time do not lie in the age of the students but in the selection of contents and its didactic treatment (Egan, 1994; Trepát, 2000; Cooper, 2002; Cuenca and Estepa 2005; Cuenca, 2011).

Learning time assumes experiencing or living that in the context of continuity there has been things or situations that were but no longer are (Trepát, 2011), but, on the other hand, the child is only aware of the passage of time when developing the memory, where the events experienced by him, but also by their parents and by their social group remain (Estepa, 2007).

Using the Project-based learning (PBL) as teaching methodology (work plan with which a group of children and their teacher intend to carry out an action research), the elements that explain what happened in their own environment during the Second Age Iron were introduced, taking advantage of the proximity of the site of Numantia and the resources offered by the Numantia Museum in Soria. The contents relating to that period were adapted to schoolchildren through images, performances, dialogues, narratives... to generate meaningful and playful learning at the same time.

The Celtiberians were very present in children throughout the quarter we worked on them. Through verbalizations the proposed learning was observed to be acquired and, at project completion, after resuming the questions raised at the beginning, we saw that we could answer them all. While we watched the creations of children and the photos taken throughout the process, we recognized what we had learned.

Corroborating what many scholars say, the teaching and learning of history in Early Childhood Education is possible if appropriate strategies that return the leading

role to the students are used. The use of questions that their own historical and cultural environment generates enhances their motivation; and direct contact with the archaeological remains, not only watching but also participating and acting through play, help them to fix and grasp contents that are otherwise too abstract.

ORAL

## 11. DYNAMIZATION MODELS OF ARCHAEOLOGICAL SITES IN SPAIN. TOWARDS A NEW MANAGEMENT MODEL OF ARCHAEOLOGICAL HERITAGE.

*Luque Cortina, Manuel. (Paleorama SL Ctra. Madrid-Irún (N-I), Km 232 (Pol., Gromber), Nave 58. 09195 Burgos) mluque@paleorama.es*

The archaeological heritage is one of the major distinctive strengths of our country, a perception that is not always shared neither by society nor by administrations that devote significant amounts of public money, sometimes without much discretion to raise infrastructures and purchase equipment whose maintenance and subsequent management generate more conflicts that apparently offer solutions. In this article we show the results of assessing and evaluating management models over 40 national archaeological sites and almost 20 years of experience from the private sector in dynamization and auditing archaeological heritage.

Our impression is that the classical model led by administrations is completely outdated "not only of infrastructures lives a location", there is also a need of specialized training, planning, alternative financing, resource control, a good communication plan and a dynamic and a long term attractive design supply. All this costs, and costs every month. The reality is that administrations are overwhelmed by lack of time and resources. It is not possible a management culture without a corporate culture and without the active participation of the society, that ultimately is what gives real meaning to any effort and investment.

We are convinced that the future lies in a mixed model, where the key role of the private sector is assuming the risk of bearing the costs of management and maintenance of public facilities, but with freedom in supply management, always under the watchful eye of the administration and through a transparent plan for the society.

To diagnose the "health" of management and revitalization programs of the analyzed sites several factors were

taken into account: the influence of environment, location, access and signage, structures and general services offered by each location, proximity to places with high load population or areas of population influence, structures monumentality, its distinctive strengths, financing sources, the legal constraints of each space, the ownership of the land, their security measures, conservation status, quality of offering, the team training and the core management leadership, the maturity and effectiveness of its communication model, used learning resources, after-sales strategy, associated research projects, public, private or mixed models implanted, and above all, its corporate management culture.

Apparent discrepancy between corporate or commercial communication (what is said to be offered) and corporate identity (what actually offers), "we are specialized in selling smoke". Excessive dependence on government, both economically and management strategies; the result is a general, ambiguous and low dose of innovation offering. More emphasis on infrastructure is given (architecture continent) than to content, teaching resources and above all, to the real needs of the public. Poor planning in a medium and long term maintenance costs and a lack of faith in the Archaeological Heritage potential as a distinctive strength compared to other sectors with more funding.

A mixed public-private management model in which risks, costs, responsibilities, benefits, and where universities validate the content as a quality certificate, is hereby imposed. A model oriented mainly to a developed sustainable model and to meet the needs in an increasingly demanding public, that should be able to participate more actively in the design and functionality of the spaces. If we want that current efforts and investments make sense, we must begin to educate culturally for the future.

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ORAL

**12. «I AM MYSELF AND I'M THE OTHER» THE PROGRAM OF INTERCULTURAL, ARTISTIC AND TECHNOLOGICAL EDUCATION FOR AN INTEGRATED MANAGEMENT OF THE LANDSCAPE (MAÇÃO, CENTRAL PORTUGAL)**

*Oosterbeek, Luiz - (IPT) loost@ipt.pt*  
*Pereira, Anabela - (GQP-CGC (uID73 FCT); Instituto Terra e Memória; Museu de Mação), belaborralheiro@gmail.com*  
*Cura, Pedro - (GQP-CGC (uID73 FCT) Instituto Terra e Memória; Museu de Mação) 0pedrocura@gmail.com*  
*Cura, Sara - (GQP-CGC (uID73 FCT); Instituto Terra e*

*Memória; Instituto Politécnico de Tomar; Museu de Mação) Osaracura0@gmail.com*  
*Alves, Alain (ITM)*  
*Ferreira, Célia (ITM)*  
*Sequeira, Renata (ITM)*  
*Moleiro, Vera (ITM)*  
*Morais, Margarida (Museu de Arte Pré-Histórica de Mação) margarida.morais@gmail.com*  
*Cerezer, Jedson (ITM)*  
*Almeida, Nelson (ITM)*  
*Garcês, Sara (ITM)*  
*Marques, Sílvia (ITM)*

The Earth end Memory Institute (ITM) was structured in 2010, joining the efforts of the Municipality of Mação, the Politechnic Institute of Tomar and two Non Governmental Organizations for prehistoric research and cultural heritage. The goal was to make the most of the available resources and to establish with the Museum of Mação and with regional support a competitive and qualified platform to promote internationalization. The ITM launched some structuring projects, such as: the organization, conservation and management of museums (partnership with private enterprises); the artistic and technological education (Andakatu Project) and programs of integrated landscape management.

The program developed by ITM is grounded on the elaboration and application of new educational possibilities in the domains of natural sciences, technology, arts and language. In that sense, ITM cooperates with teachers of elementary and high schools to structure activities in all disciplines, given to schools as a complement to the students learning process. Based in ten years of experience of scientific knowledge socialization about human adaptations in face of climatic, environmental and cultural modifications in prehistory, a support from the European Community was obtained to finance the international project «GESTART- artistic gestures revisit the diversity and convergence of art in Europe». Within this project the art and the cultural heritage are the basic references of different activities involving artists, archaeologists and citizens in domains like ceramics, stone tools knapping, design, literature, photography and cinema. Until the end of November 2014 the project will bring together artists, crafts men and women, archaeologists and art historians bounded towards the consolidation of the cultural landscapes in which citizens of several countries and regions live in.

ORAL

### 13. EN TORNO A LA HOGUERA: ENSEÑANDO PREHISTORIA A LOS MÁS JÓVENES DE LA TRIBU

*del Pozo Manzano, Elena (IES Manuel de Falla-Madrid) elena.delpozo@madrid.org*

Every student has an Indiana Jones inside. The dissemination of archaeological and paleontological discoveries is important in any Western society, and the transmission of findings from Atapuerca to younger generations is a priority in Spain. As such, it is essential that material on human evolution and Atapuerca is regularly updated by teachers and textbook publishers. Secondary education curricula in Spain offer the first exposure to content related to prehistory, archaeology and human evolution. Students are exposed to this through a range of subjects, including science, social science, philosophy and citizenship. Moreover, visits to the National Archaeological Museum in Madrid, the Museum of Human Evolution in Burgos and sites in the nearby village Ibeas de Juarros make students aware of the need to preserve the human legacy continuously uncovered by science. Students are readily attracted to this subject matter because it provides insights into the mystery of where and who we come from, the way we behave and relate to one another and the links that joins us to species both extinct and living, such as Neanderthals or today's primates. When they learn that people living in Atapuerca thousands of years before had the same needs, feelings, successes and failures as they have, students find the motivation to learn about prehistory. For example, there is a fossil in Atapuerca of an old man who lived for a long period of time without teeth. This means that there was someone in the tribe that chewed food for him and kept him alive. There was also a child who had a terrible infection that affected his brain development and he probably suffered from terrible headaches. Still, the child lived until the age of 5 with the help of the tribe. The way students learn this content has an extraordinary influence on how they value the heritage of Atapuerca on a worldwide scale.

There is a lack of uniformity in the taxonomic classification in secondary textbooks. Most of them ignore the first human species and start with the *Australopithecus Africanus*. *Homo Sapiens Neanderthalensis* is classified in the same evolution line as *Homo Sapiens Sapiens* in some books while others show them as different species. *Homo Antecessor* is a human species that is difficult to locate in the taxonomic classifications that appear in textbooks. Some authors consider it the offshoot species of both *Homo Neanderthalensis* and *Homo Sapiens*,

while others show it as an offshoot of *Sapiens* only. Secondary teachers are aware of the complexity of the hominisation sequence due to the regional variations of human species worldwide. This encourages them to keep updated information to take to their lessons.

This paper discusses the teaching of content related to Atapuerca in prehistory lessons, in textbooks and gives suggestions on how to improve both. "So I am a teacher... sometimes" – Indiana Jones and the Kingdom of the Crystal Skull.

ORAL

### 14. CRONOTABLAS AND PALEOCATÁLOGO 3D. FREE SOFTWARE TO OPTIMIZE THE MANAGEMENT AND REVITALIZATION OF ARCHAEOLOGICAL HERITAGE.

*Luque Cortina, Manuel (Paleorama SL. Ctra. Madrid-Irún (N-I), Km 232 (Pol., Gromber), Nave 58. 09195 Burgos) mluque@paleorama.es*

*Maqueda García-Morales, Raúl (Paleorama SL. Ctra. Madrid-Irún (N-I), Km 232 (Pol., Gromber), Nave 58. 09195 Burgos) raulmaqueda@paleorama.es*

*de la Torre Santos, Eduardo (Paleorama SL. Ctra. Madrid-Irún (N-I), Km 232 (Pol., Gromber), Nave 58. 09195 Burgos)*

*Marta Burgos de Olmo (Paleorama SL. Ctra. Madrid-Irún (N-I), Km 232 (Pol., Gromber), Nave 58. 09195 Burgos)*

*María Barahona López (Paleorama SL. Ctra. Madrid-Irún (N-I), Km 232 (Pol., Gromber), Nave 58. 09195 Burgos)*

Most software related to archeology is primarily targeted for the treatment and management of object, structures or the archaeological record. Over the years, the parcels related to our discipline have increased considerably. One of them, the revitalization and management of museums, reception centers and archaeological sites, have had to resort to general programs designed for other environments, or even sometimes nothing to be with the demands of an increasingly dynamic offering to meet the needs of a very concrete and specific segment.

With over 20 years of experience on our backs, in Paleorama we have detected several of these user needs and therefore we have focused our efforts to meet them. For this reason we have developed (still in beta) two programs, Cronotablas and Paleocatálogo 3D. The first is an application to manage in a simple and effectively way, the range of activities of any center or museum. Among its main features are the flow visits control (regardless of the type of activity), logistic and organization, planning and anticipation of associated costs, a powerful alert sys-

tem and two interesting communication and statistics modules. But surely its main strengths is that are working both on local and server mode and its interface is clear, simple and intuitive allowing full control "all at a glance".

It is an ideal application for small businesses and organizations that start their career in the field of the complex Heritage dynamization. The Paleocatálogo is an object-oriented application that allows teachers and students to view, rotate, zoom, download and project the main peninsular and international prehistory objects..

But what is certainly relevant is that both programs may be used free of charge, both individual users and the public or private sector. For a company like Paleorama with a high degree of maturity, the challenge is to give, share, contribute openly to improve and enhance the public's interest in our great heritage, and facilitate other companies the long and thorny road of Heritage business management. Open Innovation is therefore, our next goal.

For the development of our work we have used (in the case of Paleocatálogo) photogrammetric restitution for object scanning, generating high definition models and models with lower polygons to optimize time downloading, facilitating their use in educational environments. In the Cronotablas software, we have used different programming languages such as html5 to support its use and display in the Web and in major mobile and touch devices.

The Cronotablas software has allowed us (1) to eliminate common complex interface problems being able to visualize in an accurate, easy and on one screen view, all the information related to organization and supply management, (2) minimize the disadvantages of working in local mode, allowing remote online access (including mobile devices), enabling transparent management and reducing significantly delocalization problems and finally (3) rigorous monitoring and analysis of the predefined variables through correlation and connection between the different modules. All this translates into control, comfort in users communication with and resources optimization when anticipating and planning the associated costs.

Archaeological heritage is a distinctive strength of our country and has sufficient authority for himself as for developing specific applications to optimize their management, ensuring access and a quality services to the public. The social commitment of Paleorama SL with this educational project is embodied in these two applications as part of a more ambitious and long term open innovation program.

ORAL

## 15. PARCHIPITHECUS: AN EDUCATIONAL ALTERNATIVE TO VISIT MUSEUM OF HUMAN EVOLUTION IN BURGOS USING ICT.

*García Andrés, Joaquín (Universidad de Burgos) jgandres@ubu.es*

*Rodrigo Alonso Alcalde (Museo de la Evolución Humana) ralonso@museoevolucionhumana.com*

Parchipithecus is one educative proposal conceived to make more dynamic visits to the Museum of Human Evolution (MEH) lead to high school students. Because of the nature of this institution and the singularity of its contents, base in human evolution, the set of the activities has been design in order to make the students achieve the basic contents about this process, through the use of some of the most essential premise of it. Using the parallelism between the visit to the museum and the human evolution we aspire to make easy to understand it in a significant way.

In order to get this knowledge, the proposal is based in a didactics methodology and fundamentally active activities, this transfers importance to the student in the bosom of a model of "learning by guide discover". Organize in small teams, the students take over the role of scientist, at the same time that they investigate freely by the facilities of the MEH, they gain the principal contents combine the scientific method and the ludic aspect that reveals the title of this experience.

In fact, the name given to this activity has been given in order to the game that unite all the activities offer, this game has been inspired by other popular game "Parchisi", but with a new point of view focus in the research of information throw thirty-two key questions relatives to four different areas of the museum: Geologic, Evolution, Brain and Prehistoric Culture. Their resolution with more or less success allows players to know their hypothetical level of CC (Key Questions about this four areas), and paying attention on it, their grade of adaptation to the environment.

Distribute in different phases through a large sort of activities, this allows to give space in a integrate way and simultaneous in a different educative levels and, above everything, academic and personals interests with enough flexibility. In this way we expect to create an appropriate context in which develop an attractive visit, alternative to a conventional and significantly in an educational level, in addition we transform the MEH in an alive

institution and a reference of innovation in a formative area, like it is already in a expositive level.

In this sense, the dynamic of the work incorporate a joint of resources link to the CIT, focus in the using of the cellphone, in order to obtain one of the parts of the refer information through of Qr codes, also to communicate between players using Whatsapp, or taking photographs and record videos or record explanations that, eventually, the educators of the MEH provide.

Further than its apparent competitive character, all the didactic activities is subject to the realization of the final common conclusion, of the work realized by each team, this time in the common framework of learning, that it emphasizes that the amount of the contribution makes possible that everybody obtain a complete view and the ensemble of the contents, acquired in a motivated and personal way.

#### ORAL

### 16. LA CUNA DE LA HUMANIDAD: LOS FÓSILES DEL YACIMIENTO A LA EXPOSICIÓN

*M. C. Ortega 1 y 2; E. Baquedano 2 y 3; A. Gidna 2 y 4; A. ZP. Mabula 2,4 y 5 ; F. Diez 2 y 5; M. Dominguez-Rodrigo 2 y 6. 1. Centro Mixto UCM-ISCIll de Evolución y Comportamiento Humanos, Madrid (Spain). 2. Instituto de Evolución de África (IDEA). 3. Museo Arqueológico de Madrid, (Spain). 4. Museo Dar es Salaam, Tanzania (África). 5. University of Dar es Salaam, Tanzania (Africa). 6. Universidad de Valladolid (Spain). 7. Universidad Complutense de Madrid (Spain)*

The fossils presented in the exhibition "The Cradle of Humankind", come from Olduvai Gorge located in the Ngorongoro Conservation Area (Laetoli y Olduvai George) in the Arusha region of northern Tanzania. These sites preserve an impressive archaeological and paleontological record yielding remains of several hominin species such as *Homo habilis*, *Homo ergaster* and *Paranthropus boisei* as well as faunal remains during the last two million years. These derive from the following sites: BK, SHK, MK, FLKN, FLK Zinj, FLK West, PTK, TK, DK y AMK. The fossils often appear fractured, jumbled and encased in hard sedimentary concretions, which complicates their excavation. In addition, the sites are located far from the base camp and field laboratory, which complicates their transport, particularly the very large-sized fossils. This region of Africa does not have paved roadways and transport on the irregular roads can lead to fracturing of the fossils. The path for the fossils from the archaeological sites

to their display in the the exposition is a long and difficult one. All of the hominin and faunal species from diverse time periods are represented. Many of these were recovered by different researchers and excavation teams (the Leakeys during the 1950s and 60s and the current excavation team from 2006 to the present) taking different methodological approaches, both in terms of the excavation as well as the conservation/restoration of the fossils themselves. Specific conservation techniques employed by the current excavation team include in situ consolidation and protection, chemical and/or mechanical cleaning, specimen reconstruction and preservation with the consolidant B-72 at 5% concentration in acetone (CH<sub>3</sub>COCH<sub>3</sub>).

The Leakeys also performed chemical and/or mechanical cleaning, reconstruction with an unknown adhesive (possibly of natural origin), putty-reinforced reconstructions and use of structural supports between large fragments, volumetric reintegration with plaster and surface protection with an unknown natural varnish, possibly shellac. Present-day treatments of the fossils excavated by the Leakeys include stabilizing the moisture exposure through a slow, controlled drying process in a water-tight environment. In addition, a supporting "bed" is often constructed conforming to the contours of the individual fossil. The varnish is removed by applying a 3% concentration gel of dimetilsulfoxide with Klucel, leaving the product on long enough until the varnish is softened and can be removed with dissolvent. This is followed by dripping consolidant on the reconstructed region with Paraloid B-72 acrylic resin at 10% in acetone and subsequently filling in the cavities with a 20% solution of the same. The human fossils which could not be transported to the exhibit were molded directly, in the case of postcranial remains, and surface scanned, in the case of the crania, to produce polychrome resin casts with a similar finish as the originals. The results are entirely satisfactory.

The process was guided by the principle of minimum intervention and reversability, as well as exhaustively documenting the different stages of the process. Extraneous products and dirt adhering to the specimens have been removed without altering the interpretation of the fossil. A non-abrasive and homogenous cleaning has been carried out. The consolidation was done with compatible products and innocuous methods that do not alter the physical/chemical properties of the fossils. The reintegrations were minimal and aimed toward stabilizing the fossil. After analyzing the state of preservation, the moisture and structural stability was made a priority. Previous restorations were respected as long as they did not

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compromise the future survival of the fossils. Treatments were applied according to the demands of conservation and paleontological study, but aesthetic concerns related to museum exhibition were also considered.

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## ORAL

### 17. EDUCATIONAL AND INFORMATION STRATEGIES, DIFFUSION AT MUSEUMS AND PREHISTORIC SITES.

*Martín Nájera, Aurora (Museo de la Evolución Humana)*  
*amartin@museoevolucionhumana.com*  
*Alonso Alcalde, Rodrigo (Museo de la Evolución Humana)*  
*ralonso@museoevolucionhumana.com*

The transmission of scientific knowledge is an actual matter that has acquired a new dimension in the educational and in at museums' world. Information, ways of learning, resources, graphic and interactive possibilities are considered, more often, like fundamental to develop cultural programs, where we can find exhibitions about scientific museums, teaching centre or interpretation of archaeological sites.

Museums bring the public closer to scientific discoveries, they offer exhibitions that keep the scientific method and present in a understandable and entertaining way the importance of Science in our life. Its work is based in the information given by the scientist, in order to update contents, but also how its resources reach the visitors, understanding mediation like a fundamental part of its nature.

But not everything is an exhibition; they also develop an important cultural program that strengthens the knowledge expressed in the collection of the Museum, introducing polemic themes or new points of view that open new perspectives unknown at the moment, searching interactivity and citizen involvement.

Inside the regulate education exist interesting support that goes over the line of just teaching, they take the student into a scientific experience because resources were conceived to increase the creativity of the students bringing to light in a different way a cultural legacy resource, a historic period or a particular research project. But new technologies also suggest different ways of information and an increasing diffusion of the scientific themes: websites have more and more interesting resources to incentive the interest of the society, using audio-visuals carry out strictly based in the scientific

method. Interactive games, interactive games where you have to use different sort of abilities with the new technologies and different levels of knowledge or blogs where you can read about different themes and they get updating in order to bring them closer to society.

Companies working in explaining the cultural legacy are coming out to light and they have begun to invest in new technologies, with the goal of create a net to make themselves known but also to organise their knowledge and the different offers that they have. Mobile applications open new fields of possibilities, and getting closer to different kinds of public until now far to the scientific world.

On the other hand, we can appreciate, day by day, the need of working in a net following the aim of offer a large sort of information about diversity of the museum centres, that has in common one thematic relate to some scientific theme.

Coordinate this actions running by different agents it change into a need to keep a global perspective, join and scientific about everything related with the human evolution area.

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## POSTER

### 18. SEDUCTION IN THE DISCOURSE OF ARCHAEOLOGICAL DISSEMINATION

*San Martín González, Francisco Javier (Universidad del País Vasco)*  
*activatuneurona@gmail.com*

The resources of oral speech in the spreading of archaeology are as important as the visual. A bad Communicator, like in a radio, can make that the public "turn off" their neuronal receptors and assess their visit to a museum like not positive. The same can happen if you have only the option to recourse to modern technological applications. You cannot know how to use them or simply cannot feel obligated to do so. We propose a series of oral language resources, used in radio journalism, whose use is being studied as part of a doctoral thesis in science journalism, which can be exploited by the archaeological guide in their efforts to attract the attention of the visitor and socialize the knowledge in museums or archaeological sites.

The Garcia-Ureta's (2012: 99-124) studies about the perception of the oral message by the public, referring to radio broadcasters, can very well be applied to the scientists. The author says that "a technically perfect voice can

make it quite indifferent to an audience that connect on the emotional level with a little involved Communicator with the message transmitting or unsure of itself”.

We hypothesize that the increase in use of the oral media resources, as in the radio, will result in the better understanding by the public of the archaeological scientist message. Study the oral and auditory resources that facilitate the understanding of the scientific and archaeological discourse. Check and measure their effectiveness in the communication. According to Armand Balsebre (1996: 23) 4 types of languages are defined in the radio: verbal language, musical language, sound effects... and silence.

We unearth in this poster some characteristics of verbal language, as the ringer, tone, intensity, melody or rhythm, and we will make examples of contents and about resources, that can be connected to the emotional level of the people who attend conferences, seminars, workshops, or visit a museum or archaeological sites.

It has developed an audio-poster, with which we will invite attendees to listen an audio record, in which we apply some auditory resources, in order to measure the perception of the readers/listeners about auditory resources used in the communication.



# A16 Aegean-Mediterranean imports and influences in the graves from continental Europe - Bronze and Iron Ages

Commission on Mortuary Practices in Prehistory and Protohistory  
(Organisers: Valeriu Sîrbu, Cristian Schuster)

Friday 5th (9:00 to 13:30)  
Meeting Room B23



2014 burgos  
1-7 sept.

**uispp**

Union International  
de Sciences Préhistoriques  
et Protohistoriques



XVII World UISPP Congress  
XVIIe Congrès Mondial de l'UISPP  
XVII Congreso Mundial de UISPP

ORAL

**1. ABOUT THE CONNECTIONS DURING THE BRONZE AGE BETWEEN THE CARPATHO-DANUBIAN AREA AND THE EASTERN MEDITERRANEAN SPACE. POSSIBLE FUNERARY PROVES**

*Schuster, Cristian - ("Vasile Pârvan" Institute of Archaeology - Center of Thracology, Bucharest, Romania) cristianschuster@yahoo.com*

Many archaeologists have spoken of strong connections during the Bronze Age between the Carpatho-Danubian area and the Eastern Mediterranean space. This conclusion was formulated especially concerning the Middle and Late Bronze Age, following the discovery of artifacts that, apparently, came from the south.

Our demarche will try to identify possible relations with the Aegean area in the funerary practice of the communities from the Carpathian area. Singular funerary monuments from Dobrugea, Muntenia, Oltenia, Moldavia and Transylvania will be analyzed. The funerary practices of the following cultural phenomena will be considered: Zimnicea-Batin, Glina, Schneckenberg, Yamnaya, Katakombnaya, stone cist graves, Mures, Wietenberg, Tei, Verbicioara, Monteoru, Noua, Coslogeni, Radovanu, Zimnicea-Plovdiv, Otomani, Suci de Sus etc.

Even a superficial look shows that most of the enumerated cultures had, in the funerary domain, connections with the eastern, North-Pontic areas and western, Middle Danubian ones. Few artifacts, found mainly in Gârla Mare and Zimnicea-Plovdiv graves (cultural manifestations identified on both banks of the Danube, on the territories of Romania, Bulgaria and Serbia) allow the establishment of connections between the Northern Danubian areas and the Mediterranean space. It is obvious that the respective material proofs are the result of exchange between communities and of product imitations (metalwork especially). Weighting the proofs concerning the connection between the areas north of the Danube and the South it becomes evident that there is a quantitative and qualitative difference between the discoveries made in the domestic space and those made in funerary contexts. The funerary monuments, opposed to the settlements and to hoards, prove to be more conservative in showing southern connections.

Even the few anthropological studies reflect that the connections with the South were not that strong. They also show that the intake of population was in some stages from the East (Early Bronze Age – cultures Yam-

naya, Katakombnaya, Noua, Coslogeni), and in others from Central Europe (Middle and Late bronze Age – cultures Otomani, Wietenberg, Gârla Mare).

It can be said that the cultural manifestations of the Bronze Age from the Carpathian area are more connected with what happened in the East (in the Republic of Moldova, Ukraine and Southern Russia) and at the Middle Danube (in Hungary, Slovakia, Eastern Austria). Connections with the south of the Balkan Peninsula existed, including population movements from North to Macedonia, Greece, Anatolia, but they did not have a strong resonance in the funerary practice.

ORAL

**2. ALLOCHTHONOUS VERSUS AUTOCHTHONOUS: AN INTERPRETIVE READING OF THE FUNERARY WORLD OF THE LATE BRONZE AGE IN ALTO RIBATEJO (PORTUGAL)**

*Cruz, Ana - (Instituto Politécnico de Tomar), Ana Graça - anagrace@ipt.pt (Instituto Politécnico de Tomar) anacruz@ipt.pt*

The debate between evolutionist and diffusionist just seems to be endless because we have not been able to find "convergence" between the regionalisms detected in the material culture of excavated sites and relevant influences, whether Mediterranean, Atlantic or Continental, also detected in the archaeological record.

In addition to this discrepancy there is the confirmation - which is also archaeological - of a typological and morphological universe, essentially metal-based, which suggests the circulation of people and long-distance trade. The research developed in Alto Ribatejo takes into account these two fundamental trends of interpretation. However, according to archaeographical data, these trends seem to be "reconcilable." The "reconcilable" concept reflects the approach of two apparently distinct and paradoxical realities. Although Portugal is geographically peripheral to the European continent, it boasts a privileged position in relation to the Mediterranean and the Atlantic. At the micro-level, the Alto Ribatejo also experiences this "centre-periphery" paradigm. Within this univocal relationship, we think there might have been an internal agreement between the communities, which can be justified by very particular localisms and regionalisms, although external influences are obvious in the archaeological record.

The state-of-the-art research on the Bronze Age of the Alto Ribatejo reveals a binary organisation that distin-

guishes one phase comprising the Early Bronze and Middle Bronze (Full Bronze) and another with very different characteristics corresponding to Late Bronze Age (which in turn divides into two phases, Late Bronze I and Late Bronze II), which some authors attribute to the cultural "family" of the Atlantic Bronze.

This apparently paradoxical and dialectical process reveals primarily at funerary level. No burial records have been identified in the excavated settlements. They normally appear on hilltops, either alone or in small groups, and were characterised by us as burial records in the form of tumuli. These burial records are located outside the villages and consist of small circular mounds full of quartz and quartzite pebbles concealing the evidence of urn incineration and are datable to the Late Bronze Age. How and when changes have occurred in the funerary pattern, replacing the megalithic re-use and the burial cist by *tumuli*, and what kind of exogenous scale may have existed in this phase of the Bronze Age are issues that deserve further discussion.

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### 3. SOUTHERN AND PONTIC AMPHORAE FOUND IN SEVERAL GETAE NECROPOLISES IN THE LOWER DANUBE AREA (5TH - 3TH C. BC)

*Sirbu, Valeriu - (Museum of Brila; Institute of Archaeology Bucharest - Romania) valeriu\_sirbu@yahoo.co.uk*

*Matei, Sebastian - sebastianmatei@yahoo.com (County Museum Buzau - Romania)*

In the 5<sup>th</sup>-3<sup>th</sup> c. BC, the Getae – the north-eastern branch of the Thracians – experienced outstanding progress, as evidenced by impressive residential centres (some of them fortified with brick walls or cut limestone), as well as by impressive tumulus graves (sometimes with sculpted and painted rooms) or by rich treasures of gold and silver.

The Getae settlements and graves yielded numerous and diverse Aegean-Mediterranean or Black Sea imports, with an important place occupied by amphorae, which shows that the Thracian elites were connected to the tastes of the southern civilizations.

Thus, in the Getae graves, particularly those that can be attributed to aristocracy, one has found many amphorae, some southern, from Mediterranean centres (Rhodes, Kos) or Aegean centres (Samos, Chios, Thasos), some from Black Sea (Sinope, Heraclea, Chersoneses).

Our paper will emphasise – in several major necropolises from the Lower Danube area – both the centres that the amphorae are coming from, and their diverse use in graves (as funerary urns or as recipients with wines/food offerings) or at funerary feasts. Based on the spread of the amphorae and of their production centres, we will try to identify the ways by which they entered the area, as well as the possible poleis that mediated the wine and oil trade in the north-Thracian world.

We will also compare the number of amphorae found in settlements with the number that came from graves, in order to underline to what extent these recipients were used in the Getae funerary practices.

The presence of amphorae in some graves, together with other luxury items, shows not only that the dead had significant material resources, but also that their presence are indicators of the social status of the dead and of certain rituals which were performed for them.

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### 4. GREEK IMPORTS IN THE SOUTHERN GROUP OF TUMULI OF THE EASTERN ROYAL GETIC NECROPOLIS IN THE SBORYANOVO RESERVE (4TH-3RD CENTURY BC)

*Gergova, Diana - (National Institute of Archaeology with Museum-Bulgarian Academy of Science, Institute of Archaeology, University of Rzeszow, Poland) dianagergova@gmail.com*

The excavations of the Hellenistic necropolis of the religious and political capital of the Northern Thracians Dausdava- Helis in the Sboryanovo National reserve throw light not only on the culture, the religious beliefs and the burial "rites of immortalization" that had been practiced by the Getae, but also on historical and political events during the apogee of the development of the Getic kingdom in the last decenia of the 4<sup>th</sup> and the first half of the 3<sup>rd</sup> century BC.

The burial rites, as well as specific features of the Getic Hellenistic tombs show their connection with the earlier traditions of the Early Iron Age Thrace enriched with the contemporary architectural achievements of the Hellenistic world.

The imported pottery and mainly the amphorae from the 11 investigated tumuli of the Southern group,

(4 of them investigated in 1912-1913) originating from Thasos, Knidos, Heraklea Taurica, etc, their contexts, content and chronology through new light to the royal burial practices of the Getae and contribute to the precision of the absolute chronology of the tumuli of the Southern group.

The recent discoveries confirm the hypothesis about their almost simultaneous construction of the tumuli and the connection of the complex with the burial ceremonies of the first known from the written sources Getic king from the pre-Hellenistic and Hellenistic period - Kotela and the probable period of his rule. They contribute also to the historical reconstruction of the role of the Getic kingdom in the political life of the Pontic and Mediterranean world.

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### 5. THE MACEDONIAN FUNERARY MODEL AND ITS IMPLEMENTS IN NORTHERN THRACE - AN OVERVIEW ON THE OCCASION OF NOVEL INVESTIGATIONS IN THE KALLATIAN NECROPOLIS

*Stefan, Maria-Magdalena - (Institute of Archaeology and Art History Cluj-Napoca) madi\_burton@yahoo.com*

*Sîrbu, - Valeriu (Museum of Brila; Institute of Archaeology Vasile Pârvan Bucharest) valeriu\_sirbu@yahoo.co.uk*

*Dan Stefan - (Institute of Archaeology Vasile Pârvan Bucharest) danstefan00@gmail.com*

Monumental tomb architecture was definitely one of the outstanding elements of the royal ideological discourse during Hellenistic times in the Mediterranean basin as well as Asia Minor, attesting the changes in the public representation and reception of rulers, as a social, religious and cultural phenomenon with obvious political symbolism, following the military actions of Alexander the Great. New architectural and ritual developments in the funerary practices (the so called Macedonian tombs) may be clearly linked with the military glory and political growth of Macedonian royals and elites, especially in authority centers around the Thermic Gulf, during the middle of the 4th–3rd cs. BC, as with their adoption of oriental rulers' ideology in terms of individual glorification and deification.

The authors propose to discuss the significance of discoveries of this particular Macedonian funerary category in the lands of their northern neighbors – the Thracians – parts of whom entered under the direct control of Macedonian kings or fought as mercenaries in their

armies, in terms of assessing the degree of exercised or just claimed political control, symbolic challenge of authority, cultural contacts, but also referring to the adoption and circulation of power symbols and ideology on large spaces, in a design specific to a center-periphery system. The analysis is well justified as Thracian tribes had a previous strong tradition of expressing elite status in monumental tomb architecture and developed specific funerary types and associated rituals. Thus, the study aims to explore the impact of Hellenistic type ruler ideology on Thracian chieftains, in the context of emergence of local centralized power structures and continuous competition between families of Alexander's Diadochs for control over parts of his large Empire. In particular, the synthesis on using and adjusting the Macedonian type of funerary architecture in Thrace will benefit from recent studies undertaken in the necropolis of the Greek colony on the western Black Sea coast – Kallatis, studies that have focused on non-invasive investigations of a tumulus covering a masonry tomb exhibiting both Macedonian and Thracian style architectural elements and employment of multiple construction stages. Around Kallatis, other Macedonian style tombs were found in the past, pointing to the specific context in which the Greek city led a great coalition against the Macedonian ruler of Thrace – Lysimachus in 313 BC. Being old and undocumented excavations, their interpretation was often linked with the presence of Scythian authority in the territory of Kallatis. There is, however, a considerable need for data reintegration and reevaluation.

Willing to overcome a, somehow, traditionalist point of view in interpreting material culture, which already placed scholars in a dispute considering the origin of the so called Macedonian Tombs, the proposed study attempts the integration of the Thracian late 4th-beginning of 3rd cs. BC funerary discourse in the larger cultural Hellenistic background of the time, marked by great warrior mobility and military turmoil sweeping over the Balkan Peninsula and Asia Minor.

# Recent Trends and Aspects of Use-wear Analysis A17a and their contributing to the Modernization of Archaeology

Commission on Functional Studies of Prehistoric artifacts and their Socio-economic inferences on Past Societies

(Organisers: Andreu Ollé, Juan José Ibáñez, Adrian E. Evans, Laura Longo)

Thursday 4th  
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ORAL

## 1. STATISTICAL ANALYSIS OF USE-WEAR MICRO-SCARRING: POTENTIAL AND LIMITS FOR IDENTIFYING TOOL USE.

*Perales, Unai - (Universidad del País Vasco/Euskal Herriko Unibersitatea) perales.unai@gmail.com*

*Ibáñez, Juan José - (IMF-CSIC) ibanezjj@imf.csic.es*

*González Urquijo, Jesús Emilio - (IIIPC-Universidad de Cantabria) jesuse.gonzalez@unican.es*

The development of the methodology of use-wear analysis during the 70's and the 80's of the last century was disrupted by the disputes of the so-called high-power and low-power approach. From the 90's a more pragmatic point of view was adopted by most of the use-wear analysts, stressing that, when possible, all kind of traces should be used to reinforce the reliability of the functional inference. Micro-scarring analysis is a useful source of functional criteria for the study of un-retouched active zones, in contexts where tools have not suffered heavy post-depositional alterations. However, it is still necessary to determine quantitatively the potential and limits of this type of trace, in order to established reliable rules for use identification.

We have quantitatively analyzed micro-scarring in more than 150 experimental tools used for cutting different materials. We have observed that the scar length, the scar density along the edge and the distribution of the scars along the edge (isolated, continuous or overlapped) are the two parameters which can be used for identifying the worked material.

Through the statistical analysis of the data gathered in our experimental collection, we discuss the potential and limits of these two variables, which, beside by the worked materials, are affected by the time of use and the degree of strength applied in the activity. Finally, we establishing the type of inferences which can be achieved resorting to this kind of trace.

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ORAL

## 2. TOO MANY BURINS, TOO FEW GROOVES.

*Domingo Martínez, Rafael - (Universidad de Zaragoza) rdomingo@unizar.es*

The presumed identification of nucleiform endscrapers or burins as cores for bladelets is a commonplace in the

study of the Upper Palaeolithic, but there is a notable lack of functional and technological approaches to this subject. We would like to show how functional analysis could help prehistoric technologists to discern the real balance between tools and cores in lithic assemblages.

This paper focuses on this matter through the study of some examples, from the Gravettian of Arenal de Fonseca (Teruel) to the Magdalenian of Cova Alonsé and Forcas (Huesca), Rascaño and Juyo (Cantabria) and El Cierro (Asturias). There, many endscrapers and burins have been traditionally classified as normative tools after the list of Sonnevile-Bordes. In fact, most of the common lithic cores found in these and other sites provided blades that were too large to be retouched and utilised as projectile elements. There is growing evidence that points to *chutes de burin* as the real blanks for many of the backed bladelets.

In some cases, functional analysis has shown that many of the thick burins and endscrapers (whether classified as nucleiform or not) were mere bladelet cores; in others, they were reused as actual tools, mostly in scraping tasks. Although we cannot establish a formal trend for such a vast region during thousands of years, it is interesting to stress the different solutions achieved by the prehistoric hunters.

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## 3. NEW EXPERIMENTAL DESIGN AND ITS CONTRIBUTION FOR FUNCTIONAL ANALYSIS: THE GERINGONÇA

*Pereira, Telmo - (ICArEHB, Universidade do Algarve, Portugal) telmojrperreira@gmail.com*

*Rui Martins (ICArEHB, Universidade do Algarve, Portugal)*

*Marreiros, Joao - (ICArEHB, Universidade do Algarve, Portugal) jmmarreiros@ualg.pt*

Functional analysis is characterized by the identification of regular wear marks resulting from the combination of both active tool and passive worked material.

The result of such attrition created between their proprieties is the formation of regular features that can be divided in a way that allow us to infer past human behavior.

For the last almost 100 years, researchers have tried to replicate past human behavior through experimental works, usually replicating present hunter-gatherers technology. Some researchers even use hide, sometimes

made by themselves, trying to reach even closer the spirit of the past hunter-gatherers.

Despite the enormous effort made by these researchers, the exquisite of their tools and the importance of their achievements, many other researchers do not find such results, databases and reference collections reliable. This is because they miss one important thing: absolute control of the variables.

The production of regular features is directly related with each action has several physical variables in use. The change of one variable can have impact in the pattern and mislead the tool interpretation. Consequently, one solution for such problem can be the creation of mechanical devices that control, at least, some of the variables.

Mechanical devices are in the opposite end of the experimental works referred before and can be criticized for being unrealistic since (1) they are not human and (2) humans do not have all variables absolutely controlled when working. However, they allow us to sharp and narrow the limits of the window where each feature and respective intensity occur, meaning that we can fit them into numerical data and then triangulate such information with traditional experimental work or ethnographic data and the archaeological record. With this approach, it is expected that our interpretation of the past will be more accurate and recognize with high accuracy the production of each specific use-wear signature.

In this perspective, we developed a mechanical device that controls several variables: the Geringonça.

Geringonça allow us to control individually with high precision and in real-time the angle, strength, speed, pressure, time of the action, number of movements, type of movement, active and passive materials used.

In this paper we present some of our preliminary results, specifically, cutting *Pinus silvestris* wood perpendicularly to the veins with flakes.

In this experience the only variable that changed was raw material; we used chert and quartzite and our results indicate that each raw material performs differently under the same stress conditions, suggesting that their use might have been related with their suitability and not only due to their availability.

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#### 4. MONITORING AND INTERPRETING THE USE-WEAR FORMATION ON EXPERIMENTAL QUARTZITE STONE TOOLS

*Pedergnana, Antonella - (IPHES-URV)*

*apedergnana@iphes.cat*

*Ollé, Andreu - (IPHES-URV) aolle@iphes.cat*

Use-wear analysis has been largely applied to determine stone tools functionality, but not so many efforts have been done to extend this methodology to non-flint raw materials. Although functional analysis on quartzite implements is normally performed, practically no experimentation focusing on this kind of rock has ever been undertaken on a systematic basis. We assume that, within the framework of use-wear analysis, sometimes a reduced number of experiments on quartzite implements has been performed. Nevertheless, the resulting implications were hardly ever investigated. Indeed, we noticed that as a prevailing attitude to deal with these methodological weaknesses (when analyzing use-wear on non-flint raw materials), analysts applied the same methodology developed for flint artifacts.

Knowing that quartzite mechanical behavior differs from that of flint (because of structural differences), we recognize the need to sort a set of functional parameters specifically related to this kind of rock, relying on a comprehensive experimental collection. Therefore, a large-scale experimental program focused on the formation, identification and possible interpretation of use-wear traits on quartzite was initiated. The experiments included different quartzite varieties, presenting slightly different characteristics (in order to highlight analogies and divergences related to their mechanical behavior when a force is applied) and were conducted on different worked materials.

Sequential experiments have been set up with the purpose of monitoring use-wear formation processes, that means that we casted the fresh edges and then we observed them (after having been used) microscopically throughout the various steps of utilization. For data recording, we resorted to imaging through both optical and electron microscopes (OLM and SEM), stressing the importance of the employment of an integrated approach.

Experimental residues of the worked materials were scanned as well with microscopic facilities with the aim to understand their role as interfacial medium affecting

use-wear formation. EDS (elemental x-ray spectroscopy) has been used to document the presence of rock particles detached from the tools edges and then embedded in the residues of the worked materials. Those particles are considered to be crucial for the formation of use-wear on stone tools.

Results obtained on experimental flakes allowed us to infer more closely the mechanical behavior of quartzite and specific use-wear features have been carefully described. Then, the potential of different microscopic techniques has been evaluated and it emerged that the most reliable and elaborate results are obtained when the two approaches are combined: in an integrated approach the disadvantages of one technique are compensated by the advantages of the other one.

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## 5. MICROWEAR ON EXPERIMENTAL GRANITE TOOLS

*Agarwal, Neetu - (Universitat Rovira i Virgili, Tarragona, Spain) neetu1501@gmail.com*

*Ollé, Andreu - (Universitat Rovira i Virgili, Tarragona, Spain) aolle@iphes.cat*

Most usewear research has been undertaken with either European flint or other siliceous material with similar physical and microwear properties or obsidian. Very few studies have been made using coarse-grained rocks like basalt, quartzite, quartz, volcanic tuff and rhyolite.

Granite has been utilized for making stone tools in quite a few Lower Paleolithic industries in Africa and India, namely, Isimila, Tanzania in Africa, Lalitpur, and Hunsgi-Baichbal basin, India. However, to our knowledge, no study has been conducted to study usewear traces on granite, and so we fail to have any functional information for these tools.

Therefore this study was undertaken to see the feasibility of identifying use-wear traces on experimental granite flakes and to determine the effects of different use-actions and contact materials on the tool edges.

Detailed, sequential analysis of microwear development was undertaken. For this purpose, we utilized a short range of contact materials varying in hardness, namely, meat, wood, hide and bone and only two use-actions, namely longitudinal unidirectional or bidirectional and transverse unidirectional actions. The edges of the

used tools were examined under a Scanning Electron Microscope (SEM) at magnifications ranging from 25x to 1000x.

The short experimental programme showed that the use of granite tools leaves recognizable wear features on the tool edges and edge aspects, and this wear is characteristically different for tools used on different contact materials and use-actions.

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## 6. DOCUMENTING AND ANALYZING HAFTING-TRACES USING GIGapixel IMAGES. A CASE-STUDY FROM THE LATE UPPER PALAEOLITHIC SITE OF LA CATIVA (TARRAGONE, SPAIN)

*Vergès Bosch, Josep María - jmverges@iphes.cat (IPHES-URV)*

*Morales Hidalgo, Juan Ignacio - jignacio.morales@gmail.com (IPHES-URV)*

Hafting-traces could be evident at different scales, from millimetric chipping to micrometric polished surfaces. The isolated observation single evidences could be enough in order to identify the presence of hafted tools. But anyway the spatial and topographical relationship between the whole set of traces needs to be established to construct an identikit picture of the kind of haft and the hafting techniques employed.

Traditional photographic documentation, whether it is done by optical or electron microscopes, presents some continuity limitations in order to relate wears at different scales or distant between them. In these cases we dispose of different images from different tool areas, and at different magnification, that must be interrelated descriptively. This fact became evident when use-wear needs to be interpreted using the photography as a raw data, or when we select some examples to illustrate reports and publications.

The construction of gigapixel mosaic images allows displaying in a single composition the whole surface of an interest point independently of its size. It allows observing the selected area at different scales, with the only boundary of the magnification and resolution of the acquirement conditions of the individual images. Using this procedure is possible to reconstruct the microscope observation conditions in both study time and publication. Additionally it is not necessary to choose a single point to show as an example, allowing



observing any place of the represented area at different magnifications.

The gigapixel images performed in the study of the endscrapers from the level B of la Cativera allows to present and discuss the didactic and scientific possibilities of this kind of documentation.

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## **7. A PROPOSAL FOR THE MORPHOLOGICAL AND CHEMICAL CHARACTERIZATIONS OF EXPERIMENTAL MICRO-RESIDUES ON STONE TOOLS BASED ON AN INTEGRATED APPROACH INCLUDING SEM AND LIGHT MICROSCOPY**

*Pederagnana, Antonella - (IPHES-URV) apederagnana@iphes.cat*

*Ollé, Andreu - (IPHES-URV) aolle@iphes.cat*

*Asryan, Lena - (IPHES) lasryan@iphes.cat*

Residue analysis has been used with improving frequencies within the lithic studies to obtain more information about the function of ancient stone tools. Very often this kind of analysis has been applied in combination with use-wear analysis to improve the accuracy of the functional interpretation.

In spite of the great progress accumulated in the study of residues, a number of methodological problems has been put out by analysts, especially related to the identification of residue types. Over many decades Optical Light microscopy has been the dominant methodology in the study of residues, that means that residue identification is normally based on differential morphological features and colours. However, besides from general difficulties in finding and recognising archaeological residues, there were always other factors conditioning this recognition, such as post-depositional processes, which inevitably modify the original morphology of micro-residues.

The main aim of this research is to provide some methodological improvements to residue analysis by means of the creation of a catalogue composed by microscopic images including experimental residues obtained from plant and animal sources. A special concern has been raised to find an approach for correctly identify residues on archaeological stone tools, trying to avoid the possibility to misinterpret them because of overlapping morphologies. With this purpose, Light Microscopy has been employed as well as Variable-Pressure Scanning Electron Microscopy and

advantages and disadvantages of both techniques have been highlighted. By comparing micrographs taken with both techniques, we can obtain a more complete morphological characterization of the various residue types. We have also applied energy-dispersive x-ray spectroscopy (EDS) for elemental analysis of residues, which has showed its great potential in reducing the possibility of an erroneous interpretation.

In addition, modern contamination has been considered as a possible source of misinterpretation and a special care in the cleaning procedures has been claimed. In our opinion, analysts should not underestimate the presence of modern contaminants when scanning lithic archaeological surfaces and might learn how to discriminate background noise due to handling.

The results of this study have shown that only the use of different microscopic techniques (OLM, SEM) and the application of additional chemical analyses permit to properly interpret the organic residues found on the surfaces of the archaeological stone tools.

By providing chemical and morphological composition of experimentally produced residues and by stressing the importance of detecting modern contaminants we believe that we improved, to some extent, the accuracy and effectiveness of lithic micro-residue analysis.

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## **8. APPROACHING BEHAVIORAL STRATEGIES IN A FUNCTIONAL PERSPECTIVE**

*Longo, Laura - (Musei Civici Fiorentini) longoflint@gmail.com*

*Skakun, Natalia - (Institute for the History of Material Culture - RAS) skakunnatalia@yandex.ru*

The exploitation of specific resources in order to produce food brought the scientific community to investigate two main questions. First, what were the driving factors and changes that caused human adaption towards tool production and tool use? This brings up the second question: how can we properly investigate tool production and utilization? The heuristic approach of functional analysis/traceology is complex. It includes use-wear analysis, raw material characterization and procurement, and experimental reconstruction of the operational sequences in terms of tool production, tool use and abandonment. This approach demonstrates the methodological model that enables archaeologists to

investigate the evolutionary phenomenon of artefact production and utilization as a process through which the technological, cultural, and adaptive paths of human groups can be reconstructed.

Functional analysis demonstrates its interpretative potential in a comprehensive mixing of all the behavioural attributes with functional, technological, stylistic, cultural or even ecological perspectives. The adoption of the new strategies of tool production and subsequent utilization would have predicted responses in embracing reliable strategies; particularly those involving logistical mobility, since tools represent *Homo* articulation with the environment. Tool production and utilization provide a mechanism to manipulate a given environment and obviate risk as well as to allow for conscious changes in mobility strategies. In addition, tool assemblages are the extra-somatic adaptive response of humans who colonized different niches, representing an innovative adaption perfect for foraging necessities.

We are presenting the results of research carried out on stone tools involved in plant processing through microscopic analysis of both micro-wear analysis of the working areas associated to residues, identified and characterized as starch granules. The analytic techniques are described. A synthetic approach was applied to identify and describe use-wear traces by means of LPA, Leika MZ6 (10 to 40 X) and HPA through the combined potential of the SEM and Digital Microscope (Hirox KH-7700) applied to wear-traces analysis.

The aforementioned analytical techniques allow us to investigate complex and standardized technology that developed in Europe about 30,000 years ago, which transforms plants in to highly nutritional food. It also allows for the investigation of how it affected modern human capacity to cope with the harsh climatic condition of MIS 2.

The new data obtained improves the consistency in the existing data on the systematic utilization of vegetables in AMHs diet and the development of technological strategies in order to transform raw material (rhizomes and starch) and to produce elaborated output (flour and even cooked rice) that can either be transported or stored. The behavioural consequences of the developed and diversified substance strategies – such as demographic changes and greater independence from environmental and seasonal fluctuations – might have been part of the evolutionary success demonstrated by AMHs compared to the strategies of the late Neanderthals.

Traceology, as intended in its broader approach, including both use-wear and residues analysis, can contribute by bring pieces of evidence about vegetable food processing. Additionally, new technologies and analytical improvements are helpful in adding data to the interpretation of tool processing.

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## 9. EXPLORING THE RELATIONSHIP OF USE DURATION AND SURFACE ROUGHNESS FOR LITHIC MICROWEAR

*Evans, Adrian A. (University of Bradford, UK) A.A.Evans@bradford.ac.u*

*Macdonald, Danielle A. (CEPAM-CNRS, Université de Nice Sophia Antipolis) danielle.macdonald@cepam.cnrs.fr macdonald.danielle@gmail.com*

Previous experimental research has shown that laser scanning confocal microscopy (LSCM) is a useful quantitative tool for the study of prehistoric stone tool function. This research has demonstrated that basic roughness parameters can characterize microwear on lithic surfaces, distinguishing between different contact materials. However, further exploration is needed to understand the effect of use duration on worn lithic surfaces. Preliminary experiments suggest that surface roughness measurements plateau once polish develops on the surface of the tool, but the intervals of duration were not fine-grained enough to capture the point of stabilisation (Evans *et al.*, in press).

This presentation will focus on a current program of experimental research that addresses how the length of use affects the surface characteristics of lithic tools. In this study, tools were used on several contact materials at increasing time intervals. Surface roughness characteristics were measured at each interval using a laser scanning confocal microscope. These experiments allow for the comparison of surface parameters over time on the same tool, tracing changes in wear on the tool surface. The results of this study are presented and avenues of future research that can contribute to the development of applied method in quantitative lithic microwear analysis are highlighted.

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ORAL

### 10. USE-WEAR POLISH QUANTIFICATION THROUGH CONFOCAL MICROSCOPY: DISCRIMINATING BETWEEN DIFFERENT HARVESTING POLISH

*Ibáñez Estévez, Juan José - (IMF-CSIC) ibanezjj@imf.csic.es*  
*González Urquijo, Jesús Emilio - (IIIPC-UC) jesuse.gonzalez@unican.es*

*Gibaja Bao, Juan Francisco - (IMF-CSIC) jfgibaja@imf.csic.es*  
*Anderson, Patricia - (CEPAM-CNRS) peachypie616@hotmail.com*

During the last decade, confocal microscopy has proved to be an accurate and easy to use technique for use-wear quantification.

We have used this technique to discriminate between different use-wear polishes resulting from harvesting wild cereals in natural stands, cultivated wild cereals and domestic cereals. Some experimental tools of reed and wild grass cutting were also analyzed (22 tools in total).

Several variables measuring surface texture were found relevant for discriminating between the different types of microwear polish. The degree of polish development appears as a relevant factor affecting surface texture. Lacking an effective method to control this variable, we have isolated it choosing highly developed areas of microwear polish. Our experimental results show that, when using fine grained flint varieties, the type of flint is not a relevant variable affecting the results of polish quantification.

Finally, we have used the discriminant function resulting from the analysis of the experimental tools to classify 75 archaeological tools from the Early Natufian to the Late PPNB, showing an evolution in the characteristics of cereal being harvested which are coherent with the archaeobotanical data.

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ORAL

### 11. EXPERIMENTAL CHARACTERIZATION OF PIT FORMATION PROCESS USING LASER CONFOCAL SCANNING ELECTRON MICROSCOPE IN THE MESOLITHIC SITE OF FONT DEL ROS (SPAIN).

*Roda Gilabert, Xavier - (Centre d'Estudis del Patrimoni Arqueològic de la Prehistoria (CEPAP). Facultat de Filosofia i Lletres. Universitat Autònoma de Barcelona. 08193 Bellaterra. Spain.) javier.roda@uab.cat*

*Benito Calvo, Alfonso - (Centro Nacional de Investigación sobre la Evolución Humana (CENIEH). Paseo Sierra de Atapuerca s/n. 09002 Burgos. Spain) alfonso.benito@cenieh.es*

*Arroyo, Adrian - (Institute of Archaeology. University College London. 31-34 Gordon Square. WC1H-0PY London, United Kingdom.) a.arroyo@ucl.ac.uk*

*de la Torre, Ignacio - (Institute of Archaeology. University College London. 31-34 Gordon Square. WC1H-0PY London, United Kingdom.) i.torre@ucl.ac.uk*

*Mora Torcal, Rafael - (Centre d'Estudis del Patrimoni Arqueològic de la Prehistoria (CEPAP). Facultat de Filosofia i Lletres. Universitat Autònoma de Barcelona. 08193 Bellaterra. Spain.) rafael.mora@uab.cat*

The study of macrolithic tools in the Mesolithic site of Font del Ros (Southeastern Pyrenees, Spain) has been allowed to identify a group of pitted stones. The tencnofuncional attribution of these elements, discussed in Roda Gilabert et al. (2012) states that the origin of these use-wear is related to the bipolar knapping. In this presentation we propose to document the plastic deformations linked to bipolar technique and record the modification of the active surfaces on both anvil and hammer stones.

Sequential monitoring of bipolar size by laser scanning confocal microscope (LSCM) allows quantitative data and characterizes the formation of pits. The analysis of variables as slope and roughness express the topographical variability and synthesize the characterization of active surfaces.

The micro scans show plastic deformation and allow the quantification of the use-wear patterns. Similarly, the comparison of these data with artifacts from archaeological traces reveals significant differences between the different types of use-wear.

Surface metrology indicates that pitted stones are related to thrusting percussion on hard materials. These tools are key in identification identify bipolar knapping. The Scanning Laser Confocal Microscope (SLCM) is a reliable technique for the quantitative analysis of use-wear on macrolithic tools.

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ORAL

### 12. DIFFERENTIATION AMONG PASSIVE AND ACTIVE PERCUSSION ELEMENTS USING GIS IMAGE ANALYSIS IN THE MESOLITHIC SITE OF FONT DEL ROS (SPAIN).

*Roda Gilabert, Xavier - (Centre d'Estudis del Patrimoni*

*Arqueològic de la Prehistòria (CEPAP). Facultat de Filosofia i Lletres. Universitat Autònoma de Barcelona. 08193 Bellaterra. Spain.) javier.roda@uab.cat*

*Roy Sunyer, Miquel - (Centre d'Estudis del Patrimoni Arqueològic de la Prehistòria (CEPAP). Facultat de Filosofia i Lletres. Universitat Autònoma de Barcelona. 08193 Bellaterra. Spain.) miquel.roy@uab.cat*

*Benito Calvo, Alfonso - (Centro Nacional de Investigación sobre la Evolución Humana (CENIEH). Paseo Sierra de Atapuerca s/n. 09002 Burgos. Spain) alfonso.benito@cenieh.es*

*Mora Torcal, Rafael - (Centre d'Estudis del Patrimoni Arqueològic de la Prehistòria (CEPAP). Facultat de Filosofia i Lletres. Universitat Autònoma de Barcelona. 08193 Bellaterra. Spain.) rafael.mora@uab.cat*

Macro lithic tools gestures and kinematic allow distinguishing two main roles: active elements (hammer stones) and passive elements (anvils). Usually these two categories have been differentiated from physical attributes as measures or weight. It has also been proposed that the types of stigmas distinguish between hammers and anvils. However, these considerations are mainly based on descriptive criteria.

We propose GIS image analysis together with metrological data to distinguish between these two categories. To test the validity of this method has been selected a sample of artifacts developed for a pilot program and a number of pieces from the Mesolithic site of Font del Ros (Southeastern Pyrenees, Spain). Spatial analysis with ArcGIS, was produced by geo-referenced photographs of objects. The digitization and mapping of the outline and use-wear visible on the photos allow positioning attributes and tags on each instrument. The collected data is used to calculate spatial pattern indices.

From a technofunctional point of view use-wear on active and passive percussion tools tend to be positioned in different areas of the objects, especially in the freehand hammer stones used in tangential percussion and anvils involved in processing activities (axial percussion). However, the bipolar technique or indirect percussion on anvil makes difficult to differentiate between the two categories.

The marks identified show a certain degree of variability, and pose a problem of equifinality in the precise determination of the functional context these tools. This hinders the quantitative differentiation between active and passive element and determines the ambivalent nature of these tools.

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### 13. ADVANCES IN MICROSCOPY: NEW TOOLS FOR USE-WEAR ANALYSIS

*Borel, Antony - (Département de Préhistoire, UMR7194-CNRS, Muséum National d'Histoire Naturelle - Institut de Paléontologie Humaine, 1 rue René Panhard, 75013 Paris, France) borel@mnhn.fr*

Two of the main issues for use-wear analysts are 1) to provide clear and appropriate documentation to support their observations and 2) to provide quantified analyses and interpretations. Several attempts to solve these issues have yielded promising results with, for example, the gigapixel image concept on one hand and the application of profilometry and laser confocal microscopy in the other hand. However, they have not, as of yet, been widely applied and use-wear analyses are still mainly performed using either Scanning Electron Microscopy (SEM) or Optical Light Microscopy (OLM). We propose here to explore, test and compare new type of microscopy which could be relevant to improve our understanding and interpretation of use traces.

Four types of raw materials (flint, obsidian, quartz and quartzite) with different physical properties are selected in order to evaluate the applicability of each microscope on different raw materials. Two artefacts by type of raw material are used on two different materials (wood and bone) in a scrapping activity. A cast of the edge of interest is made from each artefact before use and each artefact is then used during 1 hour.

Six microscopes (an optical light microscope, a scanning electron microscope, two digital microscopes, a white light interferometry confocal microscope and a laser scanning confocal microscope) are used to take the same point of interest on the cast and on the stone after use at magnification 50x, 100x, 200x, 500x, 1000x and 2000x.

The properties of each microscope will be presented and the systematic comparison of the micrographs from each of them will enable to discuss their advantages and disadvantages regarding to their use for use-wear analysis.

The study is not completed yet (but may be ready for the conference) and thus no final conclusion can be given. However, we will be able to demonstrate how technological enhancements can improve the observations of use traces and how the use of new

microscopy techniques can help establish more objective and standardize methodological procedures. Some of these new techniques are also promising for the observation of artefacts made of raw materials usually difficult to observe through common microscopy techniques.

# A17b Traceological researches and experimental works

Commission on Functional Studies of Prehistoric artifacts  
and their Socio-economic inferences on Past Societies

(Organisers: Alfred Pawlik, Richard Yerkes, Patricia C. Anderson, Natalia Skakun, Mikhail Zhilin)

Thursday 4th (14:00 to 19:30) and Friday 5th (9:00 to 13:30)



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## 1. EXPERIMENTAL ARCHAEOLOGY AND RESEARCH OF FUNCTIONS OF ANCIENT TOOLS.

*Skakun, Natalia - (Institute of the history of material culture, RAS) skakunnatalia@yandex.ru*

*Terehina, Vera - (Institute of the history of material culture, RAS) terehinavera@mail.ru*

Scientific experiment is empirical research method. Such obligatory rules are applied to experiments to make their results reliable research source: clear formulation of aims; presence of previous theoretical works serving as basis for hypotheses; serial and repeated character; careful fixation of results. Experiments put forward following aims: to confirm or cancel current hypotheses; to help in correct interpretation of results of visual studies of research object, to build up the system of argumentation.

Attempts to use various experimental methods in archaeology have old tradition. Experimental archaeology received new powerful impulse in 1950-s in the USSR thank to works of the great Russian scientist S.A. Semenov. He and his followers treat experimental and traceological research as firmly connected methods of investigation of prehistoric technology. Undoubtedly experimentation plays leading role in analysis of technology of the manufacture of tools, but its role in investigation of tool functions can hardly be diminished. Practice of use-wear analysis shows that experiment is not only a source of new information concerning verification and establishing exact function of tools, but also serves as a basis for research of their productivity, gives basic data for reconstruction of production methods and economic complexes.

Results of research of materials of an unique aeneolithic site – flintworking workshop Bodaki (Ukraine) can serve as an example of employment of experimental-traceological method. Places of primary flintworking, open working area and a blade production workshop were singled out among excavated settlement structures basing on functional composition of flint finds. A series of flintknapping experiments made possible reproduction of technology of blade removing with various pressure techniques. Research of toolkit in living structures of the site showed that it was composed of various instruments used in agriculture, processing of wood, bone, hides, weaving, mineral paint and ceramic production. Experiments were conducted for research of use of these tools and their effectiveness. Flakes and blades made from local Volyn flint were used for these experiments. Oper-

ation were reconstructed on the basis of traceological research, archaeological and ethnological data. These experiments made possible to clarify difference in use-wear between tools used for cutting plants: cereals, grass and reeds. They showed that use-wear traces of sickle inserts independently of their placement in the slot of a handle and duration of use differ from tools used for cutting grass and soft reeds. Besides these, experiments in working wood, bone, antler, and hides were conducted. Experiments in ceramic production were especially important.

Employment of experimental-traceological analysis of inventory made possible not only to reconstruct technology of flintknapping, single out tools used in various branches of economy, but also get new data on organization of aeneolithic economy. Our results show that at that epoch settlements specializing at flintwork emerge near flint sources, and all production branches, needed for normal life of their inhabitants were functioning in their economy.

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## 2. THE ROLE OF USE-WEAR ANALYSIS IN THE IDENTIFICATION OF TOOL USES AND HOUSEHOLD ACTIVITIES ON THE LATE NEOLITHIC SETTLEMENT OF POLGÁR- CS/ SZHALOM, HUNGARY

*Tóth, Zsuzsanna - (Eötvös Loránd Science University) zsu-  
zsanna.toth11@gmail.com*

Polgár- Cs/ szhalom is an important site in the Hungarian Late Neolithic. It is situated on the Great Hungarian plain and consist of a tell and a flat settlement. The study of the large worked bone and antler assemblage originating from the site combines tipological investigation with raw material preferences and traceological study, too.

Use-wear analysis was carried out on a sample material containing mainly bevels made on different raw materials (animal bone and red deer antler). Our primary interest was, if we can differentiate between tool uses, which can refine our knowledge about household activities carried out on the site. The method for the study was optical use-wear analysis with high magnification combined with experimentation and ethnographichal comparison for the identification of the wears found on the tools.

As result we may say, that use-wear analysis performed

with high magnification optical light microscopy is a time consuming, but efficient tool for the exact identification of different tool functions tipologically very similar. Archaeological experimentation is crucial for the identification of the observed wears, which can be efficiently completed with ethnographical informations mainly on the level of gestures. The data gained like that can help in the identification of different household activities, the differences between the individual households and their distribution on the site.

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ORAL

### 3. FLINT STORIES FROM IRISH EARLY NEOLITHIC HOUSES: SOME TRENDS AND ISSUES FROM A USE-WEAR PERSPECTIVE

*Mallia-Guest, Sol (University College Dublin) - Sol.Mallia-Guest@ucdconnect.ie*

This paper presents some preliminary technological and functional trends observed on the flint assemblages from eight Early Neolithic rectangular timber houses in southeast Ireland (c. 3750 cal BC). Despite the limitations of the sample under study, this research suggests a link between specific depositional practices and particular artefacts' life histories including certain activity associations.

The methodology applied follows a well-established integrated approach that combines a basic technological and attribute analysis, with observations at low and high magnifications based on optical microscopy and contextual information to reconstruct an artefact's life. While the flint assemblages were studied in full from a technological point of view, a selection of formal and informal artefacts with potential for use-wear analysis was carried out by means of a stereomicroscope (up to 100x) and later subject to standard "high-power" microwear approach (100x-400x) with the aid of a reflected-light microscope. Functional inferences on use motion and contact material – supported by a small experimental reference collection - are derived based on the set of conventional variables, and possible activities in which these artefacts were involved are put forward. The functional, technological and contextual dimensions are ultimately interpreted as a whole to explore the role flint artefacts played amongst these early farmer groups.

At first glance, there is little variation amongst these houses regarding overall assemblage composition and artefact type/materials worked. On one hand, evidence of hide-working activities is well attested while unam-

biguous traces interpreted as resulting from cutting siliceous plant are elusive. More obvious differences appear in technological terms when comparing knapping by-products, formal artefacts and blanks – particularly blade and blade-like finds – in their specific depositional contexts. However, more definite activity associations are yet to be made for these artefacts that are seemingly selected as foundation/closing deposits. Overall, convex end and end-side scrapers, offer a richer picture regarding modes of use at play through their lives, demanding, as well, further experimental work.

Lithic house assemblages and use-wear studies aiming at reconstructing activities within a domestic context are not easy to reconcile. This is partly related to the character of the assemblages, as they are the result of secondary deposition, usually poorly preserved (i.e. high frequency of heat-affected finds), and, as in the Irish case, only comprising a small number of finds.

This study highlights a number of trends identified amongst flint assemblages from Irish Early Neolithic timber houses that are not fully associated with bias introduced by these issues. Instead, when considered through a biographical approach, it becomes apparent that certain items associated with particular activities were being selected for special deposition, pointing to the role of flint in reinforcing aspects of these groups identity through everyday practices.

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ORAL

### 4. USE WEAR ANALYSIS OF GRUTA DE MORGADO SUPERIOR GRAVE GOODS (TOMAR, PT)

*Berruti, Gabriele Luigi Francesco - (PhD Student of International Doctorate in Quaternary and Prehistory, Department of Geology, University of Trás-os-Montes e Alto Douro; Associazione Culturale 3P "Progetto Preistoria Piemonte") gabrielefberruti@gmail.com*

*Cura, Pedro - (Grupo -Quaternário e Pré-Histórica- do Centro de Geociências (uID73 - Fundação para a Ciência e Tecnologia) 0pedrocura@gmail.com*

*Cruz, Ana Rosa - (Centro de Pré-História do Instituto Politécnico de Tomar, Universidade de Trás-os-Montes e Alto Douro, UTAD; Grupo de Quaternário e Pré-História do Centro de Geociências da UC, CGeo, Instituto da Terra e Memória.) anacruz@ipt.pt*

*Graça, Ana - (Centro de Pré-História do Instituto Politécnico de Tomar; Grupo de Quaternário e Pré-História do Centro de Geociências da UC, CGeo, Instituto da Terra e Memória.) anagrace@ipt.pt*

*Oosterbeek, Luiz - (Centro de Pré-História do Instituto Poli-*



*técnico de Tomar, Universidade de Trás-os-Montes e Alto Douro, UTAD; Grupo de Quaternário e Pré-História do Centro de Geociências da UC, CGeo, Instituto da Terra e Memória.) loost@ipt.pt*

The Morgado Superior cave is a karst cave located in the municipality of Tomar (Santarém, Portugal).

As other caves of the same area it has provided stratigraphical data and votive deposits falling within the Holocene, more precisely in a diachronic time range that extends from the Calcolithic till the early Bronze Age. These are representative of the first attempts of domestication of the landscape and its consolidation, revealing this new way of life: the agro-pastoralism.

In the Morgado Superior cave there are multiple burials with a lot of votive objects like jars, many bones and lithic tools (blades, arrowheads etc.), beads, pendants and other decorative items in association with more than 2.000 human bones.

The number of the grave goods elements is low in relation with the number of the human individuals buried in the cave. Within the use wear study we analysed the grave goods in order to understand both their meaning in this funerary context and their function in the economy of this prehistoric society. We have focused our attention on the most representative elements of the grave goods: arrowheads, parure elements and bone artefacts.

For this study we made an experimental collection for comparing the use wear and the manufacture traces present on the archaeological finds with the ones on the experimental collection to see if these artefacts were made only for the burial rituals or were usual objects. The other question concerns the production system of the tiny parure elements made in stone and bone. For our analysis we use a combination with high power approach and low power approach preferring the use of the low power approach for studying the manufacture traces of the parure elements.

This study allowed us to understand that the majority of the grave goods were usual objects but with a strong symbolic value. Since in the Morgado Cave there are a lot of grave goods showing prior breaks, the symbolic value of these objects doesn't seem to get lost even if the objects were broken. The strong symbolic value of the arrowheads is shown also by useless arrowheads made in cortex of the silex.

The use wear analysis of the grave goods from the Morgado Cave allowed to identify the strong symbolic val-

ue of the elements of the grave goods for that human community but at the same time to hypothesize a funerary practice which did not provide a special respect for the body and the grave goods of the previous dead. For these reasons we hypothesize a progressive spoliation of the previous grave goods.

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## 5. FINDING EVIDENCE FOR BEHAVIOURAL AND TECHNOLOGICAL ADVANCEMENT IN THE PALAEO-LITHIC THROUGH MICROSCOPIC USE-WEAR AND RESIDUE ANALYSIS

*Pawlik, Alfred - (University of the Philippines, Archaeological Studies Program) afpawlik@gmail.com*

The emergence of anatomically modern Homo sapiens is associated with traits of 'modern behaviour' as seen in the more or less sudden appearance of 'packages' as part of their cultural assemblage. Examples are the beginning of art, blade technology, tools made of organic materials like bone and antler, hafting and composite tool design.

Indications for modern behaviour, tool complexity and a high level of constructive planning and memory could be detected already at Middle Palaeolithic sites of the German Lower Rhine Valley, including the type locality of homo neanderthalensis, as early as 120kya. On the other hand, lithic assemblages without any formality usually associated with expedient technology and characteristic for the Southeast Asian Palaeolithic and Epipalaeolithic can as well include implements used for complex multi-component tools.

This paper presents case studies on the Middle Palaeolithic sites of Inden-Aldorf and Neandertal in western Germany (Pawlik & Thissen 2011; Pawlik & Schmitz, in prep.) where evidence for complex behaviour and advanced technology of pre-modern hominins were detected, as well as Ille Cave on Palawan Island, Philippines (Pawlik 2012).

Microwear analysis can significantly contribute to the discussion on the development and expansion of modern behaviour and enhance the limitations of traditional technological and morphological analysis of lithic assemblages.

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**6. TECHNICAL CHOICE AND BEHAVIOUR AT MESOLITHIC HUNTERS-GATHERERS OF EASTERN SICILY**

*Iovino, Maria Rosa - (Leiden University, NL) miarosa@tin.it*

Technical choice and behaviour at Mesolithic hunters-gatherers of eastern Sicily

Previous discussions on the Mesolithic research in Sicily have generally taken place within a typological framework.

Mesolithic style-life, basically determined by lithic industry and fauna remains, is generally associated with hunting-gathering activities.

In this paper I will discuss, through use wear analysis on knapped lithic tools, Mesolithic contexts of eastern Sicily and the reconstructed human behaviour for tool making, using and discarding.

ORAL

**7. FLINT TOOLS PROCESSING AND USE IN NORTH-EASTERN BULGARIA AT THE END OF LATE NEO-LITHIC**

*Mateva, Boryana - (Historical museum-Isperih, Bulgaria) boryanamteva@yahoo.com*

Late Neolithic settlement, chronologically related to the culture Boian-Bolintineanu, of which arises the considerable collection was found in 2003 during excavations of a Thracian fortress of IV-III BC in archaeological reserve Sboryanovo, northeastern Bulgaria.

The total number of flint objects discovered to date is 1490. Over 90% of the raw flint is yellowish-grayish spotted flint with many inclusions, cracks and defects, apparently originating from small nodules collected on the surface and in the riverbeds. The rest of it is typical Ludogorian (Dobrogean) honey-colored flint with excellent quality characteristics. Overall proportion debris- tools are typical for the Neolithic and Chalcolithic settlements in the area. The type of tools, use-wear traces, methods of treatment and the raw material used are specific to the Neolithic period only.

The analysis of the raw material used and the method of processing tagged trends in production, resulting in the subsequent bloom of flint industry in the Chalcolithic of the Balkan-Danubian region.

ORAL

**8. SICKLE TOOLS FROM MICROWEAR PERSPECTIVE. A CASE STUDY OF PREDYNASTIC AND EARLY DYNASTIC SITE TELL EL FARKHA (EASTERN NILE DELTA)**

*Winiarska-Kabacińska, Małgorzata - (Poznań Archaeological Museum) mwinkab@interia.pl*

*Kabaciński, Jacek - (Institute of Archaeology and Ethnology, Polish Academy of Sciences) jacek.kabacinski@interia.pl*

That paper presents results of microwear studies of limited set of flint specimens (17 objects) from Early Dynastic beds of site Tell el Farkha. The assemblage was extracted from a small trench W01/98 located at the edge of Western Kom and excavated in 1998 by Polish Archaeological Mission to Eastern Delta. Even if limited in number it reflects basic tool types recorded in that time at Tell el Farkha site. Analyzed set of flint tools shows large variability as typology and function it concerns. From that perspective the most important seem to be results of observations of inserts with denticulated lateral edges. Traces of use recorded during a micro-wear study confirm a complexity and diversity of economic activities performed by the inhabitants of the settlement during the Early Dynastic Period. It points first of all to extensive farming related to wheat production as well as production of items for everyday use, like baskets, mates or plant containers and food preparation. That is not a surprise considering very intensive and varified nature of the settlement at Tell el Farkha during that times.

ORAL

**9. EXPERIMENTS AND ETHNOGRAPHIC OBSERVATIONS WITH THE THRESHING SLEDGE: A HISTORY**

*Anderson, Patricia C. - (CNRS, CEPAM, Nice) patriciacanderson@hotmail.fr*

Microwear analysis of blades and flakes from ethnographic threshing sledges created the first corpus for interpreting archaeological blades with traces like those used in a threshing sledge. Segmented Canaanian blades were interpreted as probable inserts in a form of threshing sledge from the early Bronze Age of Iraq, and Skakun first interpreted contemporaneous blades from the Chalcolithic in the Balkans as used in a threshing sledge. However, the Canaanian blades differed in morphology from ethnographic inserts known at the time, and could

not have fit into grooves found in present-day threshing sledge boards. Cuneiform texts of the time described a different kind of instrument, more like a raft made of lashed staves, with blades inserted using bitumen or tar.

We reconstructed this instrument several times and used it over 15 years in various areas of southern France in order to check its functioning principles, structure, affect on the straw and ears, and microwear traces developing on the blades, as well as the nature of the alteration of the flint surface due to this use. Experiments were enriched and adjustments made to the form of our experimental Bronze Age sledge by cooperation with engineers measuring the work of this instrument, and by observations of present-day threshing sledges still working in Syria and Tunisia. In particular, the Bronze Age reconstruction, having relatively few inserts and of a rather small size, resembled the Tunisian threshing sledge, used with flint blades until the 1960s, when metal blades replaced them. Working with a Tunisian sledge maker, we inserted flint blades in the Tunisian sledge and compared observations of the users. These observations lead us to readjust certain details in the form of the threshing sledge we were using in our experiments, and to change the speed at which it was pulled. The flint inserts were preferred over the metal ones. And at the time when it was used, flint sledge inserts in Tunisia, like during the Bronze Age, were mined and prepared far from their area of use. The experimental and ethnographic study also included phytolith analysis of the plant material after it was threshed using the sledge, revealing these were cut in a characteristic way.

After a number of years, the very slow forming traces on the experimental threshing sledge blades, allowed comparison with archaeological tools, and phytolith analysis of storage structures and chaff tempered mudbrick provide a second proxy for the use of this tool in archaeological sites dating from the late Neolithic in Syria, showing this instrument was part of the Neolithic package spreading from the near East to Western Europe, and found in Spanish colonies in the New World. The instrument could have functioned further north, according to our experiments in England. Ongoing research involves new morphologies of threshing sledge blades and straw storage structures from the Neolithic to the Bronze Age of northern Syria.

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## 10. AUSTRALIAN ABORIGINAL GRINDING STONES, GRINDING PATCHES AND GRINDING GROUNDS

*Fullagar, Richard - (University of Wollongong) richard\_fullagar@uow.edu.au*

*Hayes, Elspeth - (University of Wollongong) ehh998@uowmail.edu.au*

Australian grinding stones and grinding patches are sometimes found in concentrations that suggest extensive grinding grounds, where numerous grinding activities were undertaken. It is often argued, if not assumed, that grinding stones are linked with food processing. In this paper, I report recent experiments and new data that suggest grinding grounds may also be linked with fibre processing for craft production of string, nets and other craft objects. The age of grinding patches and rates of visitation at these open sites are very difficult to assess but likely to be older (perhaps Pleistocene) in northern Australia and younger (probably late Holocene) in the south of the continent.

The function of grinding stones and bedrock grinding patches at several sites in the Pilbara of northwestern Australia were sampled in situ by taking PVS peels (to record wear) and water extractions (to recover residues). The PVS peels were examined under reflected light to document wear traces. The water extractions were mounted on glass slides and examined under transmitted light to document visible residues. Based on existing comparative reference collections of wear and residues, the initial analyses suggested the processing of plants including seeds for food. Subsequent experiments, not previously undertaken, replicated ethnographic description of processing spinifex grass clumps to prepare fibres for nets and baskets. The initial interpretations of wear suggesting seed processing were re-evaluated.

The residues (phytoliths and starch grains) and wear (polish with fine striations) on archaeological specimens indicate processing of plant tissue including tubers and grasses. Where the wear is most developed, the polish on some grinding stones is markedly undulating on both high and low zones of the microtopography. On experimental stones, abundant short, narrow striations aligned in patches appear typical of processing spinifex. It is possible that a thin film of resin on the stone surface contributes to the visual effect. Re-evaluation of images of the micro-polish on some of the archaeological specimens suggests that spinifex processing was also among the likely tasks performed in the past.

The identification of plant processing on archaeological grinding stones might not be an indicator of food preparation alone. At least some artefacts may have been used for softening plant fibres to be utilised for manufacture of craft items such as baskets and nets. Plants may have been ground for other purposes, such as medicines or poisons. We should not assume that starchy plant processing is necessarily linked with food preparation. Further research is required to test alternative hypotheses.

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### 11. A POISONED CHALICE: INVESTIGATING THE PRESENCE OF POISONS ON PALEOLITHIC ARROWS

*Valentina, Borgia - (University of Cambridge, UK) vb330@cam.ac.uk*

*Carlin, Michelle G. - (Northumbria University, Newcastle, UK) m.carlin@northumbria.ac.uk*

*Crezzini, Jacopo - (Università di Siena, Italy) crezzini@unisi.it*

Ethnographic documentation tells us that very often hunters poison their weapons with toxic substances. The ease with which poisons can be obtained from plants and animals, and the benefits arising from their application on throwing weapons (a safe distance from the hunter's prey, killing large size prey relatively quickly) suggests that this practice could be widespread among prehistoric hunters. In particular, the poisonous substances can incapacitate the animal, irrespective of whether the weapon causing a mortal wound: this is crucial for the recovery of meat and furs in good conditions.

In this paper we present the development of a method for the detection of toxic substances on European Upper Paleolithic stone and bone points. This research is part of a wider project on the analysis of residues on the prehistoric projectile points in collaboration with the Dept. of Chemical and Forensic Sciences of the Northumbria University, Newcastle.

The investigation makes use of mass spectrometric analysis to establish the presence/absence of potentially toxic substances even after thousands of years.

The plants of the Ranunculaceae family, particularly monkshood, as well as other common toxic plants such as hemlock or *andstrychnos toxiferia* (curare) are those on which we have more historical information and form the basis of this work.

Using a completely non-invasive method, samples were taken from the ethnographic materials preserved in the Museum of Archaeology and Anthropology of Cambridge (UK), and samplings are scheduled at the Pitt Rivers Museum of Oxford (UK) and Museo Etnografico Pigorini of Roma (Italy).

The method preview the research of the toxic molecules starting from the present plants and working backwards through the study of the historical and ethnographic weapons.

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### 12. MICRO AND MACROSCOPIC ANALYSIS OF UPPER PALAEOOLITHIC BACKED KNIVES FROM JAPAN

*Sano, Katsuhiko - (The University Museum, The University of Tokyo) sano@um.u-tokyo.ac.jp*

The large blade industry emerged in the middle Upper Palaeolithic in the north-eastern region of the Japanese main island. This industry comprises numerous backed knives, endscrapers, and retouched blades. Although the "backed knives" from the large blade industry are classified to one typological category, the morphological variability suggests their multiple functions. The excavations of the Takakurayama site provided a number of blade tools, including tanged points, backed points, leaf-shaped points, and backed blades, which have traditionally been classified to "backed knife". A usewear analysis of the "backed knives" from the Takakurayama site was conducted in order to better understand the functions of the morphologically diverse tool type.

A total of 43 "backed knives" was micro- and macroscopically studied. For analysis of micro-traces, the KEYENCE VHX-1000 digital microscope was employed at a magnification ranging from 100x to 1000x. Macro-fractures were observed by the naked eye and were photographed using the Canon EOS 7D SLR digital camera attached to the EF 100mm f/2.8L Macro IS USM lens.

The study on micro- and macro-traces indicates that while there are "backed knives" which were indeed functioned as a knife for processing multiple materials, great numbers of the "backed knives" were used as hunting weaponry. As the large number of hunting traces was observed on the "backed knives", the delivery methods of these hunting weapons are also discussed based on the results of projectile experiments which have been performed for reconstructing the prehistoric projectile

systems. Although it is still difficult to accurately reconstruct prehistoric projectile methods, the patterns of the impact fractures on the backed pieces from the Takakurayama site implies that several specimens were mechanically delivered projectile armatures.

The usewear analysis of the “backed knives” from the Takakurayama site suggests that the morphologically diverse tools were used as knife as well as hunting weaponry. There are some correlations between the function and the morphology, such as leaf-shaped form with hunting weaponry and un-pointed form with knife, whereas the other morphological sub-types show multiple traces resulted from hunting and the processing of osseous materials and hide. The large number of fractured pieces due to impact which may include mechanically delivered armatures illustrates that hunting was closely related to the occupation at the Takakurayama site and the existence of the processing tools designates that the subsequent processing activity of faunal remains were also undertaken.

ORAL

### 13. EXPLORING PALAEO-LITHIC WEAPON DELIVERY SYSTEMS USING A CONTROLLED AND REALISTIC EXPERIMENTAL SET-UP: PRELIMINARY RESULTS

*Schlösser, Nina-Maria - (MONREPOS Archaeological Research Centre and Museum for Human Behavioural Evolution, RGZM) schloesser@rgzm.de*

*Iovita, Radu - (MONREPOS Archaeological Research Centre and Museum for Human Behavioural Evolution, RGZM) iovita@rgzm.de*

In the last decades many researchers in the field of lithic use wear studies made an effort in developing solid methods to identify stone artefacts that were used as tips of penetrative hunting weapons (lances, javelins, darts, and arrows). This study focuses on the approach proposed by Karl Hutchings [1], which relies on secondary fracture characteristics (namely, Wallner lines [WL] and fracture wings [FW]). These features occur on crack fronts of brittle solids, like glass, obsidian and finer-grained chert, and are used to infer the precursory loading rate of the impact that caused the fracture and, consequently, the type of launching mechanism used in the delivery of the weapon.

New experiments were conducted to evaluate the reliability of this method. Since in a previous controlled experiment from Iovita et al. [2] only impact velocities were simulated, whereas other similar experiments only

reported launch velocities, we aimed to check velocity curves from launch to impact. Using soda-lime glass points and synthetic targets in the same experiment, we wanted to produce a comparative, yet well controlled dataset with a more ‘realistic’ set-up, using animal targets and a naturally-occurring raw material. We measured the velocities and acceleration of three delivery systems (lance, javelin, and spearthrower dart) to 1) evaluate the magnitude of the distinction between impact velocities (at target entry as well as inside the target) and 2) determine if the pattern observed can be related to a particular delivery system as claimed in the literature.

In total 75 identical glass copies of a Levallois point [2] and 75 knapped obsidian points of the same size were hafted on the spears/darts and thrust/thrown on a complete wild boar carcass by experienced experts (25 each per delivery system). The acceleration curve for each shot was measured, including during the actual impact, using an accelerometer mounted to the weapon itself. Projectile velocities were recorded using a video camera. The broken points were analysed under a microscope and WL and FW photographed and fracture speeds calculated.

Preliminary results suggest that the relation between precursory loading rate and the pattern observed is weak and dependent on factors that are difficult to reconstruct archaeologically, such as species hunted and point-type used. The influence of parameters like hide and flesh, which slow down a travelling projectile, play a more important role than previously assumed during impact until moment of crack initiation. Consequently they should not be underestimated when reconstructing weapon launching mechanisms from artefacts of archaeological origin.

ORAL

### 14. AMBIGUITY IN TERMINOLOGIES USED TO DOCUMENT IMPACT WEAR ON PROJECTILE POINTS: TOWARDS AN IMPROVED DESCRIPTIVE FRAMEWORK

*Coppe, Justin - (Université de Liège), Veerle Rots - veerle.rots@ulg.ac.be (Université de Liège) justin.coppe@ulg.ac.be*

Recently, lithic projectile points have become a key element in discussions about the complexity of Palaeolithic human behavior. The appearance of different projection systems has certainly played an important role in technological changes that occurred during the Palaeolithic. Unfortunately, only the lithic components of these projection systems are generally recovered, and over the

years, several studies have focused on finding macroscopic and microscopic evidence that would allow the identification of potential lithic projectile points in the archaeological record.

Initial studies used a more typological approach to describe the morphology of the damage observed, while subsequent studies used a terminology based on the description of fracture initiations and terminations. At present, there is quite some variation in the descriptions of the wear features and fractures observed, both in their detail as in the elements that are considered as being diagnostic of projectile use. While discussion may reign about the latter, it is clear that the descriptive framework that is currently used lacks some homogeneity and if one wants to be able to evaluate the degree to which evidence may or may not be diagnostic of projectile use, it is important that we share a common vocabulary and that we agree on the fracture and wear characteristics that ought to be described. Some attributes are only mentioned infrequently, such as the size of certain removals as well as the association between different fracture types or damage features on a single piece. Independent of their potential importance, it often makes it difficult to compare the wear features observed between different researchers as well as to make robust statements about the diagnostic value of certain traces or fractures.

We present a synthesis of the variation in terminology that was identified in projectile studies and we attempt to document what researchers have referred to with specific descriptions. Above all, we would like to open discussion in view of the creation of a shared and systematic descriptive framework for wear features or fractures that may potentially result from projectile use.

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ORAL

## **15. EXPERIMENTAL MANUFACTURE AND USE OF LATE EPIGRAVETTIAN PROJECTILE IMPLEMENTS: NEW EVIDENCE FOR INTERPRETING USE-WEAR PATTERN ON LITHIC WEAPONS**

*Duches, Rossella - (MuSe - Museo delle Scienze di Trento)  
rossella.duches@muse.it*

*Peresani, Marco - (Dipartimento di Studi Umanistici, Sezione di Scienze Preistoriche e Antropologiche, Università degli Studi di Ferrara) marco.peresani@unife.it*

*Kompatscher, Klaus - (MuSe - Museo delle Scienze di Trento)  
klaus@azzolini-kompatscher.it*

The use-wear based criteria for recognizing ancient lithic weapons are nowadays strongly debated (Lazuèn, 2014; Rots and Plisson, in press). The difficulty in identifying projectiles implements is related to the great variability of extrinsic and intrinsic techno-functional parameters that influence wear patterns. If an integrated macro- and microscopical approach is required, it is also crucial considering all the wear features present on an armature and interpreting them on the basis of strong experimental references. A new contribution to this issue comes from an experimental program carried out by the authors and focused on Late Epigravettian projectile implements.

The experiment in fact addressed the production and use of lithic armatures from the Late Epigravettian layers of Dalmeri rock shelter (North-eastern Italy). Among lithic armatures, backed points and backed (bi)truncated bladelets are the most common artifact types and their production represents a mental template well rooted in the bladelets operational project (Duches and Peresani, submitted; Montoya 2008a; 2008b). The main goals of the experiment were to explore the performance of these types of projectile implements in penetrating medium-size ungulates, to prove their functional suitability within the bow-arrow delivery system and to create a reliable experimental reference of impact damages essential for the archaeological interpretation. The experimental protocol was thus devised to reflect the efficiency and the operating conditions of this kind of projectile during the Late Epigravettian. Some variables were kept fixed (choice of the projecting mode, animal target, shooting distance, setting) while some others were modified (armatures typology and numbers of them, hafting, bow poundage, shooting angle).

The results let to define the pattern of use wears meaningful in recognizing Epigravettian armatures and to evaluate the role of different mechanical stress in creating that pattern. First of all, the projectiles demonstrated the efficiency of this kind of lithic implements. About the fractures, the experimental evidences could be summarized as follow: a) a tip breakage is strictly connected to the fact of hitting a bones (as the edge crushing); b) the point of fracture on the tips matches in 80% of the cases with the end of the hafting; c) the combined action of bending and compressive stress in hafting area causes rarely a simple bending fracture but more frequently different and multiple breakages; d) the compressive stress contributes to the wear pattern in creating specific features on the tip and also on the cutting elements; e) hafting and armatures arrangement influence both the penetrating capability and the durability of this kind of projectiles. In conclusion, this study adds new clues

in methodological debate about criteria for recognizing ancient lithic weapon and raise the requirement of a revision of the data collected in macro-fracture analyses considering the forces involved in projectile impacts and the variability of their combination.

ORAL

## 16. IMPACT TRACES ON ROCK CRYSTAL ARTEFACTS

*Fernández Marchena, Juan Luis - (IPHES, Institut Català de Paleoecologia Humana i Evolució Social, Zona educacional 4 (Edifici W3) Campus Sescelades URV, 43007 Tarragona, Spain / Àrea de Prehistòria, Universitat Rovira i Virgili, Fac. de Lletres, Av. Catalunya 35, 43002 Tarragona, Spain) juanl.ferna@gmail.com*

*Rabuñal Gayo, José Ramón - (GEPN - Grupo de Estudios para a Prehistoria do Noroeste, dpto. Historia I, Universidade de Santiago de Compostela, Fac. Xeografía e Historia, Pz. da Universidade, nº1, 15782 Santiago de Compostela) jr.rabunal@gmail.com*

*García-Argudo Ripoll, Gala - (Estudiante del Grado en Arqueología en la Universitat de Barcelona (UB) gala.garcia.argudo@gmail.com*

In archaeological sites in NW Iberia there are frequently found lithic assemblages with a great presence of rock crystal elements. These sites are chronologically ascribed to the final moments of the Upper Paleolithic and the first moments of the Holocene. Despite their frequency, these elements have only been studied from technological and/or typological perspectives. Due to the appearance of a great lithic assemblage in rock crystal in the cave site of Cova Eirós (Triacastela, Lugo, Galicia), we decided to develop an experimental and

functional analysis about this raw material. Some of the conditioning factors that affect to this raw material are the small size of the pieces and the scarce number of configured elements. For this reason, a wider experimental programme about use wear traces was prepared taking into account these factors, in order to document the different types of traces derived from each activity. After a first analysis of the archaeological industries, some macro and microscopic stigmas might correspond more to their use as projectile armatures than to their use in daily works (fleshing, wood cutting, etc.).

Due to the appearance of these stigmas, we decided to enlarge the experimental programme with an experiment focused on rock crystal projectiles. A series of experimental tools, both configured and not-configured, were used hafted in arrow shafts using different hafting

systems. After shooting them to the target using a bow, all the tools were analyzed macro and microscopically with diverse optical means, mainly an OLM with Nomarski prism and a portable microscope (PCE-MM200) to document macroscopic fractures. Macro and microscopical analysis allowed us to document a hole series of typical stigmas of the reaction of rock crystal to impacts and pressure. Furthermore we documented microscopic fractures and traces considered diagnostic of projectile elements in other raw materials.

With this experimental programme we were able to confirm some of the tools from Cova Eirós that were provisionally considered as projectiles. This confirmation and all the new data obtained allow us to extend the reference collection of images for the analysis of other assemblages. Finally, we can state the great versatility of the industries in this raw material, either configured or not. The effectiveness and resistance demonstrated by rock crystal in its use in daily works and as projectiles can explain its great presence in certain contexts like Cova Eirós.

ORAL

## 17. AN EXPERIMENTAL STUDY ON POST-DEPOSITIONAL FACTORS AND ITS IMPACT ON LITHIC MATERIALS

*Pyżewicz, Katarzyna (Institute of Prehistory, Adam Mickiewicz University in Poznań) kpyzewicz@gmail.com Gruzdz, Witold (Institute of Archaeology, Cardinal Stefan Wyszyński University in Warsaw) wittold@gmail.com*

The aim of following communication is to examine post-depositional perturbations occurring on the sites with flint materials. We wanted to investigate the macro and microscopic changes on lithics which resulted from natural and anthropogenic factors.

The applied research methodology was a combination of the experimental method and use-wear analysis.

The studied lithic materials come from our experiments and few Polish Paleolithic and Mesolithic sites (i.a. Podgrodzie, Suchodółka, Łuãwka).

As a result of our experiments we gained detailed information about lithic pseudo-artefacts, pseudo-microscopic traces of using and hafting, and post-depositional effects on use-wear traces.

We put special emphasis on macro and micro damages

resulting from selected factors. Nowadays, the majority of sites in Poland are found during field surveys in the farming area. The effects of ploughing disturb the spatial distribution of lithics and affect the appearance of artefacts in the macro- and microscopic scale. This was one of the reasons for including experiments that could verify such perturbations in our research. Additionally, we made trampling experiments and investigated their effects on micro-wear level scale.

Our studies were later compared to the experiments made by other researchers and ethnographic information. Additionally, we made a case study based on the materials from few Paleolithic and Mesolithic sites to compare our results with the archaeological data.

Our research proved that ploughing and trampling have a strong impact on deformations of the lithics. Some of these factors may be also responsible for creating tools and disturbing the proper interpretation of flint materials. Simultaneously the created post-depositional traces were also dependent on other factors (i. a. type of the flint raw material or sediment in which lithics were placed), which confirms the complexity and problematic interpretation of artefacts.

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ORAL

## 18. EXPERIMENTAL REPLICATION OF AUSTRALIAN GRINDING STONE IMPLEMENTS

*Hayes, Elspeth - (University of Wollongong) ehh998@uow-mail.edu.au*

*Cnuts, Dries - (University of Liege) dries.cnuts@ulg.ac.be*

*Fullagar, Richard - (University of Wollongong) richard\_fullagar@uow.edu.au*

*Pardoe, Colin - (Bioarchaeology & Anthropology), Chris Clarkson - c.clarkson@uq.edu.au (University of Queensland) colin.pardoe@ozemail.com.au*

*Stephenson, Birgitta - (In the Groove Analysis) itg.analysis@gmail.com*

Until recently in Australia, lithic tool-use experiments were dominated by flaked stone with relatively few studies of ground-stone. This paper reports on a workshop, during which tool-use experiments were designed to document the wear traces associated with grinding various materials, different processing techniques and sandstones of different hardness. The specific variables were selected to build a use-wear and residue reference library applicable to archaeological grinding implements

proposed for detailed functional analysis.

Experimental sandstone grinding implements were used primarily to process organic and inorganic materials, documented ethnographically. Other materials were processed to investigate characteristics of seeds that were unavailable locally. Upper and lower stones were used together to grind seeds and bone; and abrading stones were used to file bone, stone and wood, and to grate haematite. The experimental stones came from five geographic regions in Australia, each associated with the archaeological assemblages proposed for study. Use-wear was sampled with polyvinyl siloxane peels, which were examined under a stereomicroscope and a metallographic microscope. Residues were extracted with two solvents (water and a tri-mixture of acetonitrile, ethanol and water), and subsequently mounted on slides and examined under transmitted light microscopy. The slide preparations were stained to highlight constituent plant and animal tissues.

The hardness/softness of the sandstone and the degree of grain cementation have a strong influence on the development and appearance of use-wear. On the hard sandstone, the processing time affected polish formation. Use-wear patterns were distinctive of the broad categories of processed material (seed, bone, stone, haematite and wood). Key use-wear features relating to activity and processed material are reflected in the degree of grain rounding and grain levelling, the presence of macroscopic surface striations and the occurrence of micro-fractures, polish and striations observed at high magnification.

Residues included collagen and cellulose fibres, starch granules, phytoliths, resins, bone fragments and pigment crystals. As for use-wear, the residues were also distinctive of the broad categories of processed material. Staining was particularly useful to distinguish plant and animal tissues.

The experiments provided insights into the wear formation on sandstones of different hardness and degree of cementation. Stained cellular structures provide a reliable basis for distinguishing the investigated plant and animal tissue subjected to mechanical damage, resulting from grinding and pounding. Studies are underway to further test the viability of residue identification on ethnographic specimens of varying ages, and experimental grinding stones greater than 30 years

The residue and usewear experiments build on previous studies and help form the basis of a systematic and



collaborative use-wear and residue reference library for ground-stone tools in Australia. Future experiments will focus on the wider range of plant taxa processed by grinding and documented ethnographically.

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ORAL

**19. THE EXPERIMENTAL REFERENCE COLLECTION OF EDGE MODIFICATIONS ON QUARTZITE IMPLEMENTS OF THE INSTITUTO TERRA E MEMORIA (MAÇÃO, PORTUGAL).**

*Cura, Sara - (Museu de Arte Pré-Histórica de Mação) Osara-cura0@gmail.com*

*Cura, Pedro - (Museu de Arte Pré-Histórica de Mação) Opedrocura@gmail.com*

*Grimaldi, Stefano (Università di Trento) stefano.grimaldi@lett.unitn.it*

In order to study the morphotechnical and functional features of the Portuguese Middle Pleistocene assemblages made from quartzite pebbles, an experimental program has been carried out by members of the lithic laboratory of the Instituto Terra e Memória research centre (Mação, Central Portugal). The aim is to create a complete reference collection of experimental items working different materials in different working conditions. The collection has been already compared to some archaeological contexts with significant results.

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POSTER

**20. PREHISTORIC DRILLING AND BEAD PRODUCTION: EXPERIMENTAL CASE STUDY FROM THE BALKANS**

*Gurova, Maria - (National Institute of Archaeology with Museum, Bulgarian Academy of Sciences) gurovam@yahoo.fr*  
*Bonsall, Clive - (School of History, Classics and Archaeology, University of Edinburgh) c.bonsall@ed.ac.uk*

This paper focuses on a series of experiments in drilling minerals and biominerals using both mechanical and pump drill techniques and subsequent operations of bead fashioning.

Replicas of micro-borers from Early Neolithic sites were made using high quality cherts from Bulgaria, southern Romania and southern England. Samples of various

rocks, minerals and biominerals that would have been available to Neolithic peoples in Southeast Europe were selected for experimental bead production. On Mohs scale of mineral hardness the materials ranged from 3 to 6.5. Actual bead production was approached by manufacturing 16 delicate beads of 5 different materials using fine sand and water abrasion. Though not conclusive, the experimental work was instructive in many of the parameters, procedures and technical details of prehistoric drilling.

One of the most challenging results of the experiments consisted in the use-wear and technological traces observed on the drill bits and the bead holes and surfaces. The use-wear database on perforators used in the experiments could serve as comparative reference when considering archaeological collections of similar items. The detailed photo documentation and micro observation has provided useful insights into various aspects of prehistoric drilling.

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ORAL

**21. HUNTER-GATHERERS OF SOUTHERN PATAGONIA AND TIERRA DEL FUEGO (XVI ? XX CENTURY): THE INCORPORATION OF NEW RAW MATERIALS**

*De Angelis, Hernan - (Centro Austral de Investigaciones Científicas. CADIC-CONICET) hernandeangelis@yahoo.com.ar*

*Bautista Belardi, Juan - (Universidad Nacional de la Patagonia Austral. CONICET) juanbautistabelardi@gmail.com*

*Carballo Marina, Flavia - (Universidad Nacional de la Patagonia Austral) flaviacarballomarina@gmail.com*

One of the most outstanding aspects during the contact between the European population and the hunter-gatherer of southern Patagonia and Tierra del Fuego (16th to 20th century) was the incorporation of raw materials such as glass and ceramic stoneware, used to manufacture endscrapers and glass arrowhead. This situation was documented by both the ethnographic and the archaeological records.

There is a very important documentary record corresponding to the Selk'nam population that occupied almost the entire territory of Isla Grande de Tierra del Fuego. One of the first studies regarding this subject belongs to F. Outes (1906), whose description of the scrapers are coincident with those of other contemporary

and subsequent authors such as C. Gallardo (1910) or M. Gusinde (1982). Regarding the glass arrowheads, the best descriptions were published by M. Gusinde (1982), who described the manufacture of arrows and specifically shafts. Finally, to continental Patagonia, G. Muster (1871) refers to the use of glass artifacts for the treatment of sun-dried hides.

The analysis of artifacts - manufactured with these raw materials - from archaeological sites in the South of the continent and Tierra del Fuego with known contextual information allows us to discuss the incidence of this incorporation into the technological repertoire.

For that purpose, the presence of glass and ceramic stoneware artifacts must be overviewed in several sites and a techno-functional experimentation program with a microscopic base on glass and ceramic stoneware must be presented. Later, their performance on different materials is evaluated and a reference framework is established with the purpose of being compared with the artifacts found in several other archaeological sites located in these spaces. The experimental study is based on the replication of these instruments using both raw materials and their use on different materials such as wood, hide and bone. Thus, we identify the modifications produced on the edges in this way, to be able to compare them with the archaeological materials.

The results obtained show the use of scrapers solely for the work on hide, with a kinematic transversal at the edge. Besides, they put in evidence -for historical moments- the preeminence of this artifactual type in continental Patagonia and in some sites in Tierra del Fuego.

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ORAL

## **22. FUNCTIONAL ANALYSIS OF EXPERIMENTAL POLISHED STONE AXES AND ADZES: TECHNOLOGICAL, WOODWORKING AND HIDE PROCESSING WEAR.**

*Masclans Latorre, Alba - (Universitat de Girona)  
alba.masc@gmail.com*

*Palomo Pérez, Antoni - (Universitat Autònoma de Barcelona)  
antonipalomo@gmail.com*

*Gibaja Bao, Juan Francisco - (IMF-CSIC)  
jfgibaja@gmail.com*

Our main aim lies in provide a better understanding of which role did stone axes and adzes played among the

communities living in the NE of the Iberian Peninsula around the middle of the 5th and the 4th millennium cal BC, either as an object of work, tool, medium of exchange and/or symbolic item. In order to conclude in which production processes these tools were involved and what was their function, we required a large and systematic experimental framework.

We have designed an experimental program headed to replicate some of the activities in which this kind of artifact may have been involved according to ethnographic data. In the present communication we will expose the results of our research with hide processing and different kind of woodworking, using eclogite and hornfel rock as a support. This reference collection enables us to identify and interpret wear patterns and develop an accurate methodology applicable to the archaeological data. We include both low and high magnification approaches (10X to 400X) in order to be able to perform a complete characterization of macro and micro wear patterns taking into account edge damage, micropolish features, residue disposition, rounding and lineal traces, both in matrix and in crystal surfaces.

In this communication we will expose our results related to the establishment of use wear identification patterns originated in the course of tool production (technological wear) and during its use in the course of tree felling, woodworking activities involving carpentry and handi-craft, and hide processing, both fresh and dry.

We are in the right path to establish criteria that allow us to distinguish technological wear from different kind of woodworking and hide processing wear. Up to now our results have been positive not only in the process of discriminating the worked material, but also in the moment of carrying out the kinematics and the hafting orientation identification.

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ORAL

## **23. FLINT TOOLS FOR PRODUCTION OF BONE AND ANTLER ADZES AT EARLY MESOLITHIC SITE KRZYŻ WIELKOPOLSKI 7 (WESTERN POLAND)**

*Winiarska-Kabacińska, Małgorzata - (Poznań Archaeological Museum) mwinkab@interia.pl*

In 2003 a rich early Mesolithic peat-bog site was discovered by a town of Krzyż, at the northern edge of the

Notec River. During excavations in the years 2005-2013 large inventory of flint, bone, antler and wood artefacts was collected placed within a developed stratigraphy of the beach zone. A series of 49 AMS dates allow to place the settlement within the frames of second half of Pre-boreal and Boreal periods preceded by a short episode of the Younger Dryas.

The faunal assemblage reflects the typical game species of Mesolithic forest hunters, including, auroch, horse, red deer, elk, roe deer and brown bear accompanied by birds and turtle. That is accompanied by a strong evidence of specialized fishing and hazel nuts processing.

A large set of tools made of bone and antler is accompanied by organic rests with traces confirming their local production. Traseological analysis of stone tools delivered information on tool kit used for production of bone and antler adzes and on diversified ways they were used during that process.

ORAL

#### **24. HIDE POLISH OF WORKED BONE OBJECTS FROM DIFFERENT EAST EUROPEAN UPPER PALEOLITHIC SITES OF BUKI (RUSSIA)**

*Akchmetgaleeva, Natalia - (Kurchatov' state museum of Local Lore) achmetga@mail.ru*

The paper represents an analysis of use-wear traces on bone objects from the East European Upper Paleolithic sites Byki-1, Byki-7 (Layer I), Byki-7 (layer Ia).

The used methods for micro- and macro analysis studies of worked bone objects are based on methodology developed by the Saint-Petersburg Use-Wear Lab (Institute of history of material culture, Russian academy of sciences)

We have defined a limited complex of tools with use-traces of hide polish. Absent polishers. Knives for cutting and knives for softening or kneading skin are rare. Among the most tools with hide polish are needles, awls and points. The polish to them varies depending on the quality of hides and kinematics.

Number of represented types of tools and their percentage in the total number of worked bone objects at these

sites vary. Analysis of the tools with hide polish helped us to clarify the functional purpose of ancient settlements.

ORAL

#### **25. THE BISEAUX ON LARGE UNGULATES RIBS DURING THE BRONZE AGE IN NORTH-EASTERN ITALY: FUNCTIONAL AND EXPERIMENTAL ANALYSES.**

*Bertolini, Marco - (Università di Ferrara) marco.bertolini@unife.it*

*Thun Hohenstein, Ursula - (Università di Ferrara) ursula.thun@unife.it*

Functional analyses and experimental works on animal hard tissues artifacts have been sparsely applied in the Italian territory, above all in Bronze Age contexts. Recent researches, carried out on several sets of artifacts coming from sites dated between the Middle and Late Bronze Age in North-Eastern Italy, have highlighted a good amount of biseaux made on large ungulate ribs.

This paper aims at identifying the function of these objects through an experimental work, in order to reproduce the same category of artifacts that have been utilized on different materials and in different ways.

The analyses of the archaeological remains and the experimental artefacts were performed at low magnification using a stereomicroscope Leica EC3 S6D with integrated digital camera. Then, the surfaces analysis at high magnification was carried out by using a metallographic microscope in reflected and transmitted light (Optika Met: 50x-500x). For larger objects, silicone replicas of the active borders were made (Provil® Novo) and when necessary, Scanning Electron Microscopy was used (Teknehub of the University of Ferrara).

The experiments were carried out using the experimental tools on various hard materials, such as wood (fresh and dry) and antler (dry and wet) and elastic ones (fresh and dry skin). During the testing phase the time of use, the state of the material processed, the gestures employed (direction and quantity) were monitored and recorded.

All the archaeological artefacts bear quite similar use-wear. Some of them have fractures and micro-chipped areas on the distal margin that indicate the contact with a hard and durable material. The remaining artifacts, however, present edges slightly smoothed and less evident anomalies. On the upper face use-wear stops after

about 5 mm from the distal edge, while on the lower face it seems to be slightly larger, about 1 cm from the edge. At the microscope very dense striations, longitudinally oriented, are visible on the distal edge, while proceeding in the mesial portion of the artefact, they become more rare and often oblique. At high magnification the analyzed surfaces are fairly uniform near the edge and more irregular distancing from it.

The experimental work has allowed us to hypothesize that some of these artefacts were used for the removal of the fresh and dry bark. Infact, experimental use-wear presents macro-and micro-morphologies compatible with the ones detected on the archaeological remains.

ORAL

## 26. SPATULAS AND ABRASED ASTRAGALUS: TWO TYPES OF TOOLS USED TO PROCESS CERAMICS? EXAMPLES FROM THE ROMANIAN ENEOLITHIC

*Margarit, Monica - (Valahia University of Targoviste, Romania) monicamargarit@yahoo.com*

In most of the Eneolithic assemblages, all over Romania, constantly appear two types of artifacts: spatulas made on longitudinal bipartitioned rib and abraded astragalus.

The autochthonous literature considered them tools used in different stages during the operative chain of ceramics production. Starting from this functional hypothesis, we developed an experimental program in order to establish its reality. Thus, after the tools were processed, the spatulas were used in the action of modeling the ceramics' form, in order to eliminate the excess of raw material and to homogenize the surface. The astragalus, abraded previously to their utilization, were used for the ceramics finishing, in order to create a mechanic polish of the surface.

The experimental program proved the fact that, indeed, we can accept the fact that this functional hypothesis may be one of the utilization variants for the two types of artifacts.

ORAL

## 27. PEEPING THROUGH A POT-HOLE

*Vidal, Aixa - (UCM) aixavidal@gmail.com*  
*Mallía-Guest, Sol - (UCD School of Archaeology) Sol.mallia-guest@ucdconnect.ie*

This paper presents a preliminary experimental attempt, informed by ethnohistorical accounts, to understand the technical gestures and the material correlate deployed during the process of repairing pottery vessels by boring/drilling patching holes, through a microscopic use-wear approach to the lithic tools employed.

An experimental programme was carried out including flint borers and drillers used by a traditional master potter as well as an inexperienced individual. The technique comprises boring, involving hand-held tools, and mechanical drilling, reproducing the toolkit identified in historical sources. Also, a variant to boring, that combines this rotational motion with tapping, is included as observed in traditional practices. To replicate prehistoric manufacturing and firing conditions, two sets of pottery, one with quartz, mica and schist inclusions and another, with organic temper, were subject to a standard firing temperature below 900° C. In addition, abrasive agents such as sand and water were incorporated to observe their role during the boring/drilling process. The macroscopic analysis of the damage seen on the borers/drill tips was complemented by a standard high-power approach based on optical microscopy observations (100x-400x).

On one hand, use-wear patterns observed are presented and discussed in terms of the user's experience, the mode and variant of the technique employed for the activity, the ceramic fabric, and the role of abrasive agents. Overall, variations in the character and extent of the microscopic wear amongst these tools are not substantial and correlate with the intensity of the damage. Secondly, task efficiency is also explored in terms of user/time and failed attempts, including the fragmentation of both tool and sherds during the task with skill and sherd-thickness playing a significant role.

Assessing skill and more specifically wear patterns resulting from pottery manufacture are known to be problematic issues in use-wear research. Experimental programmes have frequently focused on working unbaked clays. On the other hand, pottery, since fired, imposes new challenges due to its hardness and brittleness and, in particular, because the actions taken are irreversible

with the risk of damaging the piece completely. Since the reasons behind repairing containers can be economic and functional as much as symbolic, this experience also triggers questions on the role of the agents carrying out this activity in past societies inasmuch as the context of use and deposition. We highlight the potential contribution of historical techniques, manifested in a traditional trade that was in existence less than a hundred years ago, in understanding a very specific skill-set, and the overall feasibility and material constraints of this activity for which the ethnoarchaeological record is limited.

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POSTER

**1. VERS UNE TRACÉOLOGIE À FORT GROSSISSEMENT DE LA PRÉHISTOIRE DU NORD-EST AMÉRICAIN: CRÉATION ET UTILISATION DE RÉFÉRENTIELS EXPÉRIMENTAUX ADAPTÉS**

*Chabot, Jacques - (Université Laval) jacques.chabot@hst.ulaval.ca*

*Dionne, Marie-Michelle - (Université Laval) marie-michelle.dionne.1@ulaval.ca*

Dans plusieurs laboratoires de tracéologie à travers le monde existent des référentiels expérimentaux pour aider à comprendre les microtraces des outils en silex. En Amérique du nord, de tels référentiels sur les matières premières utilisées par les préhistoriques sont rarissimes. Depuis 2 ans, avec deux subventions spéciales, nous avons commencé à concevoir des référentiels sur huit variétés de cherts que l'on retrouve de l'état de New-York à l'est du Québec (Gaspésie) et deux variétés de quartzites provenant du nord du Québec (quartzite de Ramah et de Mistassini). Non seulement ces référentiels sont très utiles pour comprendre les dynamiques d'usure, mais dans ces deux premières phases, nous avons aussi travaillé à comprendre un type d'outil universel dont il est très difficile de saisir la fonction: les outils ad hoc (expedient tools). La base de données obtenue laisse entrevoir l'étendue des possibilités quant à l'interprétation de la fonction des outils. Entre autres, elle atteste clairement de l'existence de processus d'usure variables suivant: 1. les propriétés intrinsèques des matières premières lithiques utilisées; 2. les modes d'utilisation; 3. les propriétés intrinsèques de la matière travaillée. La compréhension de ces processus permet de mettre en évidence la valeur interprétative et le potentiel de la donnée tracéologique pour l'archéologie de la préhistoire du Nord-Est de l'Amérique. L'exposé

portera donc sur ce projet et l'importance de concevoir des référentiels adaptés aux matières premières découvertes archéologiquement ainsi qu'aux contextes culturels à l'étude.

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ORAL

**2. EXPERIMENTAL AND USE-WEAR RESEARCH OF PRODUCTION INVENTORY OF AENEOLITHIC SITES IN BULGARIA.**

*Skakun, Natalia - (Institute of the history of material culture, RAS) skakunnatalia@yandex.ru*

Complex investigation of inventory of Aeneolithic sites in Bulgaria included technical and morphological analyses, use-wear studies, experimental works and ethnographic observations.

An opinion existed that flint industry of Aeneolithic cultures of Bulgaria was an archaic element, and high level of development of cultures was based only on discovery of treatment of the first metal – copper. Not diminishing the significance of this discovery it should be noted that flintworking of Aeneolithic epoch achieved outstanding results which made possible obtaining a blank with optimal technical qualities – the long blade. Experimental works proved that it was possible only with definite technology of flintworking and cracking it with a lever. Emergence of blanks from fragments of these standard superregular blades stimulated emergence of new instruments which were singled out with the help of use-wear studies. Because these tools were met for the first time, identification of their functions was impossible without experimental works which included replication of the technique of flintworking, and tools identical to ancient ones; use of the latter, finding out their productivity, and experimental reconstruction of the whole productive cycles of main economic branches.

Among new tools made from large blade fragments inserts for planes-scrapers, inserts for leather working lathe used for hides; inserts for planes-whittling knives, planes-scrapers used for wood should be mentioned. The character of macro and microwear made possible reconstruction of these instruments. Use-wear traces on experimental replicas were absolutely the same as on archaeological instruments. Construction of these tools and modes of their use find direct ethnographic analogies in many regions of Eurasia.

Besides these instruments inserts of a thrashing sledge were singled out for the first time in Bulgarian materials. The character of their use is similar to the use-wear on sickle inserts only at the first glance. Differences are in intensive blunting, macro deformation of the working edge, character of linear traces and polishing. A number of experiments was carried out near one Aeneolithic settlement of the Black Sea zone of Ukraine. A special area was prepared for an experiment participants of which were local peasants in accordance with ethnographic data. Oxen from local peasant households were used to drive sledge. The work was carried out during a week. Macro and microwear traces on inserts which experienced hard working pressure after 4 hours of work were identical to use-wear traces on archaeological tools. Thrashing sledges with flint, stone and basalt inserts were discovered in a number of burials in Caucasus and Southern Russia. Ethnographic parallels to this agricultural device are well known in many regions of Eurasia.

Thus complex research of production inventory from Aeneolithic sites in Bulgaria evidently show that tight connection of use-wear analysis and experiment bring substantial contribution not only to solving the problem of determination of tool functions, level of supply of ancient productions with specialized instruments, but serves as one of important sources for paleoeconomic reconstructions.

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ORAL

### 3. EXPERIMENTAL RESEARCH OF THE USE-WEAR ON WORKING PARTS OF SICKLES AND KNIVES FOR HARVESTING GRASS AND REEDS

*Terekhina, Vera (The Institute for the Material Culture History of Russia, Academy of Sciences, St. Petersburg, Russia)*

*López-Rodríguez, M<sup>a</sup> Cristina (Department of Prehistory and Archaeology of University of Granada, Spain) mcris-tinalopezrodriguez88@gmail.com*

*Skakun, Natalia - (Institute of the history of material culture, RAS) skakunnatalia@yandex.ru*

*Jurado-Cortés, Andrés (Department of Prehistory and Archaeology of University of Granada, Spain)*

Analyses of tools connected with treatment of plant materials occupies one of leading places. Studies of various types of sickles, thrashing sledge inserts and grindstones are most numerous. Diagnostic signs for these tools: macrowear, linear traces and polishing are well studied

now.

Information about instruments used for harvesting grass and reeds is much more scarce. Characteristic of difference in use-wear of working parts of these tools and sickles used for harvesting wild and domestic cereals is nowadays insufficiently studied.

A series of experiments carried out by the international crew basing on the Eneolithic expedition of the IMCH RAS in Bodaki village in Ukraine was devoted to these questions. Outcrops of high quality Volhynian flint used as raw material for experimental tools are located in this area. Experimental blanks were used as inserts for sickles with straight or curved wooden or antler handle, tools of crescent shape; knives for grass and reeds with a handle or without it. During experiments the square of worked area, productivity of work of each tool, working time and use-wear were documented each 15 minutes (macrowear, linear traces, polishes; topography of these signs was also documented).

Harvest was carried out in fields occupied by modern mild wheat. Experimentators with different experience worked in two ways: a) cutting plants near the ground, and b) harvesting only ears. Experiments in cutting grass were conducted at areas with different grass vegetation which produced different use-wear on working edges.

As a result of these experiments a reference collection of flint tools used for harvesting main kinds of plant materials which were widely used in economy and everyday life of prehistoric societies was obtained.

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POSTER

### 4. EXPLOITATION OF THE PLANT ENVIRONMENT DURING THE PRECERAMIC NEOLITHIC OF DJA'DE-EL-MUGHARA: PRELIMINARY RESULTS OF THE FUNCTIONAL STUDY OF THE GLOSSY BLADES.

*Pichon, Fiona - (Paris-Sorbonne, UMR8167 east and the mediterranean sea) fiona.pichon@paris-sorbonne.fr*

Around 10 000 B.C. in the near east a long-term process began which would change humanity's way of life from that of hunter-gatherers to that of farmer-breeders. These changes can be observed in particular on the dja'de-el-mughara site (syria, excavated by eric coqueugniot) which yielded a continuous stratigraphy from the final PPNA to the beginning of the former PPNB.

Functional analysis of its lithic material, glossy blades especially, represents an essential field of research to increase our knowledge of the local cultural traditions and better our understanding of these human groups entering a process of neolithisation. Functional analyses of contemporary glossy blades have already demonstrated their importance to comprehend how neolithic groups used the vegetation during the process of plant domestication.

This study was conducted as part of my doctoral research prepared under the joint supervision of Pr. Monchambert (Paris-Sorbonne University, UMR 8167 east and the Mediterranean Sea) and Dr. Coqueugniot (UMR 5133 Archéorient).

I am currently studying a sample of about fifty flint polished blades. The analysis of use-wear traces combines observations with a low power optical microscope (x40) and with a high-power digital one (x400). A comparative basis for observations is constituted by a set of experimental tools used with plants both present and absent at Djâde.

The technological study of the glossy blades revealed the homogeneity of the selected blanks: thin, often with a rectilinear profile with sharp edges. The raw material usually is a very fine-grained, high quality flint. Various types of glossy blades were defined: unilateral or bilateral denticulate blades, denticulate with back and with truncation and denticulate on ogival base obtained by direct or alternate retouch.

The on-going use-wear study shows traces of polish characteristic of harvesting siliceous plants. Because those microscopic traces are particularly well developed and preserved, one of the objectives of my research is to characterise types of microwear polish depending on the kind of plant harvested, while correlating this information to the type of used blanks and the type of retouch affecting the used edge.

The delineation of the gloss and sometimes the preservation of the adhesive bear witness to the hafting arrangement. Most of the time, the gloss follows a rectilinear delineation, which attests parallel hafting in a straight or curved haft. Some elements present a sharpened base spared by the gloss: the retouch then seems to have facilitated the hafting.

The remarkable preservation of the Djâde lithic assemblage gives hope for promising results in the understanding of the exploitation of the vegetation in Djâde. The confrontation of the technological, typological and

functional data will eventually allow highlighting the technical choices made by the gatherers on the site.

POSTER

## 5. TO EACH CEREAL ITS OWN USE WEAR, PRELIMINARY DATA

*D'Errico, Davide - (Leiden University) archeodavidederrico@gmail.com*

The study presented here concerns the acquisition and processing of experimental data regarding the wear traces from cereals on flint tools. In the long debate (Anderson-Gerfaud 1988, Gassen 1993, Jensen 1994, Gibaja 1998, Ibanez et alii 2008, Van Gijn 2010) about the possibility of recognise several species of cereals through the traceological approach, the opportunity to recognise the morphological characteristics typical of the various species through an experimental phase aimed at the reconstruction of the various steps regarding the development of the traces on the tools surface has been little exploited.

As already discussed in a previous study (D'Errico 2012 in press) it is useful to divide the surface of the object used in three different areas: Edge area (outermost area more in contact with the worked material), Inner edge area (intermediate area, strictly close to the edge) and Inner surface area (innermost area of the surface).

This project, of which here I present the preliminary results, is finalised to the understanding and the definition of the different traces generated by the harvesting of *Triticum monococcum*, *Triticum dicoccum*, *Hordeum vulgare* and *Triticum spelta*.

In addition to the classical methodology that uses the low and high magnification, the experimental data will be processed with ImageJ in order to have a 3D graphic restitution of the surface of the objects with the purpose to study, in a general way, the changes that have occurred during the development of the trace and the differences detectable between the various types of cereals and, more specifically, how the different areas respond to the modifications caused by prolonged use for harvesting activities.

The aim is to define the principal features of each trace through the analysis of the objects during their use (60 minutes, 90 minutes, 120 minutes and 180 minutes) and in addition, from a more closely descriptive/comparative point of view, to recognise the similarities and the possible differences between the different types of trace.

POSTER

**6. MESOLITHIC BONE ARROWHEADS FROM IVANOVSKOYE 7: TECHNOLOGY OF THE MANUFACTURE AND USE-WEAR TRACES.**

*Zhilin, Mikhail - (Institute of Archaeology Russian Academy of Sciences, Moscow) mizhilin@yandex.ru*

A multilayer peat bog site Ivanovskoye 7 is situated in Central Russia, 120 km to the north from Moscow. D.A. Krainov in 1972-1974 and M.G. Zhilin in 1992-1997 excavated there early, middle and late Mesolithic cultural layers with rich bone industry.

Various arrowheads were discovered in Mesolithic layers. Most of them were made from elk long bones. All arrowheads including fragments, preforms and blanks were studied with the help of a stereomicroscope with magnifications from 6 to 70 times. Experiments in making replicas of these arrowheads from elk bones with replicas of flint tools from these layers were carried out by the author. These bone arrowheads were shafted and shot from an exact replica of a Mesolithic bow in a target made from peat and covered with a fresh wild boar skin. After it experimental arrowheads were studied under a stereomicroscope, and traces of manufacture and use-wear were compared with Mesolithic artifacts. All stages of experiments were carefully documented.

The following chain of operations was established in the manufacture of bone arrowheads from Mesolithic layers of Ivanovskoye 7 site. Elk long bones were soaked in water for softening, after it long narrow splinters were removed with the use of the "groove and splinter" technique. Sometimes direct percussion with a hammerstone was used to reduce the width of a splinter. Then splinters were turned into preforms with the help of crude scraping or whittling. Fine whittling and scraping was used for shaping the preform into arrowhead. At this stage various details such as barbs, grooves, slots for inserts were made with the help of grooving, sawing, planing and scraping. Some arrowheads were decorated with engraved ornamentation. Final treatment included grinding with fine grained abrasive slabs and bright polishing with hide. Slots of composite arrowheads were filled with glue made from coniferous pitch mixed with bee wax and charcoal powder, and heated. When the glue became soft inserts were put inside these slots. Of special interest is final treatment of one long needle shaped arrowhead with the help of the turning lathe, which left typical dense spiral traces. Use-wear traces in-

clude rounding or smashing of the tip of the point and polishing running from the point gradually disappearing. Inside the polished area thin short or longer clearly cut scratches running from the tip along the axis of the arrowhead or at acute angles to it were observed, indicating hitting rather soft slightly dirty material. Linear traces in the shape of grooves running from the point, resembling traces on soil digging tools indicate hitting the ground when the arrow missed the target.

Described research showed good skill of Mesolithic inhabitants of Ivanovskoye 7 site in the manufacture of bone arrowheads, which they used for hunting various animals. Numerous bones of the latter from Mesolithic layers confirm this.

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POSTER

**7. PECKED AND POLISHED MATERIALS FROM SOUTHERN PATAGONIA: AN EXPERIMENTAL TECHNO-FUNCTIONAL APPROACH**

*Alvarez Soncini, María Celina - (CADIC-ANPCyT) mcalvarezson@gmail.com*

*Mansur, María Estela - (CADIC-CONICET) estelamansur@gmail.com*

Utilization of polishing and pecking techniques has often been associated with the emergence of Neolithic contexts. However, it is now well known that these techniques were also applied by hunter-gatherer societies, sometimes for the manufacture of stone artifacts, such as clubs, weights or balls, others to make artifacts in different raw materials, such as wood, shell or bone (beads, knives, retouchoirs, harpoons, awls, etc.). In South America, pecking and polishing techniques appear in hunter-gatherers contexts since about 10000 years BP.

Identification of materials made by pecking and polishing techniques is not always easy, particularly in the case of those which do not have defined morphologies, where it can be difficult to distinguish taphonomic and technological traces. The approach to these materials has usually been performed descriptively, due to the lack of a techno-morphological and functional analytic framework. Consequently, it is also difficult to evaluate the role that these materials had within the technologi-



cal strategies implemented by hunter-gatherer societies.

The aim of this paper is to present some results of a research about polished and pecked materials in hunter-gatherers contexts of southern Patagonia. We will focus especially on the analysis of manufacturing and utilization techniques.

Our approach is based on an experimental program about tool manufacture, use and analysis, which is still in progress. This program included as a first step the identification of raw materials used for the archaeological pecked and polished materials of the area, followed by evaluation of the geological contexts and field work to recover raw materials.

Then, they were formatted to be used in experiments that include different technological and functional processes: treatment of faces by pecking or polishing techniques and utilization on different materials as wood, bone and hides.

Macro and micro wear analysis were carried out by means of binocular stereo microscope (40X) and reflected light metallographic microscope (200 and 400X), recording aspect of surfaces before and after modification and use.

The raw materials used for manufacture of the archaeological collection are principally volcanic rocks. In the first part of the experimental program, we worked and used clasts of these volcanic materials. Considering the lack of an analytic framework to study them, the results obtained up to now should be considered as preliminary. Anyway, they already show that there are differences between intentionally polished surfaces and those modified by natural phenomena (rolling, glacial erosion, etc.) and that use wear polishes are also identifiable on polished surfaces.

As we previously said, the main purpose of this investigation is to generate a comprehensive model for interpreting macro and microtraces formation processes on archaeological materials made by pecking and polishing techniques. The results obtained up to now on the diverse volcanic rocks indicate that it is possible to undertake this type of analysis.

As a second step, we will start the intensive study of the archaeological collection. Although we still need to enlarge our experimental series, we believe that progress of this study will allow microscopic identification of surfaces that are modified by anthropic actions.

POSTER

## 8. ELEMENTS OF EXPERIMENTAL ARCHAEOLOGY APPLIED TO PECKED EGYPTIAN PREDYNASTIC ROCK ART

*Caruso, Stefano - (La Sapienza Roma) stef.caruso@google-mail.com*

The creation of experimental replicas of Egyptian Predynastic petroglyphs is the focus of this study. Many experimental archaeologists and rock art specialists have replicated various types of pictograms or petroglyphs but never relative to Egyptian Predynastic rock art. Moreover a standardized experimental protocol has yet to be created or implemented, even though the creation of such a protocol would be useful for the understanding of rock art technology. Several research questions are addressed in this work: (1) what tools and raw materials were used to create these petroglyphs? (2) What were the creation methods and the kinds of tools made to create these figures? (3) Is it possible to create an experimental protocol that can be used and replicated to analyse any other pecked or incised rock art typology? If so, what are the most important criteria to take in consideration for such a protocol?

The present study was carried out with technical traces analysis and experimental archaeology methodologies. The first step was to undertake an in-depth historical, cultural, geographical and geological study of Predynastic Egypt and its rock art. I analysed the specific morphological features of the pecking marks that form the petroglyphs in order to hypothesise the tool typology implemented to create the rock art. The experimental part of the research consisted in the replication of these petroglyphs in a laboratory environment. The tools were created with materials (flint, quartz, bone, copper and horn) and methodologies (hafting) pertinent to the considered period. I then proceeded to the creation of pecking marks on sandstone surfaces (without creating a specific artistic figure) documenting and analysing the tool pertinence and manuality involved in these actions.

The results of this study are manifold, regarding archaeological and anthropological aspects of prehistoric research. I focused mainly on technological traces, testing the adequacy of the different implemented tools and the morphology of the pecking marks they created. Furthermore, the experimental part of this project was extremely useful to evidence the importance of manuality and how it helps to understand the creation methodol-

ogy of rock art figures.

In conclusion this project has allowed to hypothesise a set of raw materials and tool typologies implemented in rock art creation, a possible sequence of gestures and technical knowhow that helped in this production and to create an experimental protocol that will be useful for further research in rock art technology and prehistoric stone-working.

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POSTER

**9. PREHISTORIC FLINT SCRAPERS OR THE GUN-LOCK FLINTS? EXPERIMENTAL AND USE-WEAR CRITERIA (ACCORDING TO ARCHAEOLOGY OF KAZAN, TATARSTAN)**

*Galimova, Madina Sh. - (Institute of Archaeology, Tatarstan Academy of Science) mgalimova@yandex.ru*

*Sitdikov, Ayrat G. - (Institute of Archaeology, Tatarstan Academy of Science) sitdikov\_a@mail.ru*

Flint artefacts are frequent type of finds at Kazan because of the city geographical position. Kazan Kremlin – the medieval hill-fort is situated on the mouth of Kazanka River – left tributary of Volga. Some prehistoric sites were probably located here but its cultural layers were destroyed later during the activity of medieval and historical town. The problem of distinction between prehistoric scrapers and the gun-lock flints arose in 1995-2005 during the intensive excavations aimed at historical substantiation of the 1000-year Anniversary of Kazan.

Flint scrapers from the excavation trenches at the Kremlin and near Kazan State University amount to 54 artefacts (Sitdikov, 2006). An experimental study has been organized by the authors to solve the problem mentioned above. The replicas of gun-lock flints as well as fire stones (flints) were produced and used in order to define use-wear features. Experimental shooting has been provided of Vladislav Khabarov (National Museum of Tatarstan Republic). The shots were fired using the replica of Russian musket of 1806, which was successfully used before during the historical-military reconstructions. The medieval fire steel (an occasional find) was used in our experiments in order to reveal traceological features of the fire flint replicas. Use-wear peculiarities of flint scrapers (rounding of working edge and specific form of striations on it) are well known for researchers (Vaughan, 1985; Korobkova, Shchelinsky, 1996; Poplevko, 2007). Microscopic analysis experimental replicas of gun (musket) - flints and the fire ones allow us to determine

its use-wear features.

First we have observed the remains of powder on the flint surface, especially on the hafted part. Main traceological feature has defined as damage of striking edge, the last one become discontinuous. The margins and hafting edge demonstrate analogous but less intensive use-deformations. Initial shots make the flint striking edge more sharp. Also there are notched micro-scars here, which appear on one face at the beginning of shooting and further – on both faces. After making 25-30 shots the striking edge become more rounded therefore a gun-flint lost its firing properties and must be turned or replaced. Also “ring-shaped” micro-fractures have been observed sometimes on the striking edge. Use-wear peculiarities of the fire flint replicas seem to be similar with additional long striations on the faces. Massive shape of the fire flints is regarded as its supplementary feature however some gun-flints found in Kazan occurred to be massive also. As a result of our experimental and use-wear study the most of the “scrapers” found in Kazan have been identified as gun-flints. Only four of them were used as fire-stones. However some gun-flints demonstrate use-wear features of real scrapers to be remaining on the local parts of striking edge. Such a reutilization of prehistoric scrapers is supposed to be caused by shortage of high quality flint among the population of Kazan during the 17 - first half of the 19 centuries. Extreme utilization of the gun-flints made of qualitative raw in the assemblages under study serve as evidence of our conclusion.

# A17c Microscopic determination of hafting technology: use-wear and residues

Commission on Functional Studies of Prehistoric artifacts and their Socio-economic inferences  
on Past Societies

(Organizers: Robert Sala, Juan F. Gibaja, Veerle Rots, Xavier Terradas, Belén Márquez, Juan José Ibáñez)

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ORAL CONTRIBUTIONS

ORAL

## 1. DÉTERMINATION DE L'EMMANCHEMENT DES ÉLÉMENTS DE PROJECTILE LITHIQUES PAR LEURS TRACES D'USURE

Jardón Giner, Paula - (Universitat de València) paula.jardon@uv.es

Gilbert Pion - gilbertpion@wanadoo.fr

Hortelano, Laura - (Universitat de València) lauhorpi@alumni.uv.es

Tout au long du Paléolithique Supérieur et le Néolithique on constate l'existence de projectiles composites qui se généralise à partir de l'utilisation de l'arc et la conservation exceptionnelle de quelques flèches préhistoriques entières en est la preuve. Mais ce n'est pas le cas pour la plupart des éléments lithiques qu'on interprète comme des pointes ou barbelures de flèches.

La position des éléments des projectiles préhistoriques dans leurs fûts a été évoquée et approchée dans des études fonctionnelles. L'analyse de la position et l'orientation des fractures d'impacte ou parasites est un indice d'habitude employé dans les hypothèses de reconstitution des emmanchements.

Nous présentons ici une expérimentation qui vise à répertorier les fractures issues des situations d'emmanchement et d'impacte lors de lancement des flèches.

L'observation à la loupe binoculaire (OPTTECH LFZ, zoom de 0,7 à 4,5 et oculaires de 10x) et au microscope Olympus BH2-UMA, objectif de 5x, 10x, 20x et 50x, el oculaires de 10x) des éléments de 500 projectiles provenant des sites de La Fru et Gerbaix (fin du paléolithique Supérieur des Alpes du Nord français) donne comme résultat une large typologie de fractures d'impacte. Nous avons émis des hypothèses d'emmanchement de différents types d'éléments de projectile.

Une expérimentation est menée à terme pour essayer d'identifier des positions dans les fûts des flèches par la typologie et position des fractures. Le lancement de flèches dont la morphologie et l'emmanchement reproduisait cette hypothèse et l'étude des fractures résultantes s'avère révélatrice des possibilités de détermination de modèles des flèches par l'étude des fractures.

ORAL

## 2. AND WHEN THERE IS NO HANDLE? DESCRIPTION AND PROBLEM OF DISTINCTION BETWEEN BONE TOOL PREHENSION AND WRAPPING.

Mayca, Justine - (Aix-Marseille Université, LAMPEA (UMR7269)) justine.mayca@gmail.com

Technic and functional wear on bone tools is now well known thanks to the numerous studies done in the last decades about them. This is not the case of prehensile wear, which has been seldom tackled about bone industry. A punctual interest about hafting of bone tools can be seen, following mostly the discovery of tools with preserved handles, or else with focalized studies about some specific themes such as hafting of assegai points. However, two particular technics, direct prehension and wrapping, have been largely forgotten. Thus, our aim is to know which traces are left by these technics, and what the problems resulting from their identification are.

Nevertheless, before answering these issues, we focused on problems of terminology related to the ambiguous nature of these technics. The terms "direct prehension" are quite clear because they simply correspond to the hand-holding of a tool, without any intermediary elements. Having said that, how to qualify the prehensile zone that could be intentionally shaped to make the prehension easier, or, on the contrary, that could not be shaped? Concerning the wrapping, it seems to be a male hafting with a soft handle. Can this definition be really applied when we envisage a punctual wrapping held only by hand? Does this arrangement have the same function as a hard handle that extends the hand?

With these considerations in mind, we have conducted several experimentations whose main modality is the tool prehensile mode in its use: direct prehension (or hand-held use), direct wrapping with hide, and hide wrapping inserted in a handle. Many other parameters have been taken into account: time of use, worked material, action mode, mode of force application, movement... Then, experimental objects have been observed at low and high magnification and compared to some archeological pieces.

Polishes that resulted present strong similarities, they are all characteristic of hide work. Microscopic analysis shows a general polish characterized by a hard aspect, filled weaving and a homogeneous distribution on a heterogeneous topography with rounded and smooth tops. However, location, extension, degree of polish de-

velopment, orientation and density of striation reveal some variations that could allow us to distinguish, at least partially, the prehensile mode.

These types of prehensile wear also seem to be found on archeological pieces, as the analysis of some bone tools from the final Neolithic of the south-east of France shows. Hand-held tools even seem to be particularly frequent, although a more comprehensive study of archeological series would be necessary if we want to confirm it. However, these results lead us towards a new way of thinking about the importance of hafting at this period and thus about technical investment in the bone industry.

ORAL

### 3. HAFTING AND PROPULSION TECHNIQUES OF SOLUTREAN SHOULDERED POINTS WITH ABRUPT RETOUCH

*Muñoz Ibáñez, Francisco Javier - (Universidad Nacional de Educación a Distancia) fmunoz@geo.uned.es*

*Márquez Mora, Belén - (Museo Arqueológico Regional) bel-en.marquez@madrid.org*

*Martín Lerma, Ignacio - (Universidad de Murcia) ignacio.martin@um.es*

*Marín de Espinosa Sánchez, Juan Antonio - (Sílex. Arqueología y Difusión del Patrimonio) info@tallarsilex.com*

The shouldered points with abrupt retouch are one of the most characteristic tools of the extracantabric region Upper Evolved Solutrean hunting repertory. The change towards barbed and tanged arrowheads into shouldered ones may have been related with the propulsion systems. Moreover, their morphological and volumetric variability can be due to the different ways of hafting. This type of arrowpoint, characteristic of Cueva Ambrosio (Almería-Spain), was first described by Breuil in 1912 and has never been studied until now from both a ballistic and traceological point of view.

Thus, we have knapped 45 flint replicas of shouldered points to be mounted in 8 different ways on 30 shafts. These tips have been fixed with birch resin and in some cases reinforced with gut into shafts of different length and diameters, thus creating arrows with one tip, two or three armatures. The different ways of hafting have been based on archaeological samples and on those coming from the modern archery. The arrows have been shot with three bows of different poundage i.e. a reproduction of the Holmegaard flat elm bow of 40 lb and 2 laminated flatbow of 40 and 50 lb respectively, into 2 fallow

deers, previously shot in culling procedures. The most natural conditions for the shots have been observed.

Their ballistic and penetration capabilities have been evaluated as well as their viability to be shot with the bow, being scarce the probability of a correct flight and impact with a spear-thrower due to their low weight. A use-wear study has been performed on those arrow points that have been recovered in order to be compared with the archaeological record.

The results also have allowed to establish four basic types of hafting for the shouldered points, with slight variations for each. Moreover we have confirmed its hunting efficacy and its perfect ballistic performance to be mounted in arrow shafts. Finally, we have observed a direct relation between the way of hafting and conservation and fracture of the arrowpoints. This experimental work, still in progress, will increase the amount of experimental data to be compared with the archaeological samples.

ORAL

### 4. UTILISATION AND HAFTING OF UPPER PALAEO-LITHIC BACKED BLADELETS- A CASE STUDY FROM CUEVA MORÍN, CANTABRIA

*Bradtmöller, Marcel - (University of the Basque Country) marcel.bradtmoeller@ehu.es*

*Perales, Unai - (University of the Basque Country) perales.unai@gmail.com*

*Sarmiento, Alfredo - (University of the Basque Country) alfredo.sarmiento@ehu.es*

*Zuluaga, María Cruz - (University of the Basque Country) mcruz.zuluaga@ehu.es*

The aim of this paper is to summarise the recently conducted investigation of utilisation and hafting arrangements of backed blades and bladelets from the Gravettian levels of Cueva Morín (Excavation 1966-69 by Echeagaray & Freeman).

A macroscopic study of artefact morphology as well as a detailed use-wear analysis of selected pieces was conducted, in order to get an idea of how and for what these tools were used. While dealing with assemblages from a 40 year old excavation, the record of, so far unmentioned, residues on the surface of some of these artefacts was unexpected. Due to Raman and SEM-EDX scans of these remains, done by the SGIker of the University of the Basque Country, further important information about the variability of position and composition of these residues

could be added to the main research question.

The results provides us with an improved picture concerning projectile technology of hunter gatherer communities during this timeframe, in throwing a detailed light on the design and utilization patterns of these artefacts. Finally, we emphasize the benefit of using new methods of analysing, especially when working with old excavated assemblages.

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ORAL

### 5. EXPEDIENT VS. FORMAL HAFTED TOOLS IN THE PROTOAURIGNACIAN (EUP)

*Pasquini, Amaranta - (LAMPEA (Laboratoire Méditerranéen de Préhistoire Europe Afrique) - UMR 7269, France) amerasi@gmail.com*

Between 40 and 30 ka BP, major changes characterize the Middle-Upper Palaeolithic "transition" in the Western Europe: the appearance of Sapiens (AMH) and disappearance of Neanderthal fossils; the generalization of blade stone tool technology (replacing the Mousterian technology), as well as the bladelet production; the spreading of osseous tool technology.

Chronologically dated to the beginning of the Upper Palaeolithic on coastal Mediterranean areas, the Protoaurignacian is considered one of the first techno-complexes linked to AMH.

The Protoaurignacian complex is characterized by a lithic tool-kit composed by a small amount of typological/formal implements (backed bladelets, end-scrapers and retouched blades above all).

The majority of utilised items from some of the French Protoaurignacian sites analyzed (Observatoire, Esquicho Grapaou, Laouza, Cottés) is made up by "unretouched blanks" and, among these pieces, a specific technological category (thick-end elongated items from the débitage technical process) systematically shows recurrent hafting traces.

This implies that already since the Early Upper Palaeolithic the items considered only as "technical debris" (or issued from a secondary blank production) represent in fact a significant group of utilised tools, as do the retouched ones.

During the Protoaurignacian, tools are made by morpho-technical characters of the blank instead of retouch modification (on the blanks). This latter is rather linked to

the hafting arrangement than to the active part of the tool, which is often unmodified. When present, the retouch hardly changes the general form of the active part of the tool (e.g. end-scrapers on flat blades).

All these aspects highlight how difficult our perception of actively used prehistoric "implements" (instrumentum = tool as a whole) among the lithic assemblages can be, without carrying out use-wear analysis and in absence of organic handle evidence.

Furthermore, the attention paid to hafting traces would allow to establish indirect evidence of hafting arrangements, rarely preserved, on particular worked material (e.g. ivory).

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ORAL

### 6. HAFTING TRACES ON MICROBLADES FROM THE LGM MICROBLADE ASSEMBLAGES IN HOKKAIDO, NORTHERN JAPAN

*Iwase, Akira - Archaeology Laboratory, Faculty of Social Sciences and Humanities, Tokyo Metropolitan University) yiu51057@nifty.com (Nakazawa, Yuichi - Division of Human Evolution Studies, Graduate School of Medicine, Hokkaido University) nkzw2011@live.jp*

During the Last Glacial Maximum (LGM, 25-16ka), climatic conditions were extremely harsh, and floral and faunal populations declined in Siberia. There are two hot topics currently debated in the northeast Asian prehistory; the LGM human depopulation and the origin and spread of microblade technology. Graf (2006, 2009), for example, placed the maritime eastern Asia including Japan not only as the LGM refugia for humans from higher latitudes, but also as the potential homeland of microblade technology. These studies suggest that the investigation of Japanese archaeological evidence around the LGM will contribute to the study of technological adaptations in northeastern Asia. This study presents the results of use-wear analysis on the LGM microblade assemblages recovered from Hokkaido, northern Japan, and discusses the tool-use behavior and hafting technology of the earliest microblade assemblages in northeastern Asia.

The LGM lithic assemblages of Hokkaido are composed of three groups: Flake, Blade, and Microblade assemblages (Izuho 2013). Among them, the LGM microblade assemblage is characterized by the "Rankoshi type microblade cores" which set platforms at the end of elongated wedge-shaped preforms and detach microblades along the longer axis. The assemblage consists of highly standardized stone tools including microblades, burins, endscrapers and perforators.

Present study examines LGM microblade assemblages recovered from the two sites; Kashiwadai 1 and Obarubetsu 2 in the central and southwestern Hokkaido, respectively. Microblades, endscrapers, burins, burin spalls, perforators, blades, and flakes from two sites were sampled for the analysis. The raw materials consist mainly of the high-quality "hard-shale" and small amount of obsidian. The use-wear analysis was conducted by the high-power and low-power approaches. To observe microscopic traces, an incident light microscope (Olympus BXFM-S) was used.

Results of use-wear analysis are as follows; (1) bright spots on the dorsal ridges of microblades imply that they were slotted into hard hafts (osseous implements), (2) burin-like and spin-off fractures suggest that microblades were used as lateral edges of hunting weapons, (3) use-wear polishes on burinated edges indicate that the burins were used primarily for antler, bone, and ivory (ABI) workings, (4) use-wear polishes formed by dry hide boring were remained on the bit of perforator, and (5) dry hide polishes with perpendicular striations suggest that distal ends of endscrapers were used for dry hide scraping.

The preliminary traceological analysis on the LGM microblade assemblages implies that standardized stone tools were functionally specialized for different tasks. Furthermore, hafting traces and ABI polishes suggest that burins were used for shaping the osseous points, along which microblades were slotted. The LGM hunter-gatherers with the earliest microblades developed the complex hunting weapons. The tool specialization and tool complexity will illuminate the hunter-gatherers' technological adaptation to the landscape where resource patches were dispersed under the rigorous climate of the LGM.

#### ORAL

### 7. THE RED-STAINED FLINT CRESCENT FROM GESH- ER: AN INSIGHT INTO PPNA HAFTING TECHNOLOGY

*Shaham, Dana - (Institute of Archaeology, The Hebrew University of Jerusalem) dana.shaham@mail.huji.ac.il*

*Grosman, Leore - (Institute of Archaeology, The Hebrew University of Jerusalem) lgrosman@mssc.huji.ac.il*

The Pre-Pottery Neolithic A (PPNA) period in the Levant is marked by major changes in human culture and socio-economic behavior, as attested by the beginning of cultivation, sedentary lifestyle and emerging social complexity. We wish to present an additional aspect of in-

novation, namely a new adhesive technique for hafting.

The study pertains to a red-stained flint crescent found in the PPNA site of Gesher, Israel. By its actual distribution, the red staining could be associated with hafting the crescent in a shaft. Several lines of evidence enabled a reconstruction of an innovative adhesive technology and the materials.

In order to reveal the chemical and mineralogical composition of the red staining these analyses were carried out:

1) The morphology and chemical composition of the samples were analyzed with Environmental Scanning Electron Microscope (ESEM) equipped with energy dispersive X-Ray Spectroscopy (EDS).

2) Analyses of the mineralogical composition were carried out by X-Ray Powder Diffractometer (XRD).

3) Characterization of the attributes observed by the above methods was carried out by Infra Red Spectrometry (FTIR) analysis.

Interpretation of the results was based on information derived from comparative ethnographic data and relevant studies of the archaeological record.

The SEM image and the chemical analyses revealed that the residue is comprised of two layers: the paste and the vegetal matrix above it. The mineralogical composition of the paste comprises calcite (CaCO<sub>3</sub>), quartz (SiO<sub>2</sub>), and clays. The red color of the paste derives from iron oxides; and the presence of hematite was recognized. While the paste was not burned, heating would have been the only way in which a homogenous red stain could have been created.

Accordingly, the adhesive includes a silty-clayey mud and ochre minerals as a paste with loaders like quartz and vegetal material atop of it. The 'ochre' paste served as the main adhesive component, yet technologically it should be defined as mud plaster.

The results provide us with an opportunity to reconstruct the complex technological chaîne opératoire employed in the hafting of the crescent. The study contributes insights into hafting technology that was used during the Early Neolithic period. Similar mud plaster technologies were used for the manufacture of numerous artifacts at Gesher (e.g. architecture, beads etc.). It seems that technological innovations went hand in hand with the socio-

economic and cultural transformations of the PPNA.

ORAL

## 8. NEW DATA ON THE HAFTING MODES OF THE NEOLITHIC SICKLES IN THE WESTERN MEDITERRANEAN

*Gibaja Bao, Juan Francisco - (IMF-CSIC) jfgibaja@imf.csic.es*  
*Ibáñez, Juan José - (IMF-CSIC) ibanezjj@imf.csic.es*  
*Mazzucco, Niccolo - (CSIC) nicco.mazzucco@gmail.com*  
*Gassin, Bernard - (CNRS) bgassin@libertysurf.fr*

The first studies on the hafting modes of the Neolithic sickles, began almost ten years ago with the analysis of a series of sites from the NE of the Iberian Peninsula. During the last years we have been gradually publishing our results, demonstrating the existence of different typologies of harvesting tools since the early phases of European Neolithic.

Through a functional approach to lithic industries, we have tried to relate such differences in the morphology and functionality of the sickles, to the development of different agriculture techniques, as well to specific cultural and technological traits.

Moreover, sickle tools can help us in the understanding of the Neolithization process itself. With the aid of other disciplines (e.g. faunal, archaeobotanical and chronological data), it is indeed possible to relate the existence of different types of sickles with the existence of a variety of 'migratory routes' followed by the first agro-pastoral communities during their diffusion across the Mediterranean, from ca the VII millennium calBC.

After analyzing a great number of contexts of the Iberian Peninsula (Spain and Portugal), Southern France and Morocco, we actually extended our research to Northern and Southern Italy. In this work we present the last results of our research.

ORAL

## 9. HAFTING TECHNOLOGY IN WOODEN TOOLS. CASES FROM THE NEOLITHIC WATERLOGGED SITE OF LA DRAGA (NORTH-EASTERN IBERIA)

*Terradas, Xavier - (CSIC-IMF) terradas@imf.csic.es*  
*Palomo, Antoni - (UAB) antonipalomo@gmail.com*  
*Piqué, Raquel - (UAB) raquel.pique@uab.cat*  
*Tarrús, Josep (Museu Arqueològic Comarcal de Banyoles)*

*Bosch, Angel (Museu Arqueològic Comarcal de Banyoles)*  
*Chinchilla, Júlia (Escola Superior de Restauració de Béns Culturals de Catalunya)*  
*Buxó, Ramon (Museu d'Arqueologia de Catalunya)*  
*Maria Saña (UAB)*  
*Gibaja Bao, Juan Francisco - (IMF-CSIC) jfgibaja@imf.csic.es*  
*López, Oriol (UAB)*  
*Rageot, Maxime (CNRS-CEPAM)*

The excellent preservation of organic materials in the waterlogged site of La Draga (Banyoles, north-eastern of Iberia) allows the analysis of tools, utensils and goods elaborated on wood. In this site, two different early Neolithic occupations have been documented, both placed within the ending of the Cardial Ware Neolithic culture. Phase I (5,324-5,000 cal BC) is characterized by the collapse of wooden structures (presumably dwelling structures), which have been preserved in an anaerobic environment. The layers corresponding to Phase II (5,210-4,980 cal BC) are not covered by the water table, that's why wooden artefacts are not preserved.

The types of wood products represented in La Draga are diverse and according to functional hypotheses they can be related to different uses. Among them we would like to emphasize some of the agricultural instruments (sickles) as well as tools used for woodworking (adzes). We will characterize here the hafting technology of these tools according to the study of the production process of their hafts, reviewing how the raw material was obtained, which were the techniques used to cut and chip logs and how the final production of tools was carried out. In some cases (sickles), this study will be complemented with use-wear analyses describing microwear produced by the haft or related to the use of a hafted tool. Recently, we have started a new research line on adhesive substances elaborated from plant resins whose results are preliminary so far.

ORAL

## 10. THE USE OF THE EGOLZWILL III SICKLES (SWITZERLAND): FIRST RESULTS

*Nielsen, Ebbe - (Kantonsarchäologie Luzern) ebbe.nielsen@lu.ch*  
*Kienholz, Anna - (Arbeitsgruppe für Experimentelle Archäologie in der Schweiz (AEAS) anna.kienholz@gmx.ch*  
*van Willigen, Samuel - (Landesmuseum Zürich) Samuel.vanWilligen@snm.admin.ch*  
*Ibáñez, Juan José - (IMF-CSIC) ibanezjj@imf.csic.es*  
*Gibaja Bao, Juan Francisco - (IMF-CSIC) jfgibaja@imf.csic.es*



Some of the sickles recovered in the waterlogged site of Egolzwill III (Switzerland), dated in 5440-5420 BP (4280-4250 cal BC), are exceptionally preserved, showing a single flint blade obliquely inserted into a straight wood shaft which is composed of a extremity used for handling the tool and an opposed pointed extremity of unknown use. The reconstruction of the use of the Neolithic sickles in most of the archaeological sites has to be based exclusively on the analysis of the flint elements.

In this case, the preservation of the flint elements and the wood shaft allows us to have access to a more detailed analysis of how the Egolzwill III sickles were used. The preliminary microwear study of 10 complete sickles and 7 flint blades shows, in some of the sickle elements, some abrasive traces, indicating that the cereal stems could be cut near the ground, probably in order to get a long cereal stem, while in other cases the typical harvesting gloss indicates a higher cutting of the stem. Some transversal abrasions in the cutting edge in some blades could indicate an uprooting movement. In some cases, the pointed extremity of the wood shaft is polished by friction against an abrasive material, probably the ground. In fact, in some of the sickles, the pointed extremity was treated by heating, most probably to harden the point, making it more resistant against abrasion. This polishing of the point could indicate that this zone entered in contact with the ground when the harvesting motion was being carried out

Taking account of the use-wear traces in the flint blade and in the wood shaft, several hypotheses on the harvesting gesture are put forward, which have to be tested experimentally. Finally, the characteristics of the Egolzwill sickles are discussed in the context of the Neolithic sickles in Europe and the Near East, showing the enormous diversity in the harvesting techniques among the first farming communities.

#### ORAL

### 11. MACRO- AND MICRO-TRACES OF HAFTING ON THE QUARTZ TOOLS OF THE PLEISTOCENE SITES OF THE SIERRA CAPIVARA IN PIAUÍ (BRAZIL).

*Clemente-Conte, Ignacio - (AGREST Y Arqueología de las Dinámicas Sociales, Departamento de Arqueología y Antropología, IMF-CSIC, Barcelona) ignacio@imf.csic.es*

*Boeda, Eric - (Professeur Université Paris X – Nanterre, Membre de l'Institut Universitaire de France. CNRS – UMR 7041 ArScAn, Anthropologie des Techniques, des Espaces et des Territoires au Pliocène et Pléistocène (AnTET). Maison de l'Archéologie et de l'Ethnologie) boeda.eric@gmail.com*

*Farias-Gluchy, Maria - (Professeur en Arqueologia de la Universidade Federal do Rio Grande do Sud (FURG) mgluchy@gmail.com*

Analyzing the 'controversial' quartz tools of the Pleistocene sites of the Sierra de Capivara (PiauÍ, Brasil), we recognized the presence of various macro-wears which show a regular pattern in their distribution and morphology. Such traces consist of a series of 'notches' that were performed on the edges in order to adapt the tools morphology for the hafting, probably through the application of some kind of vegetal fiber as 'rope clamp'. In the interior of such notches, quartz surfaces show the presence of microscopic wears, mainly bright polishes, with a flat topography and a compact texture characterized by large and fine strias. All of these wears are attributed to the contact with vegetal matter. In the site of Vale da Pedra Fourada, with a radiocarbon date of ca. 25.000 yrs. BP, a tool associated to the work of soft vegetal fibers has been identified, showing traces very similar to the ones produced by hafting. Both types of traces have been reproduced experimentally.

#### POSTERS

#### POSTER

### CREATING A REFERENCE COLLECTION OF HAFTING ADHESIVES TO INTERPRET SOME 'BLACK SPOT' RESIDUES ON LITHIC ARTEFACTS

*Ollé Cañellas, Andreu - (IPHES, Institut Català de Paleoecologia Humana i Evolució Social, Zona educativa 4 (Edifici W3), Campus Sescelades URV, 43007 Tarragona, Spain / Àrea de Prehistòria, Universitat Rovira i Virgili, Fac. de Lletres, Av. Catalunya 35, 43002 Tarragona, Spain) aolle@iphes.cat*

*Asryan, Lena - (IPHES, Institut Català de Paleoecologia Humana i Evolució Social, Zona educativa 4 (Edifici W3), Campus Sescelades URV, 43007 Tarragona, Spain / Àrea de Prehistòria, Universitat Rovira i Virgili, Fac. de Lletres, Av. Catalunya 35, 43002 Tarragona, Spain) lasryan@iphes.cat*

*Bazgir, Behrouz - (IPHES, Institut Català de Paleoecologia Humana i Evolució Social, Zona educativa 4 (Edifici W3), Campus Sescelades URV, 43007 Tarragona, Spain / Àrea de Prehistòria, Universitat Rovira i Virgili, Fac. de Lletres, Av. Catalunya 35, 43002 Tarragona, Spain) bbazgir@iphes.cat*

*Fernández Marchena, Juan Luis - (IPHES, Institut Català de Paleoecologia Humana i Evolució Social, Zona educativa 4 (Edifici W3), Campus Sescelades URV, 43007 Tarragona, Spain / Àrea de Prehistòria, Universitat Rovira i Virgili, Fac. de Lletres, Av. Catalunya 35, 43002 Tarragona, Spain) juanl.ferna@gmail.com*

*Hardy, Karen - (ICREA at Universitat Autònoma de Barce-*

*Iona, Barcelona, Spain) khardy@icrea.cat*  
*Loza, Pablo - (Institute of Photonic Sciences, Av. Carl Friedrich Gauss 3, 08860 Castelldefels, Spain) pablo.loza@icfo.cat*  
*Marro, Mónica - (Institute of Photonic Sciences, Av. Carl Friedrich Gauss 3, 08860 Castelldefels, Spain) monica.marro@icfo.es*  
*Pedergrana, Antonella - (IPHES, Institut Català de Paleoecologia Humana i Evolució Social, Zona educacional 4 (Edifici W3), Campus Sescelades URV, 43007 Tarragona, Spain / Àrea de Prehistòria, Universitat Rovira i Virgili, Fac. de Lletres, Av. Catalunya 35, 43002 Tarragona, Spain) apedergrana@iphes.cat*

Though the debate continues regarding whether the organic material on ancient lithic artefacts can survive and be microscopically identified, the study of residues is in fact already one of the key components of functional analysis. Indeed, the study of different kind of organic residues (e.g. bone, wood, plants, blood cells, starch granules etc.) on the archaeological lithic artefacts is currently being carried out by many authors.

Here we focus on a particular type of residue, the "black spots" observed in some archaeological lithic artefacts from different sites (e.g. Umm El Tel and Hummal in Syria, Campitello in Italy, les Vachons in France, Königsau and Inden-Altdorf in Germany, Diepkloof Rock Shelter in south Africa, some sites in the Yukon Territory, Canada, etc.) and interpreted most commonly by researchers as being residues of bitumen, tar or bark birch pitch, pine or other plants resin, used for hafting the lithic artefacts. The most commonly employed methods for identification of these residues have been through use of optical and scanning electron microscopy to determine morphological features, and energy dispersive spectrometry (EDX) and the chromatography-mass spectrometry (GC-MS) for identification of chemical composition.

Here we present a reference collection including different substances which, alone or mixed with other products, can be used as hafting adhesives: tars and pitches, bitumen, beeswax, conifer resins, pistacia resin, etc. A selection of these substances is analysed using a combination of techniques including optical microscopy, scanning electron microscopy with energy dispersive spectrometry (SEM-EDX), Raman spectroscopy, and gas chromatography-mass spectrometry (GC-MS).

The combined use of these techniques provides a detailed morphological and chemical characterisation of these substances, which is strong enough to identify

preserved archaeological residues.

As archaeological case studies, we present here some examples of very different Palaeolithic sites showing such "black spots" apparently related to projectile hafting: Azokh Cave, in Nagorno Karabagh, Gilvaran and Kaldar, in Iran, and Cova Eirós, in Spain. Although the reference collection is still in construction, the combination of techniques demonstrated the feasibility of differentiating and identifying some of the analysed residues, while also excluding the identification of some of the spots as hafting residues.

## POSTER

### PRELIMINARY RESULTS FROM A SPECTROSCOPIC ANALYSIS OF RESIDUES ON GRAVETTIAN LITHIC ARTEFACTS

*Zuluaga, María Cruz - (University of the Basque Country) mcruz.zuluaga@ehu.es*  
*Bradtmöller, Marcel - (University of the Basque Country) marcel.bradtmoeller@ehu.es*  
*Sarmiento, Alfredo - (University of the Basque Country) alfredo.sarmiento@ehu.es*

The paper presents preliminary results from a non-destructive analysis of lithic artefacts using Scanning Electron Microscopy and Raman spectroscopic analysis to establish the identification of preserved (hafting) residues on Gravettian tools from Cueva Morín, Cantabria. In so doing SEM-EDX has been used to obtain information about the morphology and chemical composition in these extremely tiny samples.

The characterization of the residues was performed using a CARL ZEISS EVO 40 scanning electron microscope (SEM) operating with an Oxford Xmax X-ray microanalysis system (EDX). Secondary electron images and elemental distribution maps were taken in high vacuum mode (without coating the samples in order to avoid sample modifications). Raman spectra were recorded with a Renishaw InVia Raman spectrometer coupled to a Leica DMLM microscope having a spatial resolution for the 50x objectives of 1-2  $\mu\text{m}$ . In this work a laser of 514 nm with a holographic net of 1800 lines/mm was used. This laser has a nominal power at the source of 50 mW, being the maximum power at the sample of 20 mW.

EDX spectra recorded at different positions of the residue surface allowed to conclude about the composition, although the distribution of the chemical elements differs

from one area to another. And also the chemical analyses differ between different samples. The EDX analysis of remains on a fragmented projectile point indicated further the presence of carbon, calcium and phosphorous in the residue area and oxygen and silicon in the flint area, whereas Na, Mg, S, Cl, Fe, Al, K were present as minor elements. However phosphorous is absent in other residues and Al, K, Fe and Ti appears with C and Ca.

A particular problem for Raman analysis of these artefacts was found in the application of resin or organic compounds to the flint substrata has resulted in large fluorescent backgrounds. Nevertheless, useful information has been obtained which assists in the interpretation of the uses of some of the artefacts. The Raman spectra of hafting residues consist mainly of charcoal in different crystallisation states with broad bands at  $\approx 1300$   $\text{cm}^{-1}$  and  $\approx 1600$   $\text{cm}^{-1}$ . A preliminary Infrared analysis of one backed bladelet residue was performed using a Jasco 4200 FTIR spectrometer for determining spectra in medium infrared (400-4000  $\text{cm}^{-1}$ ) using the potassium bromide pellet technique. In spite of the small amount of the sample the spectrum's quality is good enough to identify the presence of phosphate in the residue. Both Raman and FTIR spectra show spectral features related to C-H bonds, although the nature of this organic compound has not been already determined. Analytic results confirm the organic nature of the residues at the flint substrata. Organic residue of one backed bladelet contains P whereas is absent in most of the other samples.

While this poster is dealing with preliminary results only, the conducted methods are providing interesting data for a further understanding of the utilisation of these lithic artifacts.

# A18a Redefining the Postpalaeolithic rock art in the world: Groups, diffusion areas, chronology and last methodological contributions

Commission on Post-Palaeolithic Rock Art

(Organisers: Hipólito Collado Giraldo, José Julio García Arranz, Jane Kolber)

Monday 1st (14:00 to 19:30)

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ORAL CONTRIBUTIONS

ORAL

## 1. GLOBAL REVIEW OF THE ROCK-ART SHELTERS OF EL ARRASTRADERO? (ALBARRACÍN, TERUEL, SPAIN)

*Bea, Manuel - (3D Scanner Patrimonio e Industria, Spin-off University of Zaragoza. Group "Primeros Pobladores del Valle del Ebro" Area of Prehistory, Dpt. Sciences of Antiquity. University of Zaragoza) manubea@unizar.es*

*Angás, Jorge - (3D Scanner Patrimonio e Industria, Spin-off University of Zaragoza. Group "Primeros Pobladores del Valle del Ebro" Area of Prehistory, Dpt. Sciences of Antiquity. University of Zaragoza) j.angas@3dscanner.es*

In 2014 we have carried out the global study and documentation of the eight rock-art shelters known in the "Arrastradero" area, in the mountain range of Albarracín (Teruel, Spain). New technologies in documentation were used in the study: geometric documentation, photogrammetry and digital tracing. But the most important aim of the project was to carry out an exhaustive review of this large number of rock-art shelters distributed in a very reduced territory.

It was absolutely necessary to review one of the most important rock-art nuclei in Aragon, given that the latest global study was carried out almost 25 years ago, bearing in mind that the results never have been published with a high level of detail.

Among these rock-art sites we could document two of the most surprising and high quality Levantine rock-art shelters in Aragon, with some of the better naturalistic motifs, forming real hunting and symbolic scenes or with some singular characteristic as the use of the roof to paint a large scene or the use of white colour pigments, or the large dimension of the motifs (some of which exceed 70 cm in length).

Some of the other sites, with schematic or subnaturalistic motifs, present pure symbolic scenes or with economic functions, some of them interpreted as domestic scenes.

One of the most important aspects is the spatial coincidence of very different rock-art styles. In this way, it is possible to observe one of the most naturalistic Levantine examples, but also some other sites with the more classical schematic style, while there are others which are

very difficult to classify in any of the two greater groups mentioned, and that we could define as a subnaturalistic style.

The analysis of these sites points out the definition of this territory as a genuine "hinge territory" through the evolution of prehistoric periods. We can find good parallels for themes and motifs in many different areas, both inside the mountain range of Albarracín and outside: in Cuenca or the basin of the rivers Martín and Guadalope.

The study of these sites may shed light on the evolution of different rock-art styles, especially the Levantine, in a territory that is so far from its classic area of development.

ORAL

## 2. A NEW POSTPALAEOLITHIC ROCK-ART NUCLEUS IN TORMÓN (TERUEL, SPAIN)

*Bea, Manuel - (3D Scanner Patrimonio e Industria, Spin-off University of Zaragoza. Group "Primeros Pobladores del Valle del Ebro" Area of Prehistory, Dpt. Sciences of Antiquity. University of Zaragoza) manubea@unizar.es*

*Angás, Jorge - (3D Scanner Patrimonio e Industria, Spin-off University of Zaragoza. Group "Primeros Pobladores del Valle del Ebro" Area of Prehistory, Dpt. Sciences of Antiquity. University of Zaragoza) j.angas@3dscanner.es*

*Royo, José Ignacio - (General Direction of Cultural Heritage. Government of Aragon) jiroyo@aragon.es*

In the municipality of Tormón (Teruel), in the mountain range of Albarracín, there are four rock art shelters included in the World Heritage List. Two of them were studied by H. Breuil and H. Obermaier. In 1981 the rock art shelter of Cabras Blancas was discovered, and 13 years later La Paridera. The discovery of those sites, always coincidental, were carried out individually and staggered in time. Nevertheless, since 2008, 16 new rock art sites in Tormón have been discovered, so this territory has become in one of the area with a larger number of rock art shelters in Aragón.

The rock art motifs on these shelters, all of which are located in the same distribution area in just 100 ha of surface, can be classified as one of the two main post-Palaeolithic rock art styles: Levantine or schematic.

The schematic representations are documented just in three of the sites, with classical motifs of this style, as vertical bars, zig-zags or anthropomorphic figures, as well as

other elements that could be defined as abstract.

Some of the Levantine rock art sites have certain characteristics, both thematic as technique or spatial location. These aspects make them to appear as some of the most relevant and singular elements of all the rock art in Aragon and even in the Iberian Peninsula.

Among those characteristics, it is worth highlighting those motifs depicted in white (despite there being motifs in red and black), a great fight scene between two groups of archers, large representations of male deer in a naturalistic style, large bovid figures, another motif of a bovid with the representation of the ribs. Along with these particularities of theme and colour, we have to emphasize the importance of the rock art shelter of Hoya de Navarejos III. In this site, there are two panels inside a narrow and short natural gallery that is associated to an outdoor space limited by slabs buried in the ground.

We present a preliminary study of this new rock art nucleus, carrying out a methodology by using new technologies, that appears as an area with a singular entity, despite it being possible to observe some common characteristics with those in the mountain range of Albarracín, but also with a series of distinctive features that make it one of the most important post-Palaeolithic rock art areas of the Iberian Peninsula.

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ORAL

### 3. CONTRIBUCION AL CONOCIMIENTO DE LA FASE DE LOS JINETES: EL CASO DEL JEBEL RAT, ALTO ATLANTE, MARRUECOS

*Bravin, Alessandra - (Doctorado en curso Université Aix-Marseille) cercid@cobratours-maroc.com*

El arte rupestre de la fase de los jinetes es una manifestación cultural difundida en un área muy extendida del Magreb y del Sahara, tan como grabados que como pinturas.

En Marruecos este arte se encuentra en todo el Sur, donde destaca el sitio de Foug Chenna en la región pre sahariana del valle del Draa. El segundo sitio más importante de Marruecos es el Jebel Rat, en una meseta a 2400 metros. Las pinturas de esta fase son raras.

Los jinetes del Rat se distinguen de los demás jinetes de Marruecos por ciertas particularidades que hacen de ello

un sitio único, y para comprender en que el Rat es diferente, hay que presentar las características típicas de esta fase.

La figura más típica es un personaje a caballo, el jinete, empuñando una lanza y un escudo. La segunda figura típica es el infante, también armado. El jinete se encuentra aislado o en escenas de duelos, de batallas y de caza a gacelas y muflones. Las figuras de esta fase se reconocen inmediatamente por el estilo esquemático y simplificado y por las dimensiones reducidas de no más de 30 cm. La lanza es una simple línea sin detalles de la punta y el escudo es un disco con piqueteado invasivo. La técnica empleada es el piqueteado, siendo el pulimentado muy raro. Todos estos elementos ofrecen escasos elementos informativos sobre el armamento, el arnés y el ropaje de los personajes.

El interés de un grupo de jinetes del Jebel Rat viene del hecho que, diferentemente de lo demás, estas figuras muestran ciertos detalles sobre la lanza y el escudo. En este grupo el tamaño de las lanzas es muy grande, con grandes puntas con nervadura axial, pareciendo la miniaturización de las grandes puntas de la fase antecedente, atribuida al Bronce final. Los escudos de este grupo, realizados en contorno, presentan "decoraciones" en la superficie interna, y parecen continuar la tradición de las decoraciones de los grandes escudos, ellos también pertenecientes al Bronce final.

Todos estos detalles, encontrados solamente en el Jebel Rat, nos parecen elementos de continuidad entre la fase del Bronce final y la fase de los jinetes, representando una forma de transmisión del saber cuánto a la producción de armas. La idea que el Rat fue abandonado al final del Bronce, según la hipótesis de unos autores, no parece estar avalorada y este grupo podría ser el más antiguo de la fase de los jinetes de Marruecos.

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ORAL

### 4. NUEVAS MANIFESTACIONES RUPESTRES EN EL NORTE DE URUGUAY.

*Cabrera Pérez, Leonel - (Departamento de Arqueología Facultad de Humanidades y Ciencias de la Educación.) leonel-cabreraperez@gmail.com*

En los últimos quince años en el norte del territorio de Uruguay se han descubierto una extensa área con Arte Rupestre, totalmente desconocido hasta entonces. Los

trabajos desarrollados han puesto de manifiesto, más de ciento cincuenta nuevos sitios arqueológicos con miles de petroglifos, los que pueden aparecer agrupados en un número mayor a los 100 por sitio, o aislados, con bajo número de representaciones. Los diseños son mayoritariamente de tipo geométrico abstractos, elaborados por técnicas de picoteado y/o abrasión (raspado y aun pulido). Desde el punto de vista morfológico, encontramos diseños que muestran motivos simples o con cierta complejidad, efectuados con trazos, en los que frecuentemente, todas las líneas o superficies se vinculan en una sola entidad. Igualmente existen motivos compuestos sencillos, resultados de la reiteración de figuras simples o diseños complicados, de tipo "meandriiformes" o grillados, muchas veces sin rigor geométrico, así como motivos indeterminados o sobrepuestos.

Tales petroglifos, podrían ser incluidos, de acuerdo a los modelos formulados para un amplio territorio del continente americano -República Argentina y Brasil-, dentro del denominado "Estilo de Pisadas" o "Tradición Meridional", definido a mediados del siglo XX. Dicho estilo fue formulado a partir de la región Patagónica, donde aparecen grabados cuyos diseños muestran supuestas huellas de animales (puma, guanaco y ñandú) y pisadas humanas, a las que se le suman elementos geométricos o signos en abundancia tales como círculos, zigzag, espirales, tridígitos, etc, con una cronología inicial de unos 4.000 años A. P. Dicho estilo con origen en los Andes Centrales y que esencialmente hace uso de la técnica del grabado, se habría expandido por una extensa región del continente americano, cubriendo áreas de Argentina, Bolivia, Brasil y Paraguay, áreas en las que se muestran discrepancias cronológicas notorias.

En nuestra región de estudio, Norte del territorio de Uruguay, si bien alguno de los indicadores señalados está presente, faltan aquellos considerados como de mayor valor diagnóstico, como las denominadas "pisadas". Nos proponemos profundizar en el análisis regional de la manifestación, mediante la contextualización de las manifestaciones y las variantes regionales implícitas. El proyecto en curso desde el año 2009, tiene además un carácter de salvataje, ya que en el área se explota la roca soporte, mediante canteras de extracción de lajas para la confección de pisos, por los moradores de la región. Tal hecho ha motivado que además de la investigación, se desarrollen paralelamente actividades de extensión, tendientes a la valoración y preservación de dicho patrimonio cultural.

ORAL

## 5. THE REPRESENTATIONS OF EYED IDOLS IN THE SCHEMATIC ROCK ART OF EXTREMADURA

*Collado Giraldo, Hipólito - (Instituto De Estudios Prehistoricos GI Quaternario-Pre-Historia G.I. CUPARQ) hipolitocolado@gmail.com*

In Schematic Rock Art, the Eyed idols representations are considered one of the most important typologies of this style. They have very clear parallels with stones and ceramic objects that have been found in settlement contexts, megalithic chambered tombs. In cases they have been found adorning ceramics

These objects have a widely diffused across the Iberian Peninsula, especially within the south, and date from the Final Neolithic and across the duration of the Copper Age. This chronological spread allows us to adjust the chronology of the final stage of the Schematic rock art tradition.

Within this paper, we wish to catalogue and discuss these figure types in Extremadura region of Spain, paying particular attention to their characteristics, distribution and chronology, as well as discussing the following:

- To analyze and discuss the Schematic rock art eyed idols depictions and their distribution, in particular those designs that are indigenous to the Extremadura region. We argue that geography played an important role in how these figures were circulated, suggesting that a specific cultural tradition existed within the region.
- To make a comparative study with the remaining eyed idols depictions that are known from the Iberian Peninsula and with these to identify particular clusters and the various cultural exchanges strategies that may have influenced such a distinctive repertoire of figures.

ORAL

## 6. THE TAGUS VALLEY ROCK ART COMPLEX (PORTUGAL): ULTIMATE STUDIES.

*Garcês, Sara - (Universidade de Trás-os-Montes e Alto Douro - FCT PhD scholarship; Instituto Terra e Memória; Grupo de Quaternário e Pré-História do Centro de Geociências) sara-garces.rockart@gmail.com*

*Collado Giraldo, Hipólito - (Consejería de Educación y Cultura. Gobierno de Extremadura; Instituto Terra e Memória*

(ITM, Mação); Grupo Quaternário e Pré-História do Centro de Geociências (u. ID73 - FCT); Grupo de Investigación CU-PARQ.) [hipollitocollado@gmail.com](mailto:hipollitocollado@gmail.com)

Oosterbeek, Luiz - (Instituto Politécnico de Tomar, Estrada da Serra 2300 Tomar; Instituto Terra e Memória (ITM, Mação); Grupo Quaternário e Pré-História do Centro de Geociências (u. ID73 - FCT) [loost@ipt.pt](mailto:loost@ipt.pt)

Nash, George - (Instituto Terra e Memória (ITM, Mação); Grupo Quaternário e Pré-História do Centro de Geociências (u. ID73 - FCT) [georgenash@btinternet.com](mailto:georgenash@btinternet.com)

Over the past five years, the RUPTEJO project has attempted to bridge one of the largest gaps in archaeological research in central Portugal, that of the lack of a comprehensive rock art corpus. Starting from the comprehensive literature review, this project aims to dramatically increase the corpus of rock art not only in quantity but also in quality thus deepening and contextualizing the way we approach rock art. Our approach may also allow the construction of a new interpretative model for this area of the Iberian Peninsula.

So far, the project has achieved a number of goals which include a detailed inventory of all sites, a comprehensive direct tracing database of all available engraved latex molds, a comprehensive documentation programme, along with an accompanying photographic record. The result is a detailed and useable corpus of material that is unique and the surviving legacy of a rich archaeological landscape that was destroyed in advance the Fratel Dam project in 1974.

This paper will present the results of detailed work so far of the Tagus Valley rock art (latex) molds; a material that has allowed scholars an invaluable insight to the extent and complexity of one of the largest rock art complexes in Western Europe.

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ORAL

## 7. REGARDING COMPOSITION AND SCENOGRAPHY PROBLEMS IN SCHEMATIC CAVE PAINTINGS OF THE IBERIAN PENINSULA

García Arranz, José Julio - (Universidad de Extremadura) [jj-turko@gmail.com](mailto:jj-turko@gmail.com)

It has traditionally been believed that schematic cave paintings of the Iberian Peninsula were based on a system of consistent representation in groupings or juxtapositions of distinct figures that are typically based on formal defined models that may be more or less geographically extended. These formal models or motifs, except for figures representing humans, animals and other tools, weapons or idols—rarely show any sort of visual connection with elements from their everyday reality or physical surroundings. The blending of features, with a lack of ethnic details in the human figures, a static nature and a lack of interaction between figures, also adds to the difficulties encountered when taking on a descriptive or narrative approach. Therefore, from a current perspective, it is difficult to find compositions that describe any sort of concrete scene or event. This particularly conceptual and distanced view of reality makes it possible to interpret these paintings as a pictographic language based on a determined combination or association of painted signs that are typically synthetic or abstract. However, on some occasions, those paintings that combine different human or animal motifs (or a combination of both), seem to potentially reconstruct economic activity “scenes”—mainly of hunts or grazing-, fighting or dancing. On the other hand, upon close observation of the juxtapositions— or overlaps—of the motifs, it is possible to detect certain repeated associations within the pictograms, including branch-shaped figures, zoomorphism, wake patterns and anthropomorphisms, resulting in certain compositional constants whose meaning or functionality is scarcely evident

To date, partial approaches have been taken to address scenographic groupings and composition problems in schematic cave paintings of the peninsula—making reference to a season, a group of seasons, or a specific geographic area—, and at times, establishing certain parallels with other sets of similar features. We feel that there is the need to review this issue, taking a global look at the most significant “scenes” found in Iberian schematic art, in order to draw conclusions based on the greatest amount of available evidence. This methodology should be based on the idea that the potential “scenes” or events narrated in cave paintings do not refer to specific or localized events, but rather, to generic or timeless concepts, and that they have an essentially informative purpose that tends to refer to the local availability or control of resources or means of survival.

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ORAL

## 8. PRIMITIVE ENGRAVINGS IN THE MEGALITHIC COMPLEX OF MEZORA (ARCILA, MOROCCO)

Gozalbes García, Helena - (Universidad de Granada) [helen-](mailto:helen-)



*agoga@hotmail.com*

*Gozalbes Cravioto, Enrique - (Universidad de Castilla-La Mancha) Enrique.Gozalbes@uclm.es*

In 1829, during his visit to the megalithic monument of Mezora, the British traveller Sir Arthur de Capell Brooke identified several engravings which, due to its characteristics, he considered as parts of a gateway in the circle. Nearly half a Century later, Ch Tissot failed to identify the motifs, although he managed to recognize the hypothetical gate. Since then these aspects are lost in the historical-archaeological researches, which mostly pointed out that they had not found the engravings.

Mezora, megaliths. Study of the surface of megaliths, detecting antique engravings.

During the course of an investigation conducted in 2013 we have identified several of the antique prints, the ones which coincide with those mentioned by Capell Brooke, and we have also located the area of the mentioned door, which had to be modified by the moving of the some of monoliths (probably during the diggings developed in 1932-1936)

Presence of engravings in certain megaliths of the Mezora Circle

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ORAL

## **9. PECKING THE CRYSTALS: AN AMAZING EXAMPLE OF SCHEMATIC ROCK ART IN SARDINIA**

*Gradoli, Maria Giuseppina - (Geologist, PhD researcher, Dept. of Archaeology, University of Leicester (UK) ggradoli@yahoo.it*

*Anardu, Venerio Giuseppe (Geologist, PhD, freelance) - anardu.geol@yahoo.it*

The present work aims to report, for the first time in Sardinia, the presence of an open-air site rich in channels and cup marks pecked on a layer of perfectly formed calcite crystals. The prehistoric people using or visiting the site must have been attracted by the mineralogical nature, consistency and colour of the substrate on which the rock art was engraved, leaving an extraordinary testimony of their symbolic and spiritual world.

The site was noted during a surface survey for human occupation of caves and rock-shelters in the central part

of Sardinia, and it is now under study to better assert the different patterns of engravings in view of their presentation during the conference.

The site is located on the upper part of a limestone plateau, near a rock shelter overlooking a wide and long valley. More than one hundred cup marks and other schematic signs of no easy interpretation are present, even though the striking feature is represented by a one centimetre deep central pool with irregular channels departing from it and ending with cup marks of different size. This pattern of channels and cup marks was obtained pecking a slightly oblique surface made of different calcite crystals, mainly white and transparent or pink-brownish in colour, having a total thickness ranging from 30 to 60 centimetres. The pecking action was intentionally performed in order to remove the first few levels of clear crystals, leaving the pink-brownish one as background for the figure.

Such an extraordinary example of open-air rock art is a tangible proof of the existence in Sardinia, as all over the world, of this typology of rock art considered since this moment not present in the Island. The intentional engraving of the crystalline surface - unique to Sardinia - by prehistoric people encourages prospection and research for other similar phenomena in the whole of Sardinia.

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ORAL

## **10. ENGRAVING VS PAINTING: THE SEVERAL GROUPS OF SCHEMATIC ROCK ART IN THE EXTREME OCCIDENT OF IBERIAN PENINSULA**

*Martins, Andrea - (Associação dos Arqueólogos Portugueses) andrea.arte@gmail.com*

The post Paleolithic schematic art is distributed in all Portuguese territory and can be divided in two major groups defined by technical differences: the schematic engraving and the schematic painting. The difference doesn't result from a cultural choice, but instead of the adaptation to the geologic and geomorphologic characteristics of the different landscapes which are anthropized through the engravings or paintings. The iconography is mainly identical, being adapted to the context, resulting in different morphological details of the execution techniques. We can mention a crono-cultural iconographic uniformity during recent prehistory with different transmissions according with the localization in the landscape. Within each community territory there is a

choice specific locations for the execution of the repertoire according to the diverse social and symbolic parameters. The different types of rock shelters, panels or cavities presenting schematic art take part of a conceptual programme in which each local should be understood as a stage where the communities, or some members of it, actively participate in the creation of symbolic and ritual narratives.

We will present some examples of this symbolic diversity in Portuguese territory contextualized in the schematic art universe.

ORAL

### 11. THE ROCK PAINTINGS FROM EBO (KWANZA SUL, ANGOLA)? RECORDING, PIGMENTS ANALYSES AND CHRONOLOGICAL ELEMENTS

*Pombares Martins, Cristina - (UTAD - Trás-os-Montes and Alto Douro University, Portugal/ FCT- Fundação Para a Ciência e Tecnologia, Portugal) crisaugst@gmail.com*

The archaeological research in Angola was developed in several phases, from its beginning in the nineteenth century, but never obeyed to a constant program. Today this reality starts to change.

Angola has many archaeological contexts of unparalleled richness. The region of Ebo, in Kwanza Sul Province, is a unique cultural landscape, possessing several shelters with rock paintings, peculiar funerary monuments, myths and legends, ancestral knowledge and practices, linguistic richness.

The first systematic study which is taking place now about the rock art of this region will be present here.

The recording of Ebo's rock art was done through non-invasive methods, followed by laboratory work, using software tools essential for the digital processing of the images of rock paintings.

The documentation includes also the analysis of context of the shelters with rock art - localization, planimetry, excavation, materials and pigments analyses.

The tracings made digitally allowed us to identify several phases in the rock paintings of this almost unknown region.

Alongside the work of recording of rock art, the results obtained from Micro-Raman spectroscopy, based on the

pigments samples collected from one of Ebo's shelters, allowed the identification of the main compounds used in the production of pigments.

To the elements which enable to establish a relative dating for the Ebo's rock art, it has been added a direct radiocarbon dating, until now.

The set of all these data contributes to the knowledge and understanding of Ebo's rock art and it adds new elements to what is known about the rock art from Angola.

ORAL

### 12. L'ART DES DOMUS DE JANAS. MÉTHODES, TECHNIQUES, RÉSULTATS

*Tanda, Giuseppa - gtanda@unica.it (Università di Cagliari)*

En 2011, avec le projet "Cultura visuale preistorica: le domus de janas decorate", nous avons repris l'examen des questions paléontologiques abordées jusqu'ici également à des projets interdisciplinaires, pour une analyse de toutes les données matérielles et monumentales, dans une perspective qui aurait comme référence les cadres culturels de la Méditerranée centrale, à l'aide des technologies innovantes aussi expérimentales.

La stratégie de base du projet couvre quatre domaines:

A. Les Domus de Janas dans les aspects structuraux, fonctionnels, d'architecture, de l'environnement, décorative- culturel, des matériaux archéologiques;

B. Le paysage anthropique entourant les Domus de Janas et les monuments de la même époque, en particulier les habitats;

C. La reconstruction des sociétés du millénaire IV - III . C. diversement articulée en termes de modes de vie et d'économie, dans les quelles le modèle funéraire de la domus de janas est presque généralisé;

D La « sémiotique » de la production d'art des hypogés:

L'argument que nous avons l'intention d'explorer dans ce congrès couvre les gravures observées dans 52 Domus de Janas .

Je vais me concentrer uniquement sur certains aspects du relief et de la classification des motifs figuratifs, qui, à notre avis, sont d'une grande importance . Très souvent, en effet, l'analyse des figures gravées sur les parois des

monuments ou sur les rochers à l'extérieur est fait pour des motifs définis uniquement sur la typologie et donc parfois classés selon des paramètres purement subjectifs.

Il vient souvent aux descriptions et interprétations de type subjectif.

L'utilisation d'une méthode de classification de nature technique viendrait peut-être à des interprétations objectives.

Nous voyons un résumé de la méthode et des problèmes

Pour la classification technologique des motifs figuratifs "à martellina" a été utilisé une méthode spécifiquement conçus et testés dans la nécropole de Sos Furrighesos - Anela: méthode rigoureuse qui répond à la nécessité de «considérer les gravures que les données archéologiques dans le plein sens du terme, comme des objets réels, des éléments par conséquent, qui ont caractères concrets et précis, définissables avec précision et sécurité dans ses traits particuliers et spécifiques" (Tanda 1984, I, 15-21).

Cette méthode est divisée en 5 parties qui, à son tour, se divisent en divers aspects secondaires, incluant d'autres éléments, dans un système hiérarchique

Avec cette méthode, il y aurait aussi la possibilité de reconstruire les phases opérationnelles des décorations des tombeaux: le traitement des surfaces des parois des hypogées, l'identification des instruments utilisés, les méthodes de réalisation, le choix d'utiliser l'espace pour valoriser et faire ressortir certains motifs, la réutilisation partielle des représentations, la réalisations modèles en superposition

La classification typologique est inspirée par les plus grands systèmes européennes de classification (la Valcamonica, le Mont Bego, la Péninsule ibérique, la Scandinavie) et d'Afrique (le Maghreb), dont nous avons pris les éléments et les mots appropriées aux caractéristiques des gravures de la Sardaigne, s'imposer ainsi, avec une grande spécificité.

Il est divisé en 7 classes: I. Les animaux; II. Les figures humaines; III. Les armes et les outils; IV. Les véhicules; V. Les figures géométriques; VI. Les coupules; VII. Figures variés.

Dans la méthode illustrée, la typologie suit la classification.

Soutien fondamental de la classification est le relief,

graphique et photographique.

À cet égard, il convient de noter que un des objectifs de la recherche est également l'expérimentation de techniques innovantes. Ils étaient des expériences du scanner laser et du photographie en 3D, précis, rapide, peu coûteux et objectif.

ORAL

### 13. CHRONOSTRATIGRAPHIC RESULTS OF ANALYSES ON BEDROCKS AND CRUSTS OF THE SERRA DE LA PIETAT ROCK ART ASSEMBLAGE (ULLDECONA, TARRAGONA - SPAIN)

*Viñas Vallverdú, Ramon - (Institut Català de Paleoecologia Humana i Evolució Social (IPHES); Universitat Rovira i Virgili (URV), Tarragona, Spain) rupestrologia@yahoo.es*

*Rubio Mora, Albert - (Seminari d'Estudis i Recerques Prehistòriques (SERP), Universitat de Barcelona (UB), Spain) albert.rubio.mora@gmail.com*

*Ruiz López, Juan F. (Universidad Castilla La Mancha (UCLM) - jfruiz@jfrl.jazztel.es*

*Vallverdú Poch, Josep - (Institut Català de Paleoecologia Humana i Evolució Social (IPHES); Universitat Rovira i Virgili (URV), Tarragona, Spain) jvallverdu@iphes.cat*

*Rowe, Marvin W. - (Texas A&M University and Professor of Chemistry, Texas A&M University at Qatar, and Conservation Scientist, Museum of New Mexico, Santa Fe, NM USA) marvin.rowe@qatar.tamu.edu*

*Santos da Rosa, Neemias - (PhD Candidate in Cuaternario y Prehistoria, Universitat Rovira i Virgili (URV), Tarragona, Spain) neemias\_of@hotmail.com*

The project "Investigación cronoestratigráfica de los soportes y recubrimientos de las pinturas rupestres de la Serra de la Pietat, Ulldecona (Montsià, Tarragona)", led by the Institut de Paleoecologia Humana i Evolució Social (IPHES) and with the collaboration of several institutions, as Universidad de Barcelona (UB), Universidad de Castilla La Mancha (UCLM) and Texas A & M University, has been developing a study focused on the analysis of micro samples of rocky supports and crusts related to Levantine and Schematic paintings of the Ermites rock art assemblage, in Serra de la Pietat (Ulldecona, Tarragona). The main objective of this project is to obtain indirect dating of the paintings, using to achieve such goal, the AMS 14C method, whereby calcium oxalate content in the microsamples are analyzed to define the chronological and cultural framework of this rock art group.

The methodology has been supplemented by petrographic and stratigraphic analysis of several micro samples through X-Ray Micro-Diffraction and Raman Micro-Spectroscopy on thin sections, reaching a very detailed knowledge about the stratigraphy of calcium oxalate and sulfate crystals on which we have attempted to perform a dating. However, the study revealed many technical issues that must be considered for this type of research.

Microsamples not always have enough calcium oxalate to obtain the amount of carbon required for a successful or reliable radiocarbon dating. Moreover, the results do not yield a direct dating of rock art paintings. However, some of the results are very significant suggesting two chronostratigraphic horizons before the Neolithic period for Levantine tradition and other more recent dates for the Schematic tradition in Serra de la Pietat (Ulldecona, Tarragona).

If we want to yield more accurate results on the minimum and maximum ages for such rock art panels, will be necessary to extract samples of pigment remains to determine the relative stratigraphic position of the painting event in relation to overlying and underlying calcium oxalate accretionary crusts.

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ORAL

#### **14. THE ROCK ART OF THE SIERRA GORDA IN GUANAJUATO, MEXICO.**

*Viramontes Anzures, Carlos - (Instituto Nacional de Antropología e Historia, Querétaro) cviramontes@hotmail.com*

Until recently, the northeastern part of the State of Guanajuato was a virtually unknown region from the archaeological point of view; therefore, little or nothing was known about the existence of rock art sites, although since the sixteenth century Augustinian monk Guillermo de Santa María report a site known as "Cuevas Pintadas" (Painted Caves). Under the archaeological project Rock Art in the Basin of the Victoria River in the last three years we have located, registered and documented 53 sites of rock art product of nomadic and semi-nomadic societies that lived in the semi-desert area of ??the Sierra Gorda. It is a ritual art primarily schematic and in this paper we will present their spatial and iconographic features, which highlights a marked obsession to represent the human figure.

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ORAL

#### **15. ROCK ART OF SIERRA GORDA, GUANAJUATO, MEXICO.**

*Viramontes Anzures, Carlos - (Instituto Nacional de Antropología e Historia) cviramontes@hotmail.com*

Until recently, the northeastern part of the State of Guanajuato was a virtually unknown region from the archaeological point of view; therefore, little or nothing was known about the existence of rock art sites, although since the sixteenth century Augustinian monk Guillermo de Santa María report a site known as "Cuevas Pintadas" (Painted Caves). Under the archaeological project Rock Art in the Basin of the Victoria River in the last three years we have located, registered and documented 53 sites of rock art product of nomadic and semi-nomadic societies that lived in the semi-desert area of ??the Sierra Gorda. It is a ritual art primarily schematic and in this paper we will present their spatial and iconographic features, which highlights a marked obsession to represent the human figure.

# A18b Post-Palaeolithic filiform rock art in Western Europe

Commission on Post-Palaeolithic Rock Art  
(Organisers: Fernando Coimbra, Umberto Sansoni)

Thursday 4th (9:00 to 13:30)  
Meeting Room B25



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XVII Congreso Mundial de UISPP

ORAL CONTRIBUTIONS

ORAL

## 1. LATE PREHISTORIC INCISED ROCK ART IN SOUTHERN EUROPE: A CONTRIBUTION FOR ITS TYPOLOGY

*Coimbra, Fernando - (Instituto Terra e Memória) coimbra.rockart@yahoo.com*

Late prehistoric incised rock art occurs in several countries from Southern Europe with a large range of motives. It's possible to observe anthropomorphic figures, zoomorphic figures (horses, dogs and deer), weapons (halberds, axes, spears, swords, daggers, arrow heads), many diverse geometric motives and several symbols, among other figures.

In this paper the author presents a contribute for a typology of this kind of rock art, joining not only common themes to countries such as Portugal, Spain, France and Italy, but also some examples that are typical from only some regions of the same countries and from others like Kosovo and Greece.

ORAL

## 2. FILIFORM ROCK ART IN MOUNT BEGO (TENDE, MARITIME ALPS, FRANCE)

*Bianchi, Nicoletta - (Scholarship holder soprintendenza per i beni archeologici del piemonte) nicoletta.bianchi@gmail.com*

Rock carvings, pecked and filiform, of mount bego region are situated in the high valleys of the mercantour national park, at altitudes of over 2000 metres and located within 1,400 hectares subdivided into eight main sectors, of which marvels and fontanalba are the most remarkable because of the great number of engravings. Pecked carvings can be date to late prehistory essentially because of the presence of different kinds of engraved weapons (daggers, halberds and axes). Furthermore, the human occupation of the site during prehistory is confirmed by archaeological digs in *gias* del ciari as well as in other rock shelters, highlighting human presence on the site from early neolithic.

The typo-chronological study of carved weapons, based on the typological comparison between engraved and real weapons found in archaeological context, provided

a chronological interval starting about 3700 B.C. and lasting until the end of the bronze age. Nevertheless, the discovery of archaeological material prior to this interval compels to admit the possibility that other motives were made in early neolithic.

Previously, carlo conti and giuseppe isetti claimed that the most ancient mount bego engravings were filiform motives and they based their hypothesis on the superimposition between pecked and filiforms engravings. Recent works on superimpositions have shown that in some cases pecked carvings really overlap filiforms and that, consequently, some filiforms pre-date pecked engravings.

Just on the base of superimposition relations it is difficult to quantify the anteriority of filiform motives; though it is undeniable that common points exist between filiform patterns - tree like motives, pectiniforms, scalariforms, zig-zags, net-patterns - and motives dating from neolithic, from other sites and in particular from iberian peninsula.

Moreover the use of incision during late prehistory is attested by the presence on the rocks of engravings realized half-and-half by pecking and incision: they can be lines «of construction» of the figure and lines «of detail» executed by a fine and superficial incision, or made by an incision in V section, which could be qualified of «polissoir».

Filiform carvings seem acquire more importance at the end of the early bronze age, when the number of the pecked carvings - especially weapons - is considerably reduced compared to the previous periods. In time, filiform motives complete pecked compositions and are combined with them. The big mixed compositions, pecked and filiform, seem to translate the expression of a transition period, corresponding to the end of the bronze age, during which pecked tradition definitively gives up her place to a tradition exclusively filiform.

The study of filiform engravings complete the chronological setting established for the carving activity in mount bego. The finding of filiform motives covered by some pecked engravings denies the hypothesis that in mount bego region only pecked carvings date from the late prehistory; besides, the repetitive association of pecked engravings and filiform patterns suggests an important interaction of the two carvings tradition.

It is possible to consider the coexistence of the two techniques, incised and pecked, and succesively a progres-

sive disuse of pecked tradition, in favour of an increasingly present schematism.

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ORAL

### 3. FILIFORM FIGURES IN THE ROCK ART OF VALCAMONICA FROM PREHISTORY TO THE ROMAN AGE

*Sansoni, Prof Umberto. - (CCSP - Dip. Valcamonica Lombardia) dip.ccs@gmail.com*

*Cinzia Bettineschi Dott. (CCSP - Dip. Valcamonica Lombardia)*

*Silvana Gavaldo Dott. (CCSP - Dip. Valcamonica Lombardia)*

The report examines the engravings made with the "filiform" (scratched) or polissoir technique in Valcamonica, dated to the pre- or proto-historic age. In Valcamonica, most of the figures are pecked, but the filiforms, although fewer in percentage, in certain sites and areas show some original and meaningful features.

The whole *corpus* of filiforms of Valcamonica has been analysed; a specific typology has been drawn up, linked to the typology used for the pecked engravings. Under and overlaps with dated pecked figures have been analysed in order to provide a dating for the filiform phases. Scenes and complex associations have been studied, and reveal that many panels have a symbolic and ritual value and some correspondences to some recently discovered paintings.

The associations and especially the overlaps between the filiform and the pecked engravings have made possible to define the chronological *excursus* of the filiforms themselves, from the late Neolithic up to the Roman era (and with a later phase from the late Middle Ages to the twentieth century). The pre- and proto-historic filiform phenomenon is concentrated mainly in the Iron Age, especially since the sixth century BC until the Romanisation in the early centuries of the Christian era. If we exclude the thousands of short, often confused signs that surround the pecked images or the traces of the preparatory sketches, three particular categories of filiforms can be defined: the completion of pecked figures, usually in their finer details; geometric shapes such as circles, pentagrams, *trias* or more structured geometric shapes; complex images as anthropomorphic, zoomorphic, buildings, handicrafts, symbols and inscriptions. The analysis of the overlaps between and among filiform and pecked figures reveals that in the middle Iron Age on some surfaces (Foppe di Nadro r. 24 and r. 27, Pià

d'Ort r. 24) the two techniques coexist, alternate, complement each other; in the late Iron Age, on other panels (in Piancogno and again Foppe di Nadro, r. 24, r. 43) the filiform technique is used exclusively or predominantly.

The geometric shapes and the complex images, typologically near to the similar pecked engravings, feature a certain stylistic naivety and often their own logic and symbolic structure. Their relationship with the contemporary pecked images is strong, as well as the thematic parallels with painted figures. The themes represented have a strong symbolic or ritual meaning, thus giving filiforms a significant role in the context of pre- and proto-historic engravings.

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ORAL

### 4. THE FILIFORM ROCK ART FROM KOSOVO

*Krasniqi, Shemsi - (University of Pristina) shemsi.krasniqi@gmail.com*

The study of rock art in Kosovo has started a few years ago. Until now eight sites were discovered, and most of them represent the filiform rock art. The most important site is Zatriq, where in the place called Sharenice, hundreds of symbols since prehistoric period are engraved on the rock surface, and a rite of passage occurs there even today. All the other sites of the filiform rock art, except Krileve, are at the megaliths complexes (Papaz, Llaushe, Aqareve, and Vitak). The motives of filiform rock art from Kosovo are very similar with motives found in other Mediterranean and European areas (asterisk, tree like motives, pentagram, vulva, net pattern, circle, square, lines). Some associations of symbols are very frequent, and what is more important, some of them correlate very well with the meaning of today's ritual. This paper presents some comparative analysis, interpretations, and a typology of filiform rock art in Kosovo.

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### 5. POST PALAEOOLITHIC FILIFORM ROCK ART IN NORTHERN GREECE. CASE STUDIES IN EASTERN MACEDONIA AND THRACE.

*Iliadis, Giorgos - (UTAD/ITM/CGS) gsiliadis@yahoo.com*

The present communication aims to deliver an expanded view of the filiform rock art of Northern Greece. Themes, techniques, chronology and regional identities are be-

ing discussed. Examples are referred to various rock art sites located in the region of Eastern Macedonia and the Aegean Thrace. Attention will be given to the recently discovered rock art sites in Evros region and particularly those which are located at the eastern slopes of the Rhodope Mountains.

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ORAL

## 6. LES GRAVURES RUPESTRES FILIFORMES DE LA PARETE MANZI DE MONTELAPIANO (CHIETI, ITALIE)

*Di Fraia, Tomaso - (Université de Pisa (Italie) tom.difraia@libero.it*

En 2010, le prof. Aurelio Manzi a découvert une série de gravures rupestres sur l'arête rocheuse qui sépare les villes de Montelapiano et Villa Santa Maria (province de Chieti), sur le côté gauche du Sangro, aujourd'hui à environ 35 km de la mer.

Les gravures sont situées sur une paroi rocheuse (*Parete Manzi*) presque verticale et exposée à W, pour une surface d'environ 100 cm de hauteur (à partir de 90 cm au-dessus du sol) et 300 cm de largeur. Il y a seulement une figure peinte, tandis que les autres sont gravées.

Cette étude fournit une première documentation et essaie de proposer quelque interprétation.

L'information suivante a été obtenue par la vision directe pendant trois explorations, par une première documentation photographique et par un dessin au décalque.

Les gravures montrent principalement des sillons minces ou très minces et seulement quelques signes, cependant aniconiques, ont été réalisés avec une rainure plus large et concave. Un élément de cohérence stylistique est la taille relativement petite des figures (une des figures plus complexes, le nœud de Salomon, mesure moins de 4 cm), ce qui suggère une forte homogénéité culturelle et une probable continuité chronologique.

Ce site a des caractéristiques particulières:

1) le site est dans une position difficile à atteindre par la très forte pente et la présence de pierres très instables; en effet jusqu'à 2010 on ignorait ces représentations, même si elles sont situées à une courte distance d'une zone urbaine et ne sont pas couvertes par la végétation; 2) l'utilisation presque totale de la technique de gravure par de fines rainures (la Parete Manzi est le seul d'une

douzaine de sites d'art rupestre dans la province de Chieti avec cette prédominance); la seule figure peinte (en noir) semble plus ancienne, si on observe entre autres la détérioration de la roche de support;

3) la typologie des figures s'éloigne du répertoire connu dans les autres sites d'art rupestre de la province. Parmi les représentations réalistes on trouve plusieurs variétés de poissons et des figures interprétables comme des harpons. Les signes géométriques/abstraites comprennent des étoiles à cinq pointes, motifs à peigne, escaliers, losanges, «papillons», carrés, faisceaux ou enchevêtrements de lignes et un nœud de Salomon.

La question se pose des liens possibles, idéologiques et symboliques, avec un site des Pouilles (Cavone di Spinazzola, Bari) surtout pour les raisons suivantes: 1) l'utilisation exclusive (Cavone) ou presque totale (Parete Manzi) de la technique de la gravure; 2) la ressemblance de nombreux sujets; 3) la superposition ou juxtaposition de figures dans de différents moments, mais toujours dans le même panneau de roche. Il est possible que de petits groupes de personnes se déplaçant sur de longues distances aient exprimé leur imagination dans des endroits très lointains. Dans ce cas, on peut penser à la transhumance comme un vecteur pour la diffusion des idées.

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ORAL

## 7. THE ROCK ART FROM FIGUEIREDO (SERTÃO, PORTUGAL): TYPOLOGY, CHRONOLOGY AND INTERPRETATION

*Coimbra, Fernando - (Instituto terra e memoria) coimbra.rockart@yahoo.com*

*Garcês, Sara - (Universidade de Trás-os-Montes e Alto Douro) saragarcês.rockart@gmail.com*

The rock art from Figueiredo is constituted by three carved rocks with incised motives, some done with a medium/thick groove and others with filiform groove. Two of them were discovered after an intensive forest fire. Since these rocks are flat to the ground, they were covered by earth during a long time, being the engravings from these two examples very well preserved.

All the three rocks were traced by the authors in two different fieldworks and, between them, rock 1 was covered by plastic and industrial sand during eight months in order to remove, in a natural way, the lichen that were over several filiform figures. After that, some experiments with a 3D laser scanner were also done.



This paper presents the results of all the research done regarding these three rocks, which is a contribute for the typology, chronology and interpretation of the incised rock art in Portugal.

It was found that the diversity of motives on Rock 1 from Figueiredo allows considering it one of the most important regarding incised rock art in southern Europe. Furthermore, some figures of this rock are extremely rare in this kind of art, appearing some of them only done in pecking technique. Other motives can be associated with cross cultural contacts in southern Europe during late Bronze Age/Early Iron Age.

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## ORAL

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### **8. LOS GRAFITIS FILIFORMES DE ÉPOCA HISTÓRICA EN LA ROCA Y EN LOS ENFOCADOS DE IGLESIAS Y EDIFICIOS CIVILES. ALGUNAS COMPARACIONES Y PROPUESTAS DE INTERPRETACIÓN**

*Troletti, Federico Dott - (CCSP) federico.troletti@lett.unitn.it*

La comunicación examina el vasto repertorio de grabados/petroglifos filiformes del yacimiento de Campanine di Cimbergo (Valcamonica) datables en plena época cristiana (del siglo XV al XIX).

La comparación entre los grabados filiformes de la roca y los de las paredes de las iglesias se comenzó ya hace diez años, por lo que, se proponen también algunas consideraciones para la metodología del estudio de este "arte incisorio".

El estudio ha demostrado la presencia de imágenes cultas y representaciones populares. Hay además muchas escenas con hombres armados y fortificaciones militares. Otros signos muestran llaves, animales, dados, horcas para el linchamiento, águilas heráldicas, nudo de Salomón, escritos en latín e italiano. Para la interpretación y la datación también han sido analizados los grabados filiformes descubiertos en las paredes de algunas iglesias de Valcamonica.

El estudio ha demostrado que tales grabados están presentes en el enfoscado de edificios civiles y religiosos, y están extendidos por casi toda Italia, pero también en varias zonas de Europa; de este modo, ha sido posible analizar las imágenes y comparar los petroglifos filiformes de las paredes de las iglesias con los de las rocas y se han encontrado muchas semejanzas.

# A19

## Bifacial tools in the Middle Palaeolithic of western Eurasia: typo-technological variability and spatio-temporal trends

Commission on Middle Palaeolithic Bifacial Tools, Backed Bifaces and Leaf Points in Western Eurasia

(Organisers: Árpád Ringer, Luis Raposo, Karen Ruebens)

Friday 5th (9:00 to 13:00 – 14:30 to 19:30)  
Meeting Room A21



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XVII Congreso Mundial de UISPP

ORAL CONTRIBUTIONS

ORAL

### 1. VARIABLES BIFACIALES

Otte, Marcel - (Université de Liège, Belgium) [Marcel.Otte@ulg.ac.be](mailto:Marcel.Otte@ulg.ac.be)

La pratique des enlèvements bifaciaux se retrouve à tous les moments et en tous lieux de l'histoire humaine. Cependant, d'innombrables variables permettent d'y distinguer des facteurs régionaux (Keil Messer Gruppe), chronologiques (Acheuléen) et traditionnels (Chine). De telle sorte que globaliser l'ensemble de ces variantes, pour cette seule raison technique, ne suffit pas à y comprendre la signification.

ORAL

### 2. BIFACE OR CORE ? AN INTRIGUISH ARTIFACT IN THE MIDDLE PALAEOOLITHIC ASSEMBLAGE OF FOZ DO ENXARRIQUE (RÓDÃO, PORTUGAL)

Raposo, Luis (Museu Nacional de Arqueologia, Lisboa, Portugal) [luisraposo@mnaarqueologia.dgpc.pt](mailto:luisraposo@mnaarqueologia.dgpc.pt)

Among the vast Middle Palaeolithic lithic assemblage Foz do Enxarrique, site dated to c. 30 kyr, located at the Tagus valley, near the Spanish border, it is worthy to be noted a singular artifact of bifacial elongated conception. Having not in mind the entire assemblage and a few technological details, it would easily be assimilated to a bifacial tool, maybe a kind of backed biface (*biface à dos*).

This strictly typological classification will be discussed. True Middle Palaeolithic bifaces from the same region will be presented. And comparisons will be made with Acheulian bifaces. In all, the impression given by current data, maybe because of its incompleteness, is much more one of discontinuities, technological, typological and "culturally" speaking, than the contrary. Which models would better fit this data? Is it possible to use in this context evolutionary concepts such as the ones of "flux and go" or "bottle neck"? Or are the traditional migrationists / diffusionists explanations still acceptable? The fact is maybe that all of these approaches are deleterious to some extent, due to the inherent nature and the circumstantial insufficiencies of the available empiric data.

ORAL

### 3. COEXISTENCE OF DÉBITAGE/SHAPING AND VARIABILITY OF RAW MATERIALS BETWEEN MIS 8/7 AND MIS 5: THE EXAMPLES OF SAINTE ANNE 1 AND PAYRE.

Santagata, Carmen - (UMR 5199 PACEA Université de Bordeaux 1) [salvacim@libero.it](mailto:salvacim@libero.it)

Moncel, Marie-Helene (UMR 7194, CNRS e Department of Prehistory, National Museum of Natural History, Paris, France) [moncel@mnhn.fr](mailto:moncel@mnhn.fr)

In the context of the work of PCR *Regions Auvergne and Rhône-Alpes*, the study of series of Sainte Anne 1 and Payre allowed us to define the coexistence between débitage reduction process and shaping, correlated with the variability of raw materials, although with different proportions and associations.

The cave of Sainte-Anne 1 was visited during MIS 6/5e: tools were produced mainly by volcanic rocks, followed by quartz and flint (represented by twenty-six genetic types). The lithotype most represented is the flint of the Puy basin, although regional and external resources are present too. Fauna, highly fragmented as result of periglacial action, reflects the existence of severe weather conditions. The site Payre, located along the Rhone valley, has a sequence that goes from MIS 8-7 at the end of MIS 6/5 (Moncel, 2008). Fourteen human remains were discovered. The local and semi local flint is the dominant raw material. Basalt, quartz, quartzite and limestone are available on the banks of the Rhone River and the Payre. The fauna is composed of elephant, horse, rhinoceroses, cervids, large bovines, tahr, chamois, bears, cave lion, dhole, wildcat, lynx, red fox and beaver.

At Sainte Anne 1, any differential resource management was observed in the débitage reduction process (Levallois, discoid, opportunist) except blank selection (Santagata, 2012). The materials rarely used (quartz and volcanic rocks) play the main role, while the quality is not always fits. Although few in number, handaxes are varied by raw material, technical, functional and morphometric features. Series of Payre, in contrast, show specialized uses of lithotype in relation to technical and/or functional features of products: if flint and limestone have the predominant role in the débitage reduction process, the shaping has applied to volcanic rocks, although their quality is not always high. Rare handaxes are very simple tools, characterized by the variability of typo-technological characters.

Although numerous hypotheses are being put in place to clarify the terms of chronological coexistence, geographical or techno - functional débitage/shaping reduction process, technical variability of observed characteristics, the variability of technological characters, the different use of raw materials, the coexistence of local and exogenous lithotype, the absence of certain production phases show the high degree of technical flexibility and strategic complexity implementation. The question under analysis is the role of handaxes in these technical systems, considering that the nature of the raw material used in these cases has certainly contributed to the idea of a set extremely related to the particularities of territory and needs (functional or cultural) specifics.

ORAL

#### 4. LATE MIDDLE PALAEOOLITHIC BIFACIAL TOOLS IN WESTERN EUROPE: TAXONOMIC COMPLEXITIES AND REGIONAL TENDENCIES

*Ruebens, Karen - (MONREPOS Archaeological Research Centre and Museum for Human Behavioural Evolution, Schloss Monrepos, 56567 Neuwied, Germany) karen.ruebens@eva.mpg.de*

During the late Middle Palaeolithic (MIS 5d-3, ca. 115,000–35,000 BP) bifacially worked tools, including handaxes, form a substantial part of the Neanderthal tool kit. Across this time period, they occur in many regions of Western Europe, often in dominant proportions and are characterised by a large degree of morphometric variability. Two main biface-rich entities are commonly distinguished in Western Europe:

1) *the Mousterian of Acheulean Tradition (MTA)* defined by the French record and typified by cordiform and triangular handaxes 2) *the recent Micoquian or Keilmessergruppen (KMG)* occurring in Central Europe, characterised by backed (Keilmesser) and leaf-shaped bifacial tools

Additionally, a plethora of smaller, often poorly defined, bifacial tool entities have been proposed for assemblages which do not conform to either the MTA or KMG definition. Together with the existence of a dense cloud of different terms and types, often with different meanings in different languages, a rather disjointed view currently exists on this late Middle Palaeolithic bifacial phenomenon. Therefore, the research presented here aims to provide a new, integrative, perspective on the techno-typological and region-specific characteristics of these Late Middle Palaeolithic bifacial tools by:

- Unravelling this epistemological confusion and creating a simplified comparative framework that incorporates all the existing local terms and types

- Taking a macro-regional approach, incorporating data from across Western Europe, and for the first time including the regions of Belgium, The Netherlands, Britain, northern, western and eastern France

1,303 bifacial tools from 14 case study assemblages were analysed through a detailed attribute analysis and compared with additional data from 61 comparison sites. At a micro-scale, results indicate high levels of variability between individual bifacial tools and assemblages, which can be linked to differing local conditions, such as raw material, site use, tool function and resharpening. At a macro-scale, a threefold regional distinction can be made between the MTA, KMG, and 'the Mousterian with Bifacial Tools (MBT)': At this level, an additional sphere of interpretation is required to explain the observed large-scale differences. It is therefore suggested that the MTA and KMG can be interpreted as two different cultural traditions, reflecting different lines of socially-transmitted information. Further work is needed in relation to the MBT, which is located at the crossroads of MTA and KMG influences, to better understand its causal factors and behavioural implications. Overall, this research demonstrates the advantages of a wider-scale approach to the archaeological record and the presence of regional behaviour among late Neanderthals.

ORAL

#### 5. ANALYSIS OF BIFACIAL ELEMENTS FROM THE GROTTES DE LA VERPILLIÈRE I & II AT GERMOLLES IN SOUTHERN BURGUNDY, FRANCE

*Frick, Jens Axel - (Universität Tübingen) jens-axel.frick@ifu.uni-tuebingen.de*

*Floss, Harald - (Universität Tübingen) harald.floss@uni-tuebingen.de*

Lithic bifacial elements are quite common in Late Middle Paleolithic assemblages in eastern France. Lately, there were discussions about the formation of space time units in the late Middle Paleolithic in Western Europe and the bifacially backed knives with para-burin blows (*Keilmesser mit Schneidenschlag*) from the *Grotte de la Verpillière I* (formerly also known as *Grotte de Germolles*) were part of these discussions concerning the formation of clusters in space and time like the *Keilmessergruppen* (Jöris), the *Moustérien mit Micoque-Option* (Richter), the

*Industrie charentiennes à influences micoquiennes* (Farizy), the *Micoquien* (Gouédo, Deloze, Depaepe), the *Moustérien de tradition acheuléenne* (Desbrosse), *Micoquien* and *Moustérien de tradition acheuléenne* (Floss, Frick) or the recently established Mousterian with bifacial tools (Ruebens). In this frame, we present production, techno-functional and morphological analyses of all known bifacial elements from the *Grotte de la Verpillière I* (VP I, from old excavations and the excavated backdirt of these) and from a new cave with intact Middle Paleolithic layers, the *Grotte de la Verpillière II* (VP II), which is 50 m south of the well-known *Verpillière I*.

The bifacially backed knives from the VP I (first presented in the 1970s by Desbrosse and others) and all other bifacial elements from every condition (old excavations, excavation of back dirt areas and excavations in intact layers) from both caves were now (re-)analyzed in the course of running research projects to the paleolithic occupation of southern Burgundy (DFG FL 244/5-1, SFB 1070 B01 and PCR UMR 6298 ARTeHIS) at the University of Tübingen and Dijon, led by H. Floss. Beside the production analysis and morphological shape comparisons, we demonstrate the separation into techno-functional units (TFU) and techno-types (TT) of these now way more than 60 bifacial elements.

In a technological production view all of these pieces are quite similar made. The analysis demonstrate that both surfaces of the bifacial elements are produced in a plano-convex way independent from its top view shape (symmetrical or not, back or not). In most cases the edges are also shaped in a plano-convex way. Reuse and recycling processes (reshaping and remould) are also visible. The morphological shape analysis of the top view show the broad range and the heterogeneity. With the aid of the production and shape analyses we are able to form TFUs on these pieces and can sort the bifacial elements into different TTs. The intact lithic assemblages from both caves also demonstrate that these bifacial elements are accompanied by a Levallois production of unifacial stone artifacts and not as formerly suggested with a Quina production.

The formation, classification and distinction of assemblages belonging to the Middle Paleolithic of Western Europe are integrated into enduring discussions. Both caves yield a heterogenous bifacial component and a homogenous unifacial Levallois production. Our analysis may help to get an idea of the bifacial diversity in the southern part Burgundy and may support the finding of criteria to group lithic components and assemblages.

ORAL

## 6. BIFACIALLY BACKED KNIVES (KEILMESSER) IN THE CENTRAL EUROPEAN LATE MIDDLE PALAEO-LITHIC.

Olaf Jöris - (*MONREPOS Archaeological Research Centre and Museum for Human Behavioural Evolution Schloss Monrepos, 56567 Neuwied, Germany*) [joeris@rgzm.de](mailto:joeris@rgzm.de)

An overview of sites, production strategies and raw material morphology, and their implications for the understanding of Late Middle Palaeolithic regional entities. A large number of Late Middle Palaeolithic assemblages from Central Europe contain, or are even characterized by, bifacially backed knives (*Keilmesser*) – asymmetric bifaces with a single active edge. Indeed, in some assemblages, morphologically different forms of *Keilmesser* represent the most dominant tool type. In contrast to their often highly standardized *châines opératoires*, flaking strategies at these sites appear much more variable. Given the different raw materials used for *Keilmesser* manufacture and the varying morphological properties of these materials, it is noteworthy that entirely different strategies were applied to produce virtually identical tools. Raw material morphology or size played only minor roles in the production of these tools, while the production process itself best documents the *Keilmesser* tool concept. This observation adds raises the question about the degree to which certain tool forms have to be regarded as desired products, and to what extent should these be evaluated in terms of cultural markers.

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## 7. BIFACIAL KNIVES IN THE MICOQUIAN SITES IN THE NORTH-WESTERN CAUCASUS AND NEIGHBORING REGIONS: TYPOLOGY, TECHNOLOGY, AND REDUCTION

Golovanova, Liubov - (*Laboratory of Prehistory*) [labprehistory@yandex.ru](mailto:labprehistory@yandex.ru)

Today in the Northern Caucasus there are known 9 Middle Paleolithic sites containing 29 layers with Micoquian industries. They are dated from late MIS 5 through late MIS 3. Similar industries were earlier defined as East-European Micoquian (Bosinski, 1967; Gabori, 1976) or East-European Mousterian (Praslov, 1984).

Presence of bifacial tools of certain types is the main feature that characterizes the Micoquian industries of

Northern-Western Caucasus and distinguishes them from other Mousterian industries in the Caucasus. These bifacial tools include small broad triangular handaxes (Breit dreieckige Faustkeilblätter), laurel leaf-like projectile points, and various bifacial and partly bifacial convergent tools and side-scrapers or knives (closed to Bocksteinmesser, Prondnikmesser, Wolgogradmesser types) (Bosinski, 1967).

The Micoquian assemblages are wide spread in the Eastern Europe, from the Volga River in the east to the Northern Ural Mountains in the north, and the Prut River in the west. Within this area, Crimean Peninsula is the region, where the largest number of Micoquian assemblages is known. The most striking feature of these industries is the common presence of a numerous and diverse group of bifacial scrapers and knives. Since works of Kolosov (1986), researchers pointed to a close proximity of these tools to Central European types, such as Bocksteinmesser, Prondnikmesser and Klausenische, although they always stressed that typical tools of these types are individual in the Crimean Micoquian. The Crimean researchers classified bifacial knives based on their forms, distinguishing triangular, trapezoidal, segment-like and other types (Chabay, 2004; Chabay et al., 2008).

In most regions, where the Micoquian industries are known, including Western, Central (Burdukiewicz, 2000), and Eastern Europe, and North-Western Caucasus, it is noted a high level of variability among bifacial knives. Researchers often suggest that each bifacial tool concept is correlated with various methods of production, resulting in large degrees of morphological variation (Ruebens, 2013). The application of a morphologic-technological analysis for the study of variability in bifacial scrapers-knives in the Northwest Caucasian industries suggests that the variability of the tool's forms and details of their design may be resulted from several factors, including situational application of specific technological methods and selective reduction. On the contrary, the similarity of many types of bifacial knives within the entire distribution area of Micoquian industries, noted above, suggests that not single, but close technologies of Micoquian bifacial scrapers-knives were used.

One of the most significant artefacts of the Middle Palaeolithic toolkit is the bifacial backed knife. Its wide morphological variability allows us to distinguish a lot of subtypes that are, in specific cases, related to the both regional and chronological groups (Bockstein, Klausenische, Wylotne, Ciemna etc.). These groups are defined mostly within the geographic area of Germany and Poland, where bifacial backed knives are relatively abundant and their stylistic pattern is well preserved.

A different situation prevails in Moravia or Slovakia. Many collections contain pieces that fulfil the definition of such a type – a tool shape formed by reduction of both surfaces, deliberately formed knife tip, use of natural or artificial backing that is situated in front of the working (cutting) edge, which is primarily formed in a bifacial manner. There are also important differences. Preserved pieces are often small, sometimes microlithic, the Prondnik para-burin scar is often missing and the working edge is rejuvenated using unifacial retouch. A typical feature of both Moravian and Slovakian bifacial backed knives is their high metrical and morphological variability and it is for this reason that we are not able to connect them to any group mentioned above.

The study is based on the both techno-typological and raw material analyses of several Middle Palaeolithic sites in Moravia (K?lna Cave, Moravský Krumlov IV, and Šipka Cave) and Slovakia (Bojnice I and Bojnice III). These new analysed assemblages are compared with sites in Poland, Hungary or Germany where Neanderthals should adapt to different conditions. Interpretive problems concerning the classification of bifacial backed knives will be discussed in this presentation by focusing on the reduction sequence in relation to the stylistic pattern (mental template) of such tools.

The author will propose the theory that both types of backed knife – the well preserved pieces from Germany and Poland and the very reduced items from Moravia and Slovakia – belong to the same techno-complex (called Micoquian, Prondikian, or *Keilmessergruppe*) which is divisible only in distinct regions. It is also argued that the variability of artefacts reflects the availability of different raw materials (quality of raw material and distance to the outcrops) and/or different levels of reduction (taphonomy of individual pieces).

ORAL

## 8. BIFACIAL BACKED KNIVES IN THE MIDDLE PALAEOLITHIC - INTERPRETIVE PROBLEMS OF VARIABILITY

Neruda, Petr - (Moravské zemské muzeum) pneruda@mzm.cz

ORAL

## 9. THE BÁBONYIAN AND ITS POSSIBLE RELATION TO INDUSTRIE OF LAYER 7C

Ringer, Árpád - (University of Miskolc) [bolringa@uni-miskolc.hu](mailto:bolringa@uni-miskolc.hu)

The Bábonyian industry was discussed by the present author on the basis of the finds from five open sites in north-eastern Hungary in a study published in 1983. These sites are located on the eastern slopes of the Bükk Mountains, near the towns of Sajóbáony and Miskolc, and near the settlement of Mályi. The techno-typological features of the Micoquian-like leaf-shaped tools dated to the Eemian interglacial show many similarities with bifacial backed knives (*Keilmessergruppen*).

The paper is made up of two parts:

- The first offers an overview of earlier research on the Bábonyian, of the new studies on its chronology and of the raw materials used by this industry, as well as of the industry's technological and typological traits.

-The second part is devoted to a comparison between the lithic artefacts from the Miskolc–Kánás-tető site and the analogous artefacts from Layer 7a of the Kulna Cave in Moravia.

We are in opinion that the Bábonyian is a Middle Paleolithic special industry, characterised by leaf shaped tools and Keilmessers. The chronological relation between the tool kit of Kánás-tető and the lithic artefacts from Layer 7a of the Kulna Cave is possible, around 60-70 Kyr BP.

ORAL

## 10. A TECHNO-TYOLOGICAL VARIABILITY OF BIFACIAL LEAF POINTS IN THE MIDDLE PALAEO-LITHIC ASSEMBLAGES IN THE EASTERN EUROPE AND CAUCASUS

Doronichev, Vladimir - (Laboratory of Prehistory) [labprehistory@yandex.ru](mailto:labprehistory@yandex.ru)

In the territory from the Carpathian to the Caucasus, there are known numerous finds of bifacial leaf points. They are often found in reworked contexts or in surface locations, sometimes yielding large lithic assemblages and sometimes containing finds of Late Acheulean handaxes, and differently defined by researchers as Late

Acheulean or early Middle Palaeolithic. A few late Middle Pleistocene stratified sites, which are dated to MIS 7 and MIS 6 and yield in situ assemblages comprising true leaf points or foliates with double-convex bifacial finishing, document that the appearance of this technology marks the transition from the Lower to Middle Paleolithic in this vast region. In the region, the earliest in situ finds of leaf points are documented in assemblages from layers Vb, Va, and V at Korolevo 1, dated by TL date of  $220 \pm 35$  ka, and paleomagnetic and pollen data to MIS 7.

These assemblages contain elongated and narrow bifaces (or fragments of such bifaces) with double-convex cross-sections, identified as leaf point pre-forms, and elongated leaf points with pointed or narrow oval-shaped bases and double-convex bifacial retouch, often supplementing with tools (scrapers and points) with plane-convex bifacial retouch. These tool sets are associated with non-laminar technique, indicating by the presence of cores with recurrent flaking (identified as proto-prismatic or Levallois), and insignificant percents of laminar (Ilam=4-9) and Levallois blanks (IL=2-7, up to 15 in Korolevo 1/5b).

Although in Eastern Europe, the leaf point assemblages that present the early Middle Paleolithic in the region are not yet associated with hominin fossils, an early leaf point industry from Ehringsdorf (Germany), which has a U/Th date of  $243 \pm 6$  ka and is dated to MIS 7, is associated with the Ehringsdorf skull presenting the earliest unquestionable fossil of typical *H. neanderthalensis* in Europe. In the Caucasus, the only hominin fossils associated with this industry type are two incisors from layers 6 and 5b in Matuzka Cave, both having a shovel-like shape typical for Neanderthals.

In the Northwestern Caucasus and Eastern Europe, the technology of bifacial foliates with double-convex cross-sections continues to exist, although ceases to be the dominant with the distribution of later Middle Paleolithic industries, which are characterized mostly by leaf-shaped points, scrapers and asymmetrical knives with plane-convex bifacial retouch, and which most of researchers define as Eastern Micoquian. These assemblages are associated with numerous fossils of classic European Neanderthals. In the region, the Eastern Micoquian assemblages are first documented during early MIS 5, and they continue to exist until the end of Middle Palaeolithic at about 40 ka ago. As a consequence of such temporal trend in the leaf point technology one can suggest that the Eastern Micoquian presents an industry type that developed during early MIS 5 (apparently, synchronously with the Keilmesser group in Central Europe)

from the early Middle Palaeolithic assemblages with double-convex bifacial retouched leaf points. The available hominin fossils indicate that the leaf point industry appears to represent the initial stage of early Middle Palaeolithic Neanderthal occupation of the Eastern Europe and Caucasus.

ORAL

### 11. BIFACES AND LEAF-POINTS OF EASTERN FRANCE : WICH PART AND ROLE OF THE RAW MATERIAL ?

Lamotte, Agnès – (Université Lille 1) [agnes.lamotte@univ-lille1.fr](mailto:agnes.lamotte@univ-lille1.fr)

Galtier, Frédéric (Ass.Sauv.Patrim.Haute-Saone)

Willemann, Georges (Ass.Sauv.Patrim.Haute-Saone)

In Haute-Saône departure, the study of surface collections and of few rare preserved stratigraphy sites show that the bifacial phenomena takes part of the middle palaeolithic until his passage to the upper palaeolithic. In this region, the raw material is very attractive by his diversity and disponibility. In this part of the region of 125 km by 75 km, we can find many geological formations from metamorphic, volcanic to sedimentary rocks rich in silicious formations (Trias, Jurassique, Cretace, Oligocène) but also non-silicious blank (terraces context, fluvio-glacial context). Rich of this large choice, men were strolling and working a relationship between the realization of tool depending on the raw material. Five great sedimentary complexes gave them around 16 kinds of flint, chert, quartz, quartzites, sandstone knapped since the beginning of Palaeolithic. Then, seven of them have been choosen and affectionnated for bifaces shaping, and for two of them only, leaf-point shaping. So even if knappers are strong of adaptation toward rognon morphology, in the case of leaf-points, a clear selection has been made in direction of flint plaque, ovalair and biconvex rognons and flake blanks.

ORAL

### 12. MIS-3 ASSEMBLAGES WITH ASYMMETRICAL KNIVES FROM POLAND: AN EXAMPLE OF LATE MICOQUIAN/KEILMESSERGRUPPE TRADITION.

Urbanowski, Mikołaj - (Szczecin University, Institute of History, Archaeological Department) [m.urbanowski@univ.szczecin.pl](mailto:m.urbanowski@univ.szczecin.pl)

Several cave sites were excavated during the last decades in the northern part of Polish Jura. The caves were excavated during the careful and slow field works, supported by multidisciplinary studies focused on palaeoenvironmental reconstruction and extensive absolute dating. The results of such work changed the existing vision of the ending part of the Middle Paleolithic in this part of Europe.

The Stajnia Cave (N 50° 36'58,28", E 19° 29'04,24"), where the excavation conducted by the author started in 2006 yielded a very rich assemblage of flint artefacts from the stratigraphic complex D, dated stratigraphically, palaeontologically and absolutely to the early and middle part of the MIS-3 period. The end of deposition of the youngest D1 unit is located about 45 ka BP. The assemblage from D1 unit represent a typically Middle Palaeolithic technology containing the discoidal and Levallois methods of debitage, as well as clear traces of extensive production of cutting tools which may be classified as the asymmetrical knives or scrapers, as only a part of them is fully bifacial. About 7000 thousands of the flint pieces, coming from a relatively small excavation area were analysed technologically and metrically. Selected part of the artefacts was also subjected to use-wear analysis. Among the artefacts, numerous animal bones were found, many of them cutmarked. The Middle Palaeolithic character of the site may be also attested by the human teeth discovered in the rear part of the cave, which were attributed to Homo neanderthalensis.

The result of the analysis, combined with the other archaeological finds from D1 unit, as like the traces of sophisticated boneworking and structuring of the space enriches the picture of the very late Neanderthal communities from Central Europe. From the techno – stylistic point of view, the flint industry present in stratigraphic complex D of Stajnia Cave may be connected with a very late part of the Micoquian (Keilmessergruppe) tradition, however some similarities to other LMP traditions as Quina and Bohunician may be observed. Interestingly, no traces of the elements typical for the "transitional" Central European industries as leaf points or Upper Palaeolithic elements were traced. Such pattern is repeated in the other sites of Polish Jura, including Biżnik Cave and Komarowa Cave, which suggests that very late Middle Palaeolithic industries in this region may be more diverse than we expected.



ORAL

**13. THE BIFACIAL REDUCTION STRATEGY DURING THE EARLY PHASE OF EUP IN THE MORAVIA (CZECH REPUBLIC).**

*Nerudová, Zdeňka - (Anthropos Institute, Moravian Museum Brno) znerudova@mzm.cz*

Upon the refittings of bifacial artefacts comes from Szeletian workshop site we can describe a specific mode of bifacial reduction (Nerudová 2009; Neruda – Nerudová 2005; Nerudová 2011). This method corresponds to the procedure reminiscent of the Micoquian technique of lithic reduction: using the technique of flaking, a back is formed on the artefact (or a natural back is used), from which thinning blows are delivered to both faces as if from a core platform. This procedure enables the reduction of the artefact's thickness without any significant loss in length. To the purpose massive first blanks, natural pebble fragments, or flat blocks were used. The incomplete pre-forms of such prepared bifacial artefacts are morphologically and technologically identical to Micoquian backed knives. The final artefact – a thin and elaborate leaf point – does not emerge until the above-mentioned back is reduced.

The same mode of bifacial reduction have been detected on the numerous Szeletian sites. On the other hand we can observe high morphological variability of different bifacial tools. The technological similarity of bifacial tools production and their variability have been resolved by statistical and GIS studies.

The seemingly (?) high morphological variability of points is given by several factors: by the raw material used, by the tool's practical purpose, by the settlement's purpose and by distance from the raw material sources. Only four out of more than hundred known Moravian Szeletian sites have so far been examined *in situ* (Vedrovice V; Valoch et al. 1993 and Moravský Krumlov IV; Neruda, Nerudová 2010) which, on the basis of radiometric dates, are being connected with Lower Szeletian. In these assemblages we can observe an evident morphological and technological similarity between Szeletian and Micoquian (Neruda - Nerudová 2005; Nerudová 2009). The similarity may be given not only by similar strategy of utilising raw materials or by a similar natural environment; identical technology in assemblages which can be considered parallel, basing on radiometric dates (Micoquian and Lower Szeletian; Neruda - Nerudová 2013), may suggest a common maker.

The possibility of cultural determination based on morphological analysis of bifacial tools in the Moravian Szeletian is considerably complicated by their high morphological variability, even though morphological analysis has shown that it is mainly the A-shapes (willow leaf-shaped), B-shapes (partly leaf-shaped) and E-shapes (almost leaf-shaped) which are dominant. It has come to light that morphological variability increases at settlement localities where it is associated with the real purpose of tools used for various activities, such as cutting, scraping or drilling.

GIS-analysis has proved that points, which were found at longer distances from the raw material deposit, diminish in size (Nerudová et al. 2011). Larger points are recorded in those Szeletian assemblages, which are considered to be younger.

ORAL

**14. MOBILITÉ ET STATUT DES OUTILS BIFACIAUX AU PALÉOLITHIQUE MOYEN RÉCENT DANS LE SUD-OUEST DE LA FRANCE**

*Brenet, Michel - (INRAP) michel.brenet@inrap.fr*  
*Bourguignon, Laurence - (INRAP) laurence.bourguignon@inrap.fr*  
*Chadelle, Jean Pierre - (SAD) jp.chadelle@dordogne.fr*  
*Claud, Émilie - (INRAP) emilie.claud@inrap.fr*  
*Colonge, David - (INRAP) david.colonge@inrap.fr*  
*Deschamps, Marianne - (TRACES) Deschamps@univ-tlse2.fr*  
*Folgado, Mila - (INRAP) milagros.folgado-lopez@inrap.fr*  
*Brad, Gravina - (PACEA) gravina.brad@gmail.com*  
*Ihuel, Ewen - (SAD) E.ihuel@dordogne.fr*  
*Mourre, Vincent - (INRAP) vincent.mourre@inrap.fr*  
*Turq, Alain - (MNP) alain.turq@culture.gouv.fr*

While Late Middle Palaeolithic industries are characterised by a well-documented diversity of stone tool types and blank production methods (Quina, Discoid, Levallois, Clactonian, etc.), the latter of which can at times be exclusively represented in certain assemblages, the bifacial tool component sometimes portrays clear similarities in use and manufacture method. Beyond sharing both comparable volumetric structures and arrangement of active and or prehensile area, the recurrence in several assemblages of specific groups of bifacial tools used for either wood-working or butchery is particularly striking. Here we address several techno-economic and cognitive aspects of biface production and use combined with a consideration of their context. Is the same degree of variability in function and manufacture method equally vis-

ible in the retouched tool component? What scales of mobility or technical use-lives do these different bifacial tools portray? Do certain highly elaborate flake tools also reflect equally complex behaviours? How to interpret the presence of carefully manufactured pieces in exotic raw materials alongside others made in local varieties that are hardly reduced but nevertheless equally functional? Finally, which components may have carried a symbolic value or shed light on technical abilities or functional objectives evident in the conception, elaboration, use, and ultimate fate of these bifacial pieces.

Several recently analysed assemblages with a relatively significant bifacial component from the Dordogne and Atlantic Pyrenees show certain similarities or important differences. In characterising the coexistence of flake production and bifacial shaping, whether accompanied by the ramification of associated reduction sequences or not, we attempt to reveal to what extent and in which ways certain bifacial tools stand out. When combined with technological and cognitive considerations. This approach provides new insights on an important behavioural facet of Neanderthal groups who occupied the Aquitaine Basin after the Last Interglacial.

ORAL

### 15. BIFACIALLY BACKED KNIVES (KEILMESSER): TOWARDS A QUALITATIVE UNDERSTANDING OF MIDDLE PALAEOLITHIC TOOL CONCEPTS.

*Olaf Jöris - (MONREPOS Archaeological Research Centre and Museum for Human Behavioural Evolution Schloss Monrepos, 56567 Neuwied, Germany) joeris@rgzm.de*

Bifacially backed knives (*Keilmesser*) are a tool type that occurs occasionally in both the late Lower and early Middle Palaeolithic contexts. However, during the Late Middle Palaeolithic of Central Europe they appear far more frequently. Despite their variability in shape and size, Late Middle Palaeolithic *Keilmesser* appear standardized at a very high level. This standardisation is, however, only poorly described by classic analytical methods with major reference to purely metrical proxies that relate to shape and size. As an alternative to these methods, qualitative approaches such as refits and flake-scar analyses can be systematically applied. Both methods provide valuable data to be analysed allowing for a detailed reconstruction of the life-histories of the artefacts studied. It is the reconstructed artefact life-histories that allow for a more profound evaluation of the degree of tool variability in terms of morphological variation. Thus, quali-

tative data on tool variability allows for discrimination between variation due to individual artefact life-histories on the one hand and overarching tool concepts, deeply implemented within hominin groups on the other.

ORAL

### 16. NEW MICOQUIAN WORKSHOP FROM OPEN-AIR SITE IN SW POLAND

*Wiśniewski, Andrzej - (University of Wrocław, Institute of Archaeology) andrzej.wisniewski@uni.wroc.pl*

Bifacial tools of the Micoquian culture vary regionally and chronologically. According to S.W. Krukowski (1939-1948) who was a pioneer in the field of research on Micoquian tools in Central Europe: "Within the range of the main attributes distinguished in industries the Prdniks (knife) are very polymorphic". This diversity results from imposed mental patterns, access to raw material as well as range and type of activities and mobility systems of humans.

It is well known that determination of the origin of techno-typological diversity requires data on the entire life-cycle of the tools ranging from the selection of raw materials to the shaping and reworking of tools. However, most bifacial finds, are represented by highly reduced tools due to their intensive use. In these cases a technological analysis is constrained. It is not surprising that the more reliable data on sequence of technological operations provide places where manufacture of bifacial tools took place and where by-products and failed forms of tools have been abandoned.

Lately a site with large number of artifacts related to the production of bifaces has been recognized at the open-air site Pietraszyn 49a located in the foreland of the Moravian Gate in Upper Silesia (Poland). This area has long been known for Micoquian finds but until recently only small collections (>100 spec.) or single implements have been recorded in this region. This paper presents preliminary results of technological analysis of data obtained from the excavation at the site Pietraszyn 49a in 2012 and 2013.

The site is situated in the valley of Troja river in the Głubczyce Upland. The age of site remains an open question. According to the preliminary geological study, the chronology of the site Pietraszyn 49a corresponds to a lower or middle part of Weichselian, however, its older age cannot be excluded.

The site Pietraszyn 49a provided over three thousand of stone artefacts. The density of artefacts is very high (above 360 specimens per 1m<sup>2</sup>).

It seems that the production of bifacial tools, within which knives and hand axes dominates, was based on selected chunks or nodules or even flakes made of erratic flints. Most of the specimens are virtually represented by abandoned pieces due to knapping mistakes or fractures of raw material. It is worth mentioning that technological study of bifacial tools shows a kind of compromise between the shape of raw material and "Micoquian patterns". It seems that single bifacial tools with traces of strong reduction were brought from outside the site. Presence of single expedient tools like unifacial side-scrapers was also confirmed.

Summarizing, the new data from Pietraszyn 49a bring a light to the recognition of the first steps in the production of Micoquian bifacial tools, which are generally unavailable to us and poorly recognized. New observations allow determining methods and techniques used during bifacial production.

ORAL

### 17. SPATIO-TEMPORAL VARIATION IN LATE MIDDLE PALAEO-LITHIC NEANDERTHAL BEHAVIOUR: BOUT COUPÉ HANDAXES AS A CASE STUDY

*Ruebens, Karen - (MONREPOS Archaeological Research Centre and Museum for Human Behavioural Evolution, Schloss Monrepos, 56567 Neuwied, Germany) karen.ruebens@eva.mpg.de*

*Wragg Sykes, Rebecca M - (PACEA, UMR 5199, Université Bordeaux 1, Bâtiment B18, Avenue des Facultés, Talence CEDEX 33405, France) rebecca.wraggsykes@u-bordeaux1.fr*

Recent broad-scale comparative studies of Neanderthal lithic assemblages have contrasted previous views of the Middle Palaeolithic as a period of stasis. Throughout the Middle Palaeolithic, ca. 300,000-35,000 years ago, distinct changes can now be observed in the Neanderthal behavioural repertoire; this includes trends that are spatially and temporally patterned. Such material culture diversity is especially apparent in the late Middle Palaeolithic (MIS 5d-3; ca. 115,000 to 35,000 BP) and is most obviously expressed in the archaeological record through differing bifacial tool types.

This paper examines one aspect of this late Middle Palaeolithic bifacial diversity by providing a much needed, up-

to-date consideration of the *bout coupé* or flat-butted cordate handaxes, widely regarded as generally restricted to MIS-3 Britain. First, their relationship to the general reoccurrence of handaxes in late Middle Palaeolithic Western Europe is discussed, including comparisons with the Mousterian of Acheulean Tradition (MTA). Primary data focusing on metrics, technology and typology was collected and analysed for 1,122 late Middle Palaeolithic handaxes from sites in Britain, southwestern, western and northern France, Belgium and the Netherlands. Secondly this *bout coupé* phenomenon is presented as a case study to explore behavioural implications of such spatio-temporal variation in lithic material culture. Different explanatory factors, such as raw material, site function, tool function, reduction/resharpening and social learning are explored, alongside potential links to Neanderthal population dynamics.

It is concluded that the *bout coupé* form is not merely a point within a continuum of bifacial variability, but its form is distinct and sometimes maintained throughout the functional life of these handaxes. It illustrates regionalised socio-cultural behaviour implying specific lines of social transmission had developed among late Neanderthals.

# A20

## The intellectual and spiritual expressions of non-literate peoples

Commission on The intellectual and spiritual expressions of non-literate peoples  
(Organiser: Emmanuel Anati)

Tuesday 2nd(9:00-13:30 to 14:30-19:30)  
Thursday 4th (9:00-13:30 to 14:30-19:30)  
Friday 5th (9:00-13:30)

Meeting Room Facultad Derecho Room "Aula Romeros"



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XVII Congreso Mundial de UISPP

"You can find the detailed abstracts of this session in the other two PDF files in your pen drive.

The EXPRESSION revue (Num. 4 & Num. 5) is a bi-monthly e-letter of the commission on intellectual and spiritual expressions of non-literate peoples. UISPP-CISENP was founded in 2006 as an international scientific commission of 5e International Union of Prehistoric and Protohistoric Sciences and Prof. Emmanuel Anati is its President.

The two issues of the EXPRESSION revue present the final group of abstracts of participants presenting on September 1-7 at the XVII UISPP World Congress to be held in Burgos (Spain) in the A20 session".

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ORAL

### 1. PRIMITIVE RELIGIOUS INFORMATION EMBODIED IN HUMAN-FACE IMAGES OF ROCK ART ON ZHUOZISHAN MOUNTAIN, WUHAI, INNER MONGOLIA

An, Li (Research Fellow with Inner Mongolia Museum, China) [anlinmg@yahoo.com.cn](mailto:anlinmg@yahoo.com.cn)

Wu, Junsheng (Head and Associate Research Fellow of Wuhai Museum)

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ORAL

### 2. DECODING PREHISTORIC ART: THE MESSAGES BEHIND THE IMAGES

Anati, Emmanuel (Italy) [emmanuel.anati@gmail.com](mailto:emmanuel.anati@gmail.com)

Fradkin, Ariela (Italy) [ariela.fradkin@gmail.com](mailto:ariela.fradkin@gmail.com)

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ORAL

### 3. PRAIRIE ECONOMY DEVELOPMENT SEEN FROM ROCK ART IN THE WEST RANGE OF LANGSHAN MOUNTAIN, INNER MONGOLIA

Aoyungerile (Associate Research Fellow with Alxa Museum, China)

An, Ying (Associate Research Fellow with Art Research Institute of Inner Mongolia, China) [andeerying@126.com](mailto:andeerying@126.com)

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ORAL

### 4. THE ROCK ART OF SARACACHI RIVER BASIN: THE EL ARCO AND BLANCA DE LA PULSERA CAVES, SONORA (MEXICO)

Rubio Mora, Albert - (Seminari d'Estudis i Recerques Pre-

històriques (SERP), Universidad de Barcelona, (UB), Spain) [albert.rubio.mora@gmail.com](mailto:albert.rubio.mora@gmail.com)

Viñas Vallverdú, Ramón - (Institut Català de Paleoeologia Humana i Evolució Social (IPHES), Universidad Rovira i Virgili (URV) Tarragona, Spain) [rvinas@iphes.cat](mailto:rvinas@iphes.cat)

Quijada López, Cesar Armando - (Instituto Nacional de Antropología e Historia (INAH), México) [cquijada26@gmail.com](mailto:cquijada26@gmail.com)

Arroyo Cabrales, Joaquin - (Instituto Nacional de Antropología e Historia (INAH) México) [arromatu@hotmail.com](mailto:arromatu@hotmail.com)

Menéndez Iglesias, Beatriz - (PhD Candidate in "Cuaternario y Prehistoria", Universitat Rovira i Virgili (URV) Tarragona, Spain. Institut Català de Paleoeologia Humana i Evolució Social (IPHES), Tarragona, Spain.) [beamenendeziglesias@gmail.com](mailto:beamenendeziglesias@gmail.com)

Iriarte Cela, Mercedes - (Universidad Nacional de Educación a Distancia, (UNED), Madrid, Spain) [ahernanz@ccia.uned.es](mailto:ahernanz@ccia.uned.es)

Hernanz Gismero, Antonio - (Universidad Nacional de Educación a Distancia (UNED), Madrid, Spain)

[meririarte@madrid.uned.es](mailto:meririarte@madrid.uned.es)

Santos da Rosa, Neemias - (PhD Candidate in "Cuaternario y Prehistoria", Universitat Rovira i Virgili (URV), Tarragona, Spain.)

[neemias\\_of@hotmail.com](mailto:neemias_of@hotmail.com)

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ORAL

### 5. CANADIAN SHIELD ROCK ART AND ITS SPIRITUAL DIMENSION: AN INFORMED APPROACH TO THE TANGIBLE AND INTANGIBLE DIMENSIONS OF ROCK ART SITES IN THE CANADIAN SHIELD

Arsenault, Daniel (Director of the Centre interuniversitaire d'Études sur les Lettres, les Arts et les Traditions (CÉLAT à l'Université du Québec à Montréal (UQAM), Montréal, Québec, Canada) [arsenault.daniel@uqam.ca](mailto:arsenault.daniel@uqam.ca)

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ORAL

### 6. ARTS AND CULTURES ARE A JOURNEY IN THE WORLD OF MANKIND

Berriet, Margalit (President of the Association Mémoire de L'Avenir. France) [margalit.berriet@gmail.com](mailto:margalit.berriet@gmail.com)

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ORAL

### 7. GRID PATTERNS IN NW IBERIA ROCK ART. ICONOGRAPHY, CONTEXTS AND INTERPRETATIONS

Bettencourt, Ana M. S. - (University of Minho) [bettencourt.ana@gmail.com](mailto:bettencourt.ana@gmail.com)

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ORAL

### 8. SEXUAL HUMAN REPRESENTATIONS OF THE

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**PAINTINGS OF SERRA DA CAPIVARA, BRAZIL: RELATIONS IN ACTION, NARRATIVE RELATIONS"**

*Binant, Pascale (CNRS / UMR 7041 ArScAn / AnTET Anthropologie des Techniques, des Espaces et des Territoires au Pliocène et Pléistocène, Prigonrieux, France) binantpascale@gmail.com*

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ORAL

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**9. CELESTIAL PATTERNS AND THE DAWN OF COSMOLOGICAL KNOWLEDGE**

*Bouissac, Paul (University of Toronto, Victoria College, Canada) paul.bouissac@utoronto.ca*

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ORAL

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**10. THE STONEHENGE SACRED LANDSCAPE, PATHWAY TO THE STARS**

*Burley, Paul D. (Consulting engineer and geologist, Blandford Forum, Dorset, UK) pdburley@gmail.com*

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ORAL

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**11. RESEARCH AND STUDY ON THE GUIZHOU ROCK ART HERITAGE**

*Cao, Bo (Guizhou Institute of Archaeology, China) 2314405746@qq.com*

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A20 The intellectual and spiritual expressions of non-literate peoples

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**12. PRELITERATE ART IN INDIA : A SOURCE OF INDIGENOUS KNOWLEDGE, ETHNO-HISTORY AND COLLECTIVE WISDOM**

*Chakraverty, Somnath (Seniormost Professor. Department of Anthropology. BEC. University of Calcutta & Project Director of Rock Art Research; The Asiatic Society; Kolkata; India) somraja2008@gmail.com*

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**13. ARCHAEOLOGY, ROCK ART, ARCHAEOACOUSTICS AND NEUROSCIENCE: WHAT KIND OF RELATION"**

*Coimbra, Fernando - (Instituto terra e memória) coimbra.rock-art@yahoo.com*

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**14. HERALDING THE SUN**

*Dubal, Léo (Virtual laboratory for archeometry, Soulages, France) abuobab@gmail.com*

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**15. THE TREASURES OF THE THIRD MILLENNIUM FROM THE RUSSIAN CITY OF ZVENIGOROD**

*Faradzhev, Arsen (Professor of Prehistory, Moscow, Russia) arsen.faradzhev@yandex.ru*

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## 16. EARTH AND SUBTERRANEITY IN EARLY SUMERIAN SOURCES

*Ghilotti, Francesco (Italy) francesco.ghilotti3@hotmail.it*

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## 17. RESEARCH ON FILE CONSTRUCTION SYSTEM OF ROCK ART

*Qiao, Hua (Director of Rock Art Research Center, Ningxia Province, China) nxyanhua605@163.com, Gong, Li Bin (China), Liu, Hui (China)*

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## 18. SURVEY OF THE STATUS AND PROTECTION STRATEGY FOR THE ANCIENT ROCK PAINTINGS IN GUIZHOU

*Hao Li (Guizhou Nationalities University, Guiyang, Guizhou) Lihao1976@126.com, He, Biao (Guizhou Nationalities University, Guiyang, Guizhou)*

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*Hochroth, Lysa (USA/France) l.hochroth@gmail.com*

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*Hu, Pengcheng (Researcher of the GuangXi Province Nationalities Museum, China) 1071669747@qq.com*

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## 21. EARTH AND SUBTERRANEITY IN EARLY SUMERIAN SOURCES

*Jiixin Zhang (Rock Art Association of China), Bo Xiao (), Zhao-hui Wang (Foreign Language college, Minzu University of China)*

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## 22. CHANGING INTELLECTUAL AND SPIRITUAL EXPRESSIONS OF THE NOMADIC BIRHOR IN JHARKHAND

*Imam, Bulu (Director, Sanskriti Centre Director, Dipugarha, Jharkhand, India) buluimam@gmail.com*

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## 23. RESEARCH ON THE CLASSIFICATION AND STAGING OF THE ROCK ART ON LUSEN MOUNTAIN IN QINGHAI

*Shi, Zeming (Master of Rock Art Research Association of China, Minzu University of China) sigumushe@hotmail.com, Jin, Yanqing (Doctor of Rock Art Research Association of China, Minzu University of China) lhlandjyq@163.com*

ORAL

## 24. PREHISTORIC ROCK ART, THE INFORMATION ERA OF HUMANS WHICH HAS BEEN OVERLOOKED

*Jin, Yanqing (Doctor of Rock Art Research Association of China, Minzu University of China) lhlandjyq@163.com*

*Xiaoxia, Zhang (Rock Art Research Association of China, Minzu University of China) zhangxiaoxia423@sina.com*

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## 25. SOME ASPECTS OF THE CONTEMPORARY USE OF ANCIENT SYMBOLS

*Krasniqi, Shemsi (University of Pristina, Kosovo) shemsi.krasniqi@gmail.com*

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## 26. ROCK PAINTINGS IN SOUTHWEST CHINA, FOCUSING ON THE COFFIN PAINTINGS IN THE ROCK CAVE AT XIANREN BRIDGE, HUIHUI COUNTY, GUIZHOU PROVINCE

*Li, Fei (Guizhou Provincial Institute of Archaeology, Department of Archeology, Sichuan University, China) 975822019@qq.com*

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### 27. RESEARCH ON THE DEVELOPMENT AND UTILIZATION OF THE GUIZHOU ANCIENT PETROGRAPHY RESOURCE

Wu, Xiaoping (Professor and Doctoral Supervisor of Guizhou Nationalities University. China)

Li, Hao (PhD, Associate Professor at Guizhou Nationalities University. China) Lihao1976@126.com

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### 28. THE CHALLENGE OF RAISING THE DEIFIED ANCESTOR. REFLECTIONS ON THE CATALAN MEGALITHIC MENHIR STATUES

López, Joan B. (Grup d'Investigació Prehistòrica, Universitat de Lleida) joanlopez@historia.udl.cat

Martínez, Pablo (CIPAG – Col·lectiu per la investigació de la prehistòria i arqueologia de Garraf. Departament de Prehistòria, Història Antiga i Arqueologia. Universitat de Barcelona) pablmartrod@gmail.com

Moya, Andreu (Arqueólogo de Itirta Arqueologia SL. Miembro del Grup d'Investigació Prehistòrica de la Universitat de Lleida) andreumoya@gmail.com

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### 29. IMAGE CLASSIFICATION AND THE SYMBOLIC STRUCTURE OF THE ROCK ART AT THE ZUOJIANG RIVER, GUANGXI

Zhang, Yasha (Rock Art Research Association of China, Minzu University of China, Beijing) yashazhang0502@163.com

Lu, Xiaohong (Rock Art Research Association of China, Minzu University of China, Beijing)

Wang, Mingshui (Rock Art Research Association of China, Minzu University of China) 447017173@qq.com

ORAL

### 30. MANIPULATION TACTICS: A CULTURAL INTERPRETATION OF ROCK ART IMAGES MASSED IN SOUTHWEST CHINA

Wan, Liangfan (Guizhou University. China) wangliangfan@sina.com

Luo, Xiaoming (Guizhou University. China)

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### 31. LIFESTYLE OF HUMAN GROUPS DURING PALAEOLITHIC AT HAR KARKOM

Maillard, Federico (Centro internazionale di Studi Preistorici, Lugano, Switzerland) ala.archeo@libero.it

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### 32. ASPECTS OF THE NATURE AND PURPOSE OF SPECIFIC SYMBOLS AND IMAGES IN THE NON-LITERATE WORLD OF NEOLITHIC AND BRONZE AGE BRITAIN AND IRELAND

Meaden, G. Terence - (Oxford University) terencemeaden01@gmail.com

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### 33. THE SPECIAL CHARACTERISTICS OF THE ZHENFENG ROCK ART IN GUIZHOU

Mu, Xiaomei (Arts Department, Zunyi Normal College, Zunyi, School of Ethnology and Sociology, Minzu University of China, Beijing)

Zhang, Lina (Arts Department, Zunyi Normal College, Zunyi)

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### 34. SEVERAL UNDERSTANDINGS ON THE CAVE PAINTINGS ON THE TURTLE STONE IN ANSHAN

Li, Gang (Cultural Relic Management Institute of Diqing, China) dpwwbh@sohu.com

Ni, Xifeng (China) 269458323@qq.com

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### 35. SYMBOLS AS PERSONA IN THE DAWN OF FOOD PRODUCTION IN THE ALTO RIBATEJO, PORTUGAL

Luiz Oosterbeek (Instituto Politécnico de Tomar, Instituto Terra e Memória, Centro de Geociências da UC) loost@ipt.pt

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### 36. LA PRÉHISTOIRE DU PORTRAIT

Otte, Marcel - (Université de Liège) Marcel.Otte@ulg.ac.be



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**37. THE DYNAMICS OF MENTAL MOVEMENTS AS A BASE FOR THE INTELLECTUAL AND SPIRITUAL EXPRESSIONS OF NON LITERATE PEOPLE AND THE ORIGIN OF DEVELOPMENT OF THE HUMAN BEIN**

*Rocchitelli, Andrea (Psychologist and Director of Centro Medico Santa Crescenza, Milano. Italy) rocchiandrea@hotmail.com*

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**38. A NATUFIAN MASK-FACE FIGURINE: AN INSIGHT INTO THE NATURE OF THE SUPERNATURAL BEING**

*Shaham, Dana - (The Hebrew University of Jerusalem) dana.shaham@mail.huji.ac.il*

*Belfer-Cohen, Anna - (The Hebrew University of Jerusalem) belferac@mscc.huji.ac.il*

ORAL

**39. INVESTIGATION AND RESEARCH INTO DAHONGYAN ROCK ART IN ZHENG FENG COUNTY, GUIZHOU PROVINCE**

*Zeming Shi (Master of Rock Art Research Association of China, Minzu University of China), Xiaoxia Zhang (Rock Art Research Association of China, Minzu University of China)*

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**40. FIELD SURVEY AND ANALYSIS OF MASK WORSHIP IN THE XILIAOHE RIVER BASIN**

*Sun, Xiaoyong (PhD, Rock Art Association of China, Associate Professor of Lanzhou University. China), Zhang, Jiabin (Rock Art Association of China)*

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**41. 3D RECONSTRUCTIONS OF THE SCULPTURED EMOTIONS IN THE COPPER AGE EASTERN BALKANS**

*Tsonev, Tsoni (National Institute of Archaeology and Museum, Sofia, Bulgaria) tsts1113@yahoo.com*

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**42. BEGINNING OF NATURAL PHILOSOPHY AND METAPHYSICS IN THE ROCK ARTS OF ARMENIA ORIGIN OF DEVELOPMENT OF THE HUMAN BEIN**

*Vahanyan, Gregor (Armenia) gregor@concourt.am*

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**43. A COMPLEX RESEARCH OF PALEOLITHIC ART IN UKRAINE**

*Vetrov, Viktor (Institute of archaeology of NAS of Ukraine, Lugansk, Ukraine) vet@iteam.net.ua*

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**44. RESEARCH ON FACE ROCK CARVINGS IN NORTHERN CHINA**

*Zhang, Wenjing (Centre for Post-doctoral Studies, Communication University of China) zwj\_faith@163.com*  
*Wang, Xiaokun (School of History, Renmin University of China)*

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**45. PETROGLYPHS OF THE NORTHERN PACIFIC RIM: THE ROCK ART OF THE XILIAOHE RIVER AND THE AMUR RIVER**

*Zhu, Lifeng (Associate Professor of China Women's University, Beijing) zhulifeng@126.com*  
*Wang, Xu (Director of the Management Office of Helan Mountain Rock Art, Yinchuan City, Ningxia) 13995414777@qq.com*

ORAL

**46. DISCUSSION OF REPRODUCTION WORSHIP IN CHINESE ROCK ART**

*Zhang, Jiabin (Rock Art Association of China)*  
*Xiao, Bo (China)*  
*Wang, Zhaohui (Foreign Language college, Minzu University of China) zhaohuiwang2005@hotmail.com*

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#### 47. DISCOVERY AND STUDY OF TWO GROUPS OF WRITING ON THE CLIFF IN THE HONGSHAN CULTURE AREA

Wu, Jiakai (China)

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#### 48. COMMUNICATION AND TRANSFORM: IN-DEPTH REFLECTION OF HELAN MOUNTAIN ROCK ART

Yang, Huiling (Associate researcher, Rock Art Association Center of Ningxia, China) yang.hll@163.com

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#### 49. USING THE MONTAGE TECHNIQUE TO READ VARIOUS CAVE PAINTING SITES ON GUIZHOU PLATEAU

Qian Sheng You (Director of The world heritage projects, Guizhou Province, China) 13885132000@163.com

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#### 50. A COMPLEX RESEARCH OF PALEOLITHIC ART IN UKRAINE

Zhu, Yuan (School of Humanities & Social Science, ECNU, Shanghai) lan324n225@163.co

Yu, Zhuoran (Rock Art Research Association of China, Minzu University of China) zhuoran414@126.com

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#### 51. AGRICULTURAL WORSHIP IN THE ROCK ART OF JIANGJUNYA, LIANYUNGANG CITY, EAST CHINA

Zhang, Jiaxin (Rock Art Association of China)

Huang, Yaqi (College of art, Sanxia University, China) hyq7427@sina.com

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#### 52. AN ANCIENT SACRIFICIAL PLACE: RESEARCH INTO ROCK ART IN XIANJU

Zhu, Houqiu (Wenguang bureau of Xianju county, China) 415512860@qq.com

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#### 53. SIGNIFICANCE OF THE STABILIZATION WORKS WHICH PROTECT THE ROCK ART PAINTING IN NINGMING DISTRICT

Qiuping Zhu (Cultural Relics Management of Ningming District, Guangxi Province, China) ningmingwenwu@163.com

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#### 54. SPIRITUAL LIFE IN NEOLITHIC. ANTHROPO-MORPHIC FIGURINES FROM POLAND

Sobkowiak-Tabaka, Iwona - (Institute of Archaeology and Ethnology Polish Academy of Sciences)

iwona.sobkowiak@iaepan.poznan.pl

Bobrowski, Przemyslaw Institute of Archaeology and Ethnology Polish Academy of Sciences)

przemyslaw.bobrowski@iaepan.poznan.pl

ORAL

#### 55. DEER FIGURE IN TAGUS ROCK ART: IDENTITIES SEEN FROM AN ARCHAEOLOGICAL PERSPECTIVE

Garcês, Sara - (Universidade de Trás-os-Montes e Alto Douro "FCT PhD scholarship; Instituto Terra e Memória; Grupo de Quaternário e Pré-História do Centro de Geociências) saragarcês.rockart@gmail.com

Oosterbeek, Luiz - Instituto Politécnico de Tomar, Estrada da Serra 2300 Tomar; Instituto Terra e Memória (ITM, Mação); Grupo Quaternário e Pré-História do Centro de Geociências (u. ID73 "FCT)) loost@ipt.pt

Almeida, Nelson - (Universidade de Trás-os-Montes e Alto Douro "FCT PhD scholarship; Instituto Terra e Memória; Grupo de Quaternário e Pré-História do Centro de Geociências) nelsonjalmeida@gmail.com

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#### 56. ROCK ART IN VALCAMONICA

Lopes, Cristina - (cenjor) clopes99@gmail.com

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#### 57. THE ANTHROPOMORPHIC FIGURINE OF CAN SADURNÍ CAVE (BEGUES, BARCELONA)

Edo Benaiges, Manuel - (Cipag) medo@telefonica.net

Antolín Tutusaus, Ferrán - ferranantolin@hotmail.com (Cipag. Ipas (Basel Univ))

Martínez Rodríguez, Pablo - (Cipag)  
pablomartrod@gmail.com  
Barrio Bonilla, María Jesús - (Cipag) chs\_bcn@yahoo.es  
Fierro Milà, Elicinia - (Cipag) eli.f.mila@gmail.com  
Castillo Heredia, Trinidad - (Cipag) tricahe@hotmail.com  
Fornell Morillo, Eva - evaf00@yahoo.es (Cipag)  
Prats Ferrando, Georgina - (Cipag) geoprats@gmail.com  
Bardera Soler de Morell, Remei - (Cipag)  
meibardera@yahoo.es  
Castellana Perelló, Concepció - (Cipag) ccastellana@ya.com

ORAL

### 58. DISCOVERY AND PILOT STUDY OF THE JINSHA RIVER CHISELLED ROCK ART IN SHANGRI-LA

Li, Gang (Cultural Relics Control Station of Diqing Tibetan Autonomous Prefecture, Yunnan Province, China) dpwwbh@sohu.com

ORAL

### 59. CARVED FOOTPRINTS AND PREHISTORIC BELIEFS: EXAMPLES OF SYMBOL AND MYTH - PRACTICE AND IDEOLOGY

Bertilsson, Ulf (Swedish Rock Art Research Archives "SHFA University of Gothenburg)

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### 60. A RITUAL SPACE WITH PAINTINGS AND ENGRAVINGS IN THE LA CALERA ROCK ART SET, SONORA, MEXICO

Ramon Viñas Vallverdú - (Institut Català de Paleoecologia Humana i Evolució Social, (IPHES), Universitat Rovira i Virgili (URV), Tarragona, Spain) rupestrologia@yahoo.es  
Rubio Mora, Albert - (Seminari d'Estudis i Recerques Prehistòriques (SERP), Universitat de Barcelona (UB), Spain) albert.rubio.mora@gmail.com  
Quijada López, Cesar Armando - (Instituto Nacional de Antropología e Historia (INAH), México) cquijada26@gmail.com  
Arroyo Cabrales, Joaquín - (Instituto Nacional de Antropología e Historia (INAH), México) arromatu@hotmail.com  
Menéndez Iglesias, Beatriz - (PhD Candidate in Cuaternario y Prehistoria, Universitat Rovira i Virgili (URV), Tarragona, Spain. Institut Català de Paleoecologia Humana i Evolució Social, (IPHES) Tarragona, Spain) beamenendeziglesias@gmail.com  
Santos da Rosa, Neemias - (PhD Candidate in Cuaternario y Prehistoria, Universitat Rovira i Virgili (URV), Tarragona,

Spain) neemias\_of@hotmail.com

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### 61. THE SET OF EL ARROYO DE LAS FLECHAS' ROCK ART ENGRAVINGS: SYMBOLIC ASSOCIATIONS IN THE SIERRA EL ÁLAMO, CABORCA (SONORA, MÉXICO)

Menéndez Iglesias, Beatriz - (PhD Candidate in Cuaternario y Prehistoria, Universitat Rovira i Virgili (URV), Tarragona, Spain. Institut Català de Paleoecologia Humana i Evolució Social, (IPHES) Tarragona, Spain) beamenendeziglesias@gmail.com  
Ramon Viñas Vallverdú - (Institut Català de Paleoecologia Humana i Evolució Social, (IPHES), Universitat Rovira i Virgili (URV), Tarragona, Spain) rupestrologia@yahoo.es  
Benavente Sanvicente, Martha E. - (Área de Prehistoria y Evolución Humana. Instituto de Investigaciones Antropológicas de la Universidad Nacional Autónoma de México (IIA-UNAM) (Mexico) marthabenavente@gmail.com  
Terrazas Mata, Alejandro - (Instituto de Investigaciones Antropológicas de la Universidad Nacional Autónoma de México (IIA-UNAM) (Mexico) tema@unam.mx  
Rubio Mora, Albert - (Seminari d'Estudis i Recerques Prehistòriques (SERP), Universitat de Barcelona (UB), Spain) albert.rubio.mora@gmail.com

POSTER

### 62. HERMENEUTICAL APPROACHES TO THE LEVANTINE ART: THE ARCHAEOLOGY OF TRADITION

Galante Pérez, José Antonio - (Uned) jgalant3p@yahoo.es

# A21a Neanderthals on their own terms: new perspectives for the study of Middle Paleolithic behavior

Commission on Settlement Dynamics of the Middle Paleolithic and Middle Stone Age  
(Organisers: M. Gema Chacón, Florent Rivals)

Friday 5th (9:00-13:30 to 15:00-19:30)  
Meeting Room: Facultad de Económicas- SALON DE ACTOS



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XVII Congreso Mundial de UISPP

ORAL CONTRIBUTIONS

ORAL

## 1. THE INFLUENCE OF LANDSCAPE ON NEANDERTHAL RANGE VIEWED FROM THE LEVANT

Henry, Donald - (University of Tulsa) [donald-henry@utulsa.edu](mailto:donald-henry@utulsa.edu)

Belmaker, Miriam - (University of Tulsa) [miriam-belmaker@utulsa.edu](mailto:miriam-belmaker@utulsa.edu)

Bergin, Sean - (Arizona State University) [sean.bergin@asu.edu](mailto:sean.bergin@asu.edu)

The geographic distribution of Neanderthals across Eurasia has largely been understood relative to: (a) their adaptation to cold conditions in their western European core area, (b) their response to the on-set of harsh climatic conditions during OIS 4, and (c) their replacement and retreat in front of an advancing wave of Modern Humans during OIS 3. This research has largely centered on the morphology and distribution of the Classic Neanderthals dating to OIS 5-4.

From an adaptive perspective, researchers have focused on geoclimatic and biotic evidence with little attention given to the influence of terrain on Neanderthal land-use strategies. Recently it has been suggested that the Neanderthals were morphological more adapted to rugged terrain than Upper Paleolithic AMH groups that preferred more open landscapes.

We review these factors and explore the effects of Neanderthal preferences of habitat and landscape. We use digital spatial analyses to define site catchments energetically and to calculate Ruggedness Indices for each site. Ruggedness Indices are based upon least cost analysis of the area surrounding sites and utilize slope, direction and distance as factors when calculating walking time to each location within a site catchment. These data-sets, in turn, are compared for sites associated with Neanderthal occupations (defined by fossils and archaeological proxies), early Upper Paleolithic occupations (defined mainly by archaeological proxies), and random terrain points across the region with predictions of the minimum cost of transport (for AMH and Neanderthals) for the average walking distance, or time taken for the acquisition of stable food resources for several time intervals.

This study sheds light on the degree to which terrain may have played a role in shaping Neanderthal and AMH land-use strategies.

EASTERN EUROPE

ORAL

## 2. SPATIAL DISTRIBUTION OF ARTEFACTS IN THE MIDDLE PALAEOOLITHIC LAYERS OF KŮLNA CAVE (CZECH REPUBLIC)

Neruda, Petr - (Moravské zemské muzeum) [pneruda@mzm.cz](mailto:pneruda@mzm.cz)

The main goal of archaeological work is reconstructing the behaviour of primeval populations. Unfortunately, the static character of archaeological finds affects the quality of information we can use for *quasi*-historical synthesis. Artefacts were abandoned in particular phases of their modification (reduction) meaning they reflect only specific points in time of human presence on a site. It is therefore difficult to interpret the life of artefacts over a longer period of time on the basis of techno-typological analyses alone. To solve this problem it is necessary to use contextual data related to the archaeological finds because this will, in particular cases, reflect dynamic aspects of human behaviour.

One approach is the study of spatial distribution of finds on a site to investigate the organisation of living space. Typically, however, only modern archaeological excavations fulfil all the necessary requirements for using the more powerful tools of GIS oriented programs. The most important information is the position of finds in any coordinate system. But, it is evident that most large Palaeolithic sites in Europe were excavated at times when measurements of all three co-ordinates (x,y,z) were not recorded, meaning we cannot simply visualise finds from these sites within 3-D space. This problem is introduced and discussed during the first part of this paper: Are we able to transform the period system of documentation into any data that are possible to analyse using e.g. ArcGIS programs?

The potential for older excavations to be studied using spatial distribution analyses was tested at Kůlna Cave (Czech Republic) on Middle Palaeolithic layers 11, 7c, 7a and 6a, excavated in the 1960s-1970s by Karel Valoch. Using a specific algorithm for the shifting and geo-referencing finds, it has been possible to create density rasters (Spatial Analyst Extension of the ArcGIS) and define the position and composition of accumulations of finds. Maps of find distributions show the behaviour of Neanderthals within the cave space changed over time (between technocomplexes). It is also evident that the spatial distribution in the layer 7a is very complex, with places oriented to specialised tasks.

Such results are very important for the comparison of behaviour of both Neanderthals and Anatomically Modern Humans within Kůlna Cave, which is the second main topic addressed by this analysis: implied results concern both depositional and post-depositional processes, and relate ultimately to the question of repetitive visits to Kůlna Cave by anatomically modern humans and Neanderthals.

ORAL

### 3. NEANDERTHALS OF CRIMEA - CREATIVE GENERALISTS OF THE LATE MIDDLE PALAEOOLITHIC

*Bataille, Guido - (University of Cologne, Institute for Prehistoric Archaeology) gbataill@uni-koeln.de*

In the Crimean mountainous region a high number of Middle Palaeolithic sites, 30 of them multi-layered, could be documented covering a temporal range between the end of the Last Interglacial (OIS 5d) and the Denekamp/Arcy Interstadial (OIS 3) (Chabai & Uthmeier 2006, 298). According to techno-typological peculiarities the Crimean Middle Palaeolithic is subdivided into two techno-complexes: the Micoquian and the Mousterian (Chabai 1998, 11 f.). Assemblages of the Crimean Micoquian (CM) are characterized by plano-convex bifacial technology and non-Levallois flake production. Assemblages of the Levallois-Mousterian variant Western Crimean Mousterian (WCM) are dominated by lineal and recurrent Levallois strategies for flake and blade production and usually lack bifacial elements.

Selected stone assemblages of Kabazi II (CM and WCM) form the empirical base of that study. Activities connected with raw material procurement, lithic production and faunal exploitation are reconstructed and set into the broader context of the Crimean Middle Palaeolithic. By comparing the spatial distribution of lithic and faunal elements of *in situ* surfaces a higher resolution of on-site activities, such as single occupational events, could be achieved (Bataille 2006, 2010, 2012).

It can be concluded that activities connected with recurrent occupations were causative for the formation of the investigated layers. A complex land use system with only ephemeral activities in connection with Micoquian stations in contrast to the more intensely used camp sites of the same industry can be seen (Bataille 2012, 204 f.). Contrary to that, the short-term Mousterian stations seem to generally function as spots for resource acquisition with only sporadic traces of consumption (Bataille 2010, 69 ff.). Cycles of specialisation on steppe species

and a more generalistic exploitation of a variety of different species can be observed, resulting from the adaptation to seasonal variation.

Concluding from that, a complementary settlement and migratory system can be reconstructed: while investigated Micoquian stations can be correlated with a low regional mobility, the investigated Mousterian inventories exhibit a high regional mobility both during warm and cold seasons.

ORAL

### 4. LATE NEANDERTHALS IN PALAEOENVIRONMENTAL CONTEXT: A STAJNIA CAVE (POLAND) CASE STUDY

*Urbanowski, Mikołaj - (Szczecin University, Institute of History, Archaeological Department) m.urbanowski@univ.szczecin.pl*

Stajnia Cave is a small, 25m long karstic cavity located in the northern part of Jurassic upland of Wy-yna Czstochowska in southern Poland (N 50° 36'58,28", E 19° 29'04,24"). It has been researched since 2006 by a multidisciplinary team of scientists from Szczecin University and partner institutions conducted by the author. Complex stratigraphy of the site represents a timespan from the pre - Weichselian till Holocene times. The most thick and archaeologically rich sediments were deposited in early and middle MIS-3 period (layers D1, D2 and D3 forming stratigraphic complex D). They contain a rich flint assemblage of late Micoquian (Keilmessergruppe) tradition. The end of deposition for the complex D is marked by its uppermost unit D1 and dated geologically, paleontologically and absolutely (14C) to about 45 ka BP. The Neanderthal presence at the site is additionally attested by the human teeth found there, which were attributed to this species. The rich (over 50 000 bones and bone fragments analysed so far) non-analogous faunal assemblage, dominated by the remains of reindeers, cave bears and wild horses complete the picture of the site intensively visited by humans.

Except the typical archaeological, geological and paleontological studies many other analysis were done, including microscopic studies of the sediments, as well as spectroscopic studies of the organic residues found inside the D1 unit (with FTIR and DTMS methods). Plant remains, including charcoals were studied mostly on macroscopic level, although microscopic studies of the pollens and phytoliths were also done. The isotopic

studies on bones added some valuable information for the reconstruction of the climatic shift between deposition of D2 and D1 units, which fully correspond with results of extensive studies on microfauna. The studies on the seasonality of thanatocenosis revealed some interesting the Neanderthal hunting habits.

All the information gathered from different analysis allowed to reconstruct a picture of late Neanderthal life-way with a precision not available before for this region of Central Europe. The precision of the picture concerns not only a detailed environmental reconstruction, but also a reconstruction of some unexpected dietary habits. The results combined together allowed us to understand, that despite former visions, the Neanderthal living north of Carpathians after MIS-4 climatic deterioration were not the seasonal immigrants in a hostile environment, but formed a stable settlement, based on subsistence strategies perfectly fit into local conditions.

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ORAL

## 5. NEANDERTHAL BEHAVIOUR IN EASTERN EUROPE: NEW DATA ON THE LEVALLOIS-TECHNO-COMPLEX IN THE DNIESTER VALLEY (UKRAINE)

*Kulakovska, Larissa - (Museum of Archaeology, Institute of Archaeology, Ukrainian Academy of Sciences, Kiev, Ukraine) larissa.kulakovska@gmail.com*

*Usik, Vitaly - (Museum of Archaeology, Institute of Archaeology, Ukrainian Academy of Sciences, Kiev, Ukraine) vitaly.i.usik@gmail.com*

*Haesaerts, Paul - (Department of Palaeontology, Royal Belgium Institute of Natural Sciences, Brussels, Belgium) paul.haesaerts@naturalsciences.be*

*Pirson, Stéphane - (SPW, Direction de l'Archéologie, Jambes, Belgium) stephane.pirson@spw.wallonie.be*

*Gerasimenko, Natsaha (Department of Earth Sciences and Geomorphology, University of Kyiv, Ukraine) Ngerasimenko@ifc.org*

*Pia Spry-Marques (McDonald Institute for Archaeological Research, University of Cambridge, UK) vps27@cam.ac.uk*

*Hublin, Jean-Jacques - (Department of Human Evolution, MPI EVA, Leipzig, Germany) hublin@eva.mpg.de*

*Nigst, Philip R (Division of Archaeology, University of Cambridge, UK, and Department of Human Evolution, MPI EVA, Leipzig, Germany) nigst@eva.mpg.de*

The Middle Dniestr valley in the Ukraine is well-known for its rich record of Middle and Upper Palaeolithic sites (Chernysh, 1973; Klein, 1973, Kulakovska,2003). These include the long sequences of Molodova I, Molodova V

and Korman 4 with Middle Palaeolithic archaeological horizons characterized as Mousterian of Levallois Tradition. Together with some other sites in the northwest of the Middle Dniestr valley, they have been grouped in the so-called Prut-Dniestr-Group of Levallois Mousterian (Meignen et al., 2006, Usik,2006).

Here, we present new data from the site Neporotovo 7 in the Middle Dniestr valley. The site was discovered in 2012 by the current team. In 2013 test pits were excavated and first sections studied. For the first time in the Middle Dniestr valley, we were able to document the Last Interglacial – Early Glacial pedo-complex. Our current studies include field and laboratory work combining archaeology (lithic technology, zooarchaeology), geology and dating. A large part of our studies is devoted to a good understanding of taphonomy and site formation processes. We are applying a chronostratigraphic approach (Haesaerts et al., 2003; 2010) to the Last Interglacial – Early Glacial pedo-sequence of the Middle Dniestr valley.

At Neporotovo 7 five archaeological horizons were documented, located above and below the Eemian soil. In this presentation we focus on the two MP levels that are post-Eemian and most probably located in Early Glacial and Early Pleniglacial sediments. We discuss the new lithic technological data from Neporotovo 7 in its chronostratigraphic and environmental context.

Further, we compare the new Neporotovo 7 dataset with the existing data on the Mousterian, including the Mousterian horizons of Molodova V. It has been suggested that the Mousterian horizons of Molodova V date to MIS 3 (Haesaerts et al., 2003). This will be discussed against the new data from Neporotovo 7. Regionally, the Middle Dniestr Levallois Mousterian shows technological similarities to the Levallois Mousterian of Crimea (e.g., Kabazi II, Level 8), which is also argued to date to MIS 3. It exhibits differences in technology to the Mousterian of Transcarpathia (south of the Carpathian Mountains; e.g., Korolevo I, Level IIb). The goal of this presentation is to discuss the Middle Dniestr Levallois Mousterian technocomplex in its local and regional context.

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WESTERN EUROPE

ORAL

**6. LATE PLEISTOCENE NEANDERTHAL OCCUPATION IN THE MEUSE RIVER BASIN IN BELGIUM: WANDERING HUNTER-GATHERERS OR STOCKY CAVE-DWELLERS?**

*Bringmans, Patrick M.M.A. - (The 'Veldwezelt-Hezerwater' Neanderthal Research Centre - Belgium) Patrick.Bringmans@hotmail.com*

Although *Homo troglodytes* Linnaeus 1758 has long been proven to be an invalid taxon, many archaeologists were convinced that Palaeolithic humans, like the Neanderthals, were predominantly cave-dwellers. By the 1970s, scientists began to realize that this was an incorrect assumption. Caves turned out to be unrepresentative samples of where and when Neanderthals were present and what they did.

The richness of the Middle-Palaeolithic record in Belgium is quite overwhelming. For instance, in 1829, the first Neanderthal skull ever was discovered in Engis. In 1886, two nearly perfect skeletons were found at Spy with numerous Mousterian-type implements. In 1993, the 'Child of Sclayn' was unearthed in Scladina Cave. Although we have much to learn regarding these cave sites, a 'Landscape Archaeology' of the Middle-Palaeolithic is increasingly possible. The most important open-air Neanderthal site in Belgium is Veldwezelt-Hezerwater. There, seven well-preserved, *in-situ* open-air settlements were discovered in a loess-soil sequence. Veldwezelt-Hezerwater was excavated in the context of a broader landscape project.

Neanderthal occupation of Late Pleistocene Belgium appears to fall mainly within Marine Isotope Stage [MIS] 5 en MIS 3. There is no evidence for Neanderthal presence during the 'Eemian' (MIS 5e). However, Neanderthals were present at Veldwezelt-Hezerwater just prior to the Late Saalian/Eemian transition, probably during the Zeifen Interstadial (MIS 6.01). There are no convincing indications of human activity during the MIS 5d-c period. However, there is clear evidence for Neanderthal presence correlated with MIS 5b/a. The second half of MIS 4 seems to have been abandoned by Neanderthals. During MIS 3, it would appear that Neanderthal occupation was restricted to very brief pulses occurring mainly between 60 and 35 ky BP, coinciding with the milder phases of MIS 3. There appears to exist a strange dichotomy between open-air and cave sites in the Meuse River Basin in Belgium. The last known open-air sites were occupied until

50 ky BP. The cave sites were inhabited by Neanderthals only between 50 and 35 ky BP. This shift from open-air sites to cave sites could signal an extremely small Neanderthal population size from 50 ky BP onwards.

Based on the Middle-Palaeolithic record from the Meuse River Basin, Neanderthals were way more spatially ambitious than the cavemen we once had thought them to be. It actually turned out that caves were probably the last refuges of the Neanderthals in the valley of the Meuse River. As a result of the dramatic climate swings and the retreat of the 'mammoth-steppe' in the second half of MIS 3, they would have to survive in ever-smaller groups, becoming largely confined to the caves. Survival stresses would have been particularly acute in winter. While potentially desirable residences for Neanderthals, most caves often had very unwelcoming, sitting tenants. These caves were usually used as 'dens' by cave bears, cave hyenas and cave lions. It would appear that hunkering down in a cave would be the choice of 'last resort' for Neanderthals.

ORAL

**7. SPATIAL CHARACTERIZATION AND PREDICTION OF NEANDERTHAL SITES BASED ON ENVIRONMENTAL INFORMATION AND STOCHASTIC MODELLING: A MODEL COMPARISON**

*Märker, Michael - (Heidelberg Academy of Sciences and Humanities, Research Centre "The Role of Culture in Early Expansions of Humans" at the University of Tübingen) michael.maerker@geographie.uni-tuebingen.de*

*Bolus, Michael - (Heidelberg Academy of Sciences and Humanities, Research Centre "The Role of Culture in Early Expansions of Humans" at the University of Tübingen) michael.bolus@uni-tuebingen.de*

We present a unique spatial dataset of Neanderthal fossil sites in Europe that was used to train a set of stochastic models to reveal the correlations between the site locations and environmental indices. For this, all Neanderthal fossils had been classified into Pre-Neanderthals, Early Neanderthals, and Classic Neanderthals.

In order to assess the relations between the Neanderthal sites and environmental variables as described above we applied a boosted regression tree approach (TREENET) and a statistical mechanics approach (MAXENT). The stochastic models employ a learning algorithm to identify a model that best fits the relationship between the attribute set (environmental variables) and the classi-



fied response variable, which is in this case the classes of Neanderthal sites. A quantitative evaluation of model performance was done by determining the suitability of the model for the geo-archaeological applications and by helping to identify those aspects of the methodology that need improvements. The models' predictive performances were assessed by constructing the Receiver Operating Characteristics (ROC) curves for each Neanderthal class, both for training and test data. In a ROC curve, the Sensitivity is plotted over the False Positive Rate (1-Specificity) for all possible cut-off points. The quality of a ROC curve is quantified by the measure of the parameter area under the ROC curve.

The dependent variable or target variable in this study are the locations of Neanderthal sites described by latitude and longitude. The information on the site location was collected from literature and own research. Since the spatial characterization of Neanderthal sites is essentially depending on the site accuracy, we spend large effort in correcting the data by a twofold approach: i) we checked and transformed the coordinates to the same projection. In this case we use a Universal Transverse Mercator (UTM) WGS84 projection; ii) all sites were checked for site accuracy using high-resolution maps and Google Earth.

The study illustrates that the models show a distinct ranking in model performance with TREENET outperforming the other approaches. Moreover, Pre-Neanderthals, Early Neanderthals and Classic Neanderthals show specific spatial distributions only in part reproduced by the different models. However, all models show a wide correspondence in the selection of the most important predictor variables generally showing less climatic influence in site selection criteria from Pre-Neanderthals to Classic Neanderthals. In a next step, we will compare our results for sites with Neanderthal fossils with results obtained when including also Middle Paleolithic sites without Neanderthal fossils.

POSTER SESSION 1

POSTER

**8. ECOLOGICAL NICHE OF NEANDERTHALS FROM SPY CAVE REVEALED BY NITROGEN ISOTOPE ANALYSIS OF COLLAGEN AMINO ACIDS**

*Naito, Yuichi I. - (University of Tübingen) ynaito0825@gmail.com*  
*Chikaraishi, Yoshito - (Japan Agency for Marine-Earth Sci-*

*ence and Technology) ychikaraishi@jamstec.go.jp*  
*Drucker, Dorothee G. - (University of Tübingen) dorothee.drucker@ifu.uni-tuebingen.de*  
*Ohkouchi, Naohiko - (Japan Agency for Marine-Earth Science and Technology) nohkouchi@jamstec.go.jp*  
*Wißing, Christoph - (University of Tübingen) christoph.wissing@uni-tuebingen.de*  
*Bocherens, Hervé - (University of Tübingen) herve.bocherens@uni-tuebingen.de*

Zooarchaeology and stable isotopes of bulk collagen led to the suggestion that Neanderthals obtained most of their dietary protein from large herbivores in open landscapes. However, recent findings based on plant remains in the tooth calculus and archaeological remains of small games and marine animals have moderately refined this picture. Moreover, the consumption of plants by hunter-gatherers is expected to have no significant impact on the isotopic signature of the bulk collagen, since many plants have a dramatic lower content in protein than animal meat. In this paper, we aim at quantitatively evaluating their consumption of plants and animal prey by Neanderthals using nitrogen isotope analysis of individual amino acids. Indeed, this approach has recently been proposed as a useful tool especially for the estimation of animal trophic position in terrestrial ecosystems meaning that it should be more sensitive to the contribution of plant resources.

We analyzed bone collagen samples that were already extracted from skeletal remains used in previous studies of bulk collagen stable isotopes. In addition to human and animal collagen materials from Spy Cave, we also analyzed faunal remains from the nearby cave of Scladina (Sclayn, Belgium).

Based on the isotopic analysis of amino acids, the Spy Neanderthal individuals relied strongly on terrestrial resources, ii) they relied not only on herbivores but also plants presumably consisting 17-27% of whole dietary protein, iii) there was an inter-individual variation in prey preference. It was also suggested that the Neanderthals occupied an ecological niche being quite different from those of spotted hyena but rather similar to that of wolf.

The Spy Neanderthals analyzed in this study showed fairly similar trophic positions in the terrestrial ecosystem despite that they lived in different chronological time. They not only relied strongly on herbivorous mammals but also certainly included plants as a protein source. Interestingly, a large inter-individual variation in prey preference were newly found that were not discernible on bulk collagen isotopes. In agreement with recent find-

ings, our results suggest that Neanderthal subsistence strategies were not involving merely hunting and scavenging but were more diversified. Although only a few individuals were analyzed in this study, we have shown that our approach would be promising for the study of Neanderthal subsistence.

POSTER

## 9. RECONSTRUCTING OCCUPATIONAL MODELS: BONE REFITS IN LEVEL I OF ABRIC ROMANI

*Modolo, Marta - (URV-IPHES-UNIV. FERRARA) marta.modolo@gmail.com*

*Rosell, Jordi - (URV-IPHES) jordi.rosell@urv.cat*

The archaeological record is the result of different long-acting processes. The study and the application of bone refits, technique adopted in archaeology since the 70's, is based on the reconstruction of broken and fractured elements to determine formation processes, to solve questions about vertical movements of remains, to evaluate post-depositional processes and to recognize the activity areas. In this way we can reconstruct some of the natural and cultural processes involved in this record. The accumulations formed by anthropogenic processes have a register located mainly around archaeological structures such as hearths and agglomerates of travertine. The aim of this paper is to present the application of this methodology and the results obtained in the Level I of Abric Romani (Capellades, Spain), which chronology was determined around 46 Kyrs by means of U/Th ages. This mousterian site is located in a tufa-draped cliff in the northeastern Iberian Peninsula and various evidence of natural and human activity has been identified in. The site is composed by a sequence of travertine platforms, which are more than 20 m high. The human occupations are located between these platforms, which are isolated from each other and this fact allows analyzing more accurately all the accumulations. Starting from the characterization of faunistic assemblages, throughout anatomic, taxonomic and taphonomic study, it is possible to define exploitation of the animals. Bone refits are made in this way: remains analysis for each squares (differentiation of anatomical elements depending on taxon and size), by closest square and in overview, by analysing all the squares of the area (considering greatest accumulation). Once the refits are carried out, all the data has been analysed and processed to obtain the spatial patterns of the investigated level. The main aim is to explore the anthropogenic use of the site, in particular during the occupation of Level I, and to value the degree of synchronicity between the different identified struc-

tures, such as hearths and the activity areas. This kind of analysis can be used in order to evaluate the differences between occupational patterns, subsistence activities, domestic areas, level of group's sophistication and duration of employment of the sites. This fact shows the importance of these studies to understand the diversity of occupational patterns and ways of life of the human communities of the European Middle Palaeolithic.

POSTER

## 10. LE MOUSTÉRIEN DES BALZI ROSSI (VINTIMILLE, LIGURIE, ITALIE) MIS EN VALEUR PAR L'ÉTUDE DES COLLECTIONS ANCIENNES

*Rossoni-Notter, Elena - elenarosso@hotmail.fr (Musée d'Anthropologie préhistorique de Monaco)*

*Notter, Olivier - notterolivier@hotmail.com (UMR 7194, Muséum National d'Histoire Naturelle)*

*Simon, Patrick (Musée d'Anthropologie préhistorique de Monaco)*

Le complexe de sites des Balzi Rossi (Vintimille, Ligurie, Italie) a livré très tôt des dépôts témoignant d'occupations moustériennes multiples et successives. Dès 1895, et jusqu'en 1914, des fouilles ont été entreprises dans les grottes du Prince, du Cavillon, des Enfants et à l'abri Lorenzi par le chanoine Léonce de Villeneuve, à la demande du Prince Albert 1<sup>er</sup> de Monaco.

Compte tenu de l'ancienneté des fouilles, des travaux historiographiques (consultation d'archives, référencement/récolement des collections) ont consolidé la base de ces travaux. Le contexte des vestiges reconsidéré, une étude pétroarchéologique et technotypologique du matériel a été réalisée.

L'identification des lithotypes, qui enrichit la lithothèque référentielle pour la zone liguro-provençale, révèle une exploitation majeure des ressources littorales périphériques (silex, calcaires) et semi-locales ligures (micro-quartzites) par les groupes moustériens. Les chaînes opératoires de production attenantes à ces matières, longues et ramifiées, se sont le plus souvent déroulées *in situ*. En revanche, les pièces en matériaux allochtones (silex de l'arc de Castellane, de la région nord varoise, d'Apt-Forcalquier, rhyolite du massif de l'Estérel, radiolarite de Ligurie orientale) sont isolées et illustrent des aires d'approvisionnements pouvant aller de 35 km jusqu'à 150 km à l'ouest et à l'est des sites. Le plus souvent retrouvés, ces artefacts ont pu être rapportés sous une forme achevée. En outre, les galets calcaires et quartzites

apparaissent contingentés aux débitages laminaires, les autres matériaux homogènes aux débitages Levallois.

L'analyse technotypologique et morphofonctionnelle a permis de caractériser puis rapprocher certains assemblages. Ainsi, les industries des Foyers I-II-III du Cavillon et A-B-C-D-E du Prince ont en commun l'emploi de percuteurs durs, des méthodes Levallois à pointes et à lames et des méthodes laminaires unipolaires, associé à de nombreux racloirs, encoches et pointes retouchées. Néanmoins, les industries inférieures du Prince se différencient par la présence de grands éclats calcaires, galet aménagé, limaces et des retouches plus souvent écailleuses. D'autres assemblages sont spécifiques tels que les quelques artefacts appartenant au foyer moustérien le plus récent du Cavillon (Foyer Inférieur de Rivière), constitués de lames massives et allongées issues des méthodes Levallois et laminaires. L'abri Lorenzi livre un petit corpus essentiellement composé de nucléus (SSDA, laminaires et Levallois) et de quelques éclats bruts et retouchés (racloirs, encoches, pointe moustérienne). Les industries de la Barma Grande s'inscrivent plutôt dans des faciès faiblement Levallois. Enfin, les données récentes, recueillies sur certaines séries de la grotte des Enfants et de Costantini, ont parfait cette première étude comparative.

Ces résultats, confrontés à ceux provenant de fouilles récentes (abri Mochi, abri Bombrini, Ex-Birreria, Ex-Casino), ont permis de proposer un panorama technologique du gisement des Balzi Rossi durant le Paléolithique moyen. Encadrée par les données chronostratigraphiques, biochronologiques et paléoenvironnementales, le Moustérien s'étend des stades isotopiques 5 à 3 et admet une certaine hétérogénéité diachronique et synchronique, inhérente à la fonction des occupations.

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POSTER

**11. SAN QUIRCE (PALENCIA, SPAIN). AN EXAMPLE OF A NEANDERTHALS OUTDOOR OCCUPATION IN THE NORTHERN PLATEAU OF IBERIAN PENINSULA**

*Terradillos-Bernal, Marcos - (Área de Prehistoria. Universidad de Burgos/Fundación Atapuerca)*

*mterradillos@hotmail.co*

*Díez Fernández-Lomana, Juan-Carlos - (Área de Prehistoria. Universidad de Burgos)* *clomana@ubu.es*

*Jordá Pardo, Jesús-Francisco (Dpto. de Prehistoria y Arqueología. Universidad Nacional de Educación a Distancia)* *jjorda@geo.uned.es*

*Benito-Calvo, Alfonso (Centro Nacional de Investigación so-*

*bre evolución Humana (CENIEH)* *alfonso.benito@cenieh.es*  
*Clemente, Ignacio (Institució Milà i Fontanals-CSIC)* *ignacio@imf.csic.es*

*Hilgers, Alexandra (Institute of Geography - University of Cologne)* *alexhilgers@web.de*

*Marcos Sáiz, Fco. Javier (Laboratorio de Prehistoria)* *f.javiermarcos@hotmail.com*

This poster presents the middle Paleolithic site of San Quirce (Palencia, Spain). San Quirce is a Neanderthals camp, currently has only intervened in a small portion. This site is located in the extreme north of the Duero Basin on a fluvial terrace +22- 23 m (T9). It is located in a strategic contact area, between the Cantabrian Mountains and the Northern Plateau.

We have obtained a sequence of OSL dating between  $74 \pm 16$  ky in sandy deposits overflow (profile E side quarry variation level III) and  $154 \pm 18$  ky in the excavated area level III.

This site is unique in the Northern Plateau by the extraordinary conservation of lithic Middle Paleolithic record, enabling technical, space, and use studies. San Quirce presents a rich and varied record allowing us to identify how has been managed the space occupied, mainly, with meat consumption and work on plant resources.

From a technological point of view, the instrumental repertoire San Quirce presents significant variability with respect to the main Middle Paleolithic situations. The lithic assemblage lacks great complexity, is highly specialized in light denticulate, with little punch, characterized by a very rapid production; and poor cutting ability. Likewise, the pronounced bifaces or cleaver morphotypes are not documented; neither, Levallois or Quina methods. It has not been identified Acheulean tradition nor Mode 3*sensu stricto*. San Quirce cannot be included in the Mode 1 and Mode 2 developed models, but must be framed in a Mode 3, determined by the precise settings of this group.

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POSTER

**12. NEW MIDDLE PALEOLITHIC SITES FROM THE MANI PENINSULA, SOUTHERN GREECE**

*Tourloukis, Vangelis - (University of Tübingen)* *vangelis.tourloukis@ifu.uni-tuebingen.de*

*Thompson, Nicholas - (University of Erlangen-Nuremberg)* *nikothompso@yahoo.com*

*Garefalakis, Charalampos - (2nd Ephory of Prehistoric and*

*Classical Antiquities, Greece) garefalakisb@yahoo.com*  
*Karkanas, Panagiotis - (Ephoreia of Palaeoanthropology-Speleology of Southern Greece) pkarkanas@hua.gr*  
*Panagopoulou, Eleni - (Ephoreia of Palaeoanthropology-Speleology of Southern Greece) elenipanagopoulou@yahoo.com*  
*Harvati, Katerina - (University of Tübingen) katerina.harvati@ifu.uni-tuebingen.de*

Paleoanthropological research in Greece has been sparse, despite the significance of the country's geographic position for human evolution in Europe. PaGE ("Paleoanthropology at the Gates of Europe: human evolution in the southern Balkans") is a five-year interdisciplinary project that conducts intensive, geoarchaeologically informed and target oriented Paleolithic fieldwork in Greece. One of the main goals of the project is to illuminate important aspects of Neanderthal behavior and investigate the possible late survival of Neanderthals in refugia of the Greek Peninsula. The region of Mani (Southern Greece) includes important excavated Neanderthal sites and yet it has not been investigated systematically. Here we report the findings of the 2012 PaGE survey in Mani, as well as the preliminary results of the test excavation at a cave, launched in 2013.

Forty-six caves, rockshelters and open-air sites in lowland settings were systematically surveyed and recorded. Documentation included the collection of 'off-site' data, such as geomorphological indicators of former sea-levels, which will potentially provide inferences on how geomorphological processes affected the preservation of sites and hence overall site distribution patterns.

In the surface assemblages, retouched tools are mainly represented by side scrapers, end scrapers, piercers, denticulates and notches, along with Levallois blanks and cores. In the excavated assemblages, both the Levallois and discoidal flaking techniques can be identified. Excavated specimens manufactured on a non-local rock indicate potential raw material transfers greater than 50 km and suggest links among the different regions of Mani, related to mobility patterns.

Since 2012, the PaGE research in Mani has nearly doubled the number of known Middle Paleolithic sites from the region. It has confirmed that the peninsula has the strongest 'Neanderthal signal' identified to date in Greece, suggesting a dense hominin presence during the Middle Paleolithic. Nearly all sites identified in our survey are located at coastal areas. Despite the dramatic influence of Pleistocene landscape dynamics, this distribution emerges as a persistent pattern, perhaps indi-

cating a preference for coastal locations. Unraveling the Neanderthal occupation of Mani is expected to illuminate important aspects of Middle Paleolithic adaptations in one of the southernmost coastal extremes of Europe.

#### ORAL CONTRIBUTIONS

#### ORAL

### 13. EVOLUTION OF NEANDERTAL SUBSISTENCE STRATEGIES AND MOBILITY PATTERN IN SOUTHWESTERN FRANCE

*Rendu, William - (CNRS) williamrendu@hotmail.fr*

Recent works on the late Middle Paleolithic from Southwestern France have identified the existence of diverse populations characterized by distinct cultural features, attesting that several Mousterian societies succeeded one another through time. These societies evolved under different paleoclimatic contexts, adopting original strategies to exploit their biotope. However, the majority of the zooarchaeological approaches focusing on the spatial distribution of the activities within the territory has considered the Neanderthal populations as a unique entity and few studies have really discuss the diversity of the subsistence strategies developed by the Mousterian societies in Southwestern Europe.

We propose here to tackle this issue through a synthesis of the zooarchaeological data available for three distinct groups from this region: the Quina Mousterian, the Mousterian of Acheulean Tradition and the Discoidal denticulate Mousterian. For this study, 40 stratigraphic levels from 16 sites have been retained, based on their chronocultural attributions, the preservation of their archaeological records and the origin of the faunal assemblages.

By taking into account several zooarchaeological criteria: faunal spectra, game selection, selective transport, hunting seasonality etc... the study suggests that different subsistence pattern and strategies might have been developed.

Quina Mousterian diet was characterized by the nearly exclusive exploitation of reindeer and the lack of diversity in its diet. Reindeer migration would have directly conditioned the settlement pattern of the Quina populations and thus their mobility.

On the contrary, denticulate hunting would have been more diversified and seasonally completed by Bison specialized hunts. The exploitation of diversified prey would have counterbalance the seasonal fluctuation of the bison concentration within the environment.

Finally MTA Mousterian exploited a large range of preys with no evidence of temporal segmentation of the hunting activities. At least for the moment, no recurrent use of hunting specific location is established. It seems that the exploitation of different prey with different behavior has conducted to minimize the influence of the hunting strategies on the distribution of the activities within the territory.

This paper demonstrates that the development of different subsistence strategies in the late Middle Paleolithic in Southwestern France had a direct impact on the organization of the activities within the territory and, thus, on the mobility of these populations. The whole society organization seems to have been directly influenced by the hunting strategies. To conclude, this paper underlined the necessity to better characterize the behavioral diversity of the late Neandertal populations

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ORAL

**14. INSIGHT INTO THE ECOLOGICAL NICHE OF NEANDERTALS: STABLE ISOTOPES AND THEIR PALEOBIOLOGICAL IMPLICATIONS**

*Wißing, Christoph - (Fachbereich Geowissenschaften - Biogeologie, Universität Tübingen, Germany) christoph.wissing@uni-tuebingen.de*

*Crevecoeur, Isabelle - (CNRS, PACEA UMR 5199, Université Bordeaux 1, France) i.crevecoeur@pacea.u-bordeaux1.fr*

*Germonpré, Mietje - (Operational Direction -Earth and History of Life-, Royal Belgian Institute of Natural Sciences, Belgium) mgermonpre@naturalsciences.be*

*Naito, Yuichi I. - (Fachbereich Geowissenschaften - Biogeologie, Universität Tübingen, Germany) yuichi.naito@ifg.uni-tuebingen.de*

*Rougier, Hélène - (Department of Anthropology, California State University Northridge, USA) helene.rougier@csun.edu*

*Semal, Patrick - (Operational Direction -Earth and History of Life-, Royal Belgian Institute of Natural Sciences, Belgium) patrick.sem@naturalsciences.be*

*Bocherens, Hervé - (Fachbereich Geowissenschaften - Biogeologie, Universität Tübingen, Germany) herve.bocherens@uni-tuebingen.de*

Collagen is the predominant protein in bone and directly reflects the isotopic signature of the dietary com-

ponents as well as environmental aspects of the habitat. The unique chemical preservation of Late Pleistocene Neandertals and contemporaneous faunal bone collagen provides direct insights not only into Neandertal ecological and cultural behavior. Different aspects such as prey choice and hunting strategies can be evaluated using the stable isotopic composition of different elements. Moreover ecological aspects such as niche partitioning of herbivorous and carnivorous mammals (including the Neandertals), trophic ecology and habitat characteristics can also be exposed by the isotopic approach as well as different landscape use pattern of this hominid.

We propose to evaluate the potential and limitations of the isotopic approach through a comparison and completion of its results with those of other fields such as zooarchaeology, tooth wear and dental calculus analysis for a broader approach. This study will focus on NW-Europe during the Late Pleistocene till the last Neandertal fossils are documented (ca. 36,000 years ago). We will pay particular attention to the Belgian sites of Scladina, Spy and Goyet, the last two having yielded late Neandertals. Several newly discovered Neandertals and coeval herbivorous and carnivorous mammal remains from the "Troisième caverne" of Goyet will be integrated in the context of previous research to get a deeper understanding of the Late Pleistocene mammoth steppe ecosystems to which Neandertals belonged. Here we present the carbon, nitrogen and sulfur composition of the collagen from herbivores, carnivores and humans, which reflect an average fractionated isotopic composition of the diet of the last years of an adult mammal. Calculating dietary contributions was made using SIAR (a specific package for stable isotopic analysis using the software R).

Carbon and nitrogen isotopic analyses allowed us to establish prey-predator relationships in Goyet, Scladina and Spy caves. The Neandertals from Goyet were very similar to those of Spy, suggesting high contribution of mammoth in the diet. The sulfur isotopic composition of collagen being linked to the characteristics of the bedrock, we could figure out significant differences within and through the sites, which indicate different foraging areas for several mammal species as well as for the Neandertals for Spy and Goyet.

So far the unique addition of sulfur isotopic analysis to that of the carbon and nitrogen provided important information about foraging areas of Neandertals within one site and between sites. All studied Neandertals individuals had a similar diet, probably rich in mammoth

meat, while all Neanderthals from each site, Goyet or Spy, had similar foraging areas but these areas were different between Neanderthals from Spy and Goyet.

WESTERN - SOUTHERN EUROPE

ORAL

**15. LONG MATURE CARBONACEOUS MATERIAL TECHNOLOGY VIEWED IN NEANDERTHAL CONTEXTS**

*Courty, Marie-Agnès - (CNRS UPR 8521) marie-agnes.courty@promes.cnrs.fr*

*Allué, Ethel - (IPHES-URV) eallue@iphes.cat*

*Blasco, Ruth - (The Gibraltar Museum) rblascolopez@gmail.com*

*David, Francine - (CNRS UMR 7041) francine.david@mae.u-paris10*

*Girard, Michel - (CEPAM-UMR 6130)*

*Hardy, Maurice - (CNRS UMR 7041) maurice.hardy@wanadoo.fr*

*Moncel, Marie-Hélène - (UMR 7194 CNRS-MNHN) moncel@mnhn.fr*

*Fernández-Peris, Josep - (Museo de Prehistoria, Diputación de Valencia) josep.fernandez@bolomor.com*

*Rigaud, Jean-Philippe - (UMR 5199 PACEA) j.ph.rigaud@wanadoo.fr*

Field-analytical study of the remarkable hearths at Abric Romani (Spain) has revealed the repeated occurrence of polymer-rich carbonaceous polymorphs. Their spatial pattern and properties have allowed to recognize exploitation by Neanderthal groups of subsurface volatile-rich hydrocarbon deposits. Their high socio-economic value was suggested based on evidence for controlled heating of the highly calorific combustible and advanced technology for preparation of secondary products used for lightning, surface cover, and colouring materials. Modern analogues have allowed to establish that deposition of the carbonaceous materials is particular to aerosol fall episodes following cosmic events. These recent situations have provided diagnostic signatures to characterize the raw sources and identify transformation products. In the continuity of the Abric Romani record, we intend to further investigate the carbonaceous materials technology from diverse Neanderthal contexts.

The data reported here have been obtained from stratified Neanderthal sequences that range from the Middle to the late Pleistocene (OIS 9-4): Bolomor Cave (Valencia, Spain), Bau de l'Aubésier shelter (Vaucluse, France),

Cave XV of Vaufray (Dordogne, France), Bison Cave at Arcy-sur-Cure (France) and Maras shelter at Saint-Martin d'Ardèche (France). We have refined our field/multi-analytical protocol to achieve the finest situ characterization of the carbonaceous materials within their host matrix from the field down to the submicroscopic level. For all the Neanderthal sites studied, in situ concentrations of carbonaceous materials which are similar to the ones found at Abric Romani are identified in distinctive strata. Based on the comparison of these assemblages to the ones encountered in recent natural contexts, coloured polymer filaments and brittle grains of vitreous glassy carbon filled with alumino-silicate cement of marine origin help to recognize intentional introduction of fresh raw sources that were collected short time (months to years) after their fall. The greater abundance of thermally resistant polymers, lime and refractory minerals and the close association of the carbonaceous polymorphs to firing microdebris, particularly pine charcoal, allow to establish the use of the carbonaceous materials as combustible, together with fresh wood, even in the absence of obvious hearths. Metal-rich carbonaceous microresidues on smooth, highly fired bone microfragments trace the use of the carbonaceous materials as a polishing paste made of a plastic aliphatic matrix with hard micron-sized metal inclusions. Polished stone and shell fragments with similar surface treatment are observed. The close association of polymers and concentrations of weakly consolidated clay aggregates allows to recognize residues of prepared carbon-rich clay materials with coloured surfaces.

The data presented show a long established link between recurrent Neanderthal occupation in well maintained habitation contexts and exploitation of freshly deposited hydrocarbon-rich materials that periodically accumulated in deeply incised valleys. The similitude in meticulous processing of the exceptional materials and its use for fabrication of resembling finely worked objects across distant regions reinforce the hypothesis of a strongly maintained community of technical practices with mature cognitive and social capacities. The close association of the carbonaceous materials with pine wood suggests favorable accumulation of the raw sources in pine forest ecosystems which were diversely exploited by Neanderthals.

SOUTHERN EUROPE

ORAL

## 16. SOUTHEASTERN PYRENEES OF LLEIDA MIDDLE PALEOLITHIC DURING MIS 3

*Mora Torcal, Rafael - (Centre d'Estudis del Patrimoni Arqueològic de la Prehistoria. UAB) rafael.mora@uab.cat*  
*de la Torre Sainz, Ignacio - Institute of Archaeology. UCL) i.torre@ucl.ac.uk (*

*Benito Calvo, Alfonso - alfonso.benito@cenieh.es (CENIEH)*  
*Martínez Moreno, Jorge - (Centre d'Estudis del Patrimoni Arqueològic de la Prehistoria. UAB) jorge.martinez@uab.cat*

Some models have depicted the Ebro valley as a relevant bio-geographic feature to explain the possible survival of Neanderthals in Iberia at the end of MIS3. However, several chronometric and contextual problems have hindered a detailed description of the archaeological evidence provided by this region.

This paper presents the results of our research onto the Neanderthal occupation of the border areas between the Ebro valley and the Southern Pyrenees. Middle Paleolithic sites from the Pre-Pyrenees of Lleida detected in this area are Roca dels Bous, Trago, Cova Gran de Santa Linya and the recently discovered sequences of Abric Vidal and Abric Pizarro.

This group of sites is yielding a key dataset to the study of Upper Pleistocene Neanderthals. If these sites may support the possible endurance of Neanderthals in the area <40,000 BP, deserves to be analyzed.

Technical attributes derived from the analysis of knapping methods and in the configuration of retouched tools, yield evidence of the emergence of a regional Mousterian techno-complex. The configuration of this stable cultural tradition could be conformed around the MIS 5e, surviving until the late MIS3. This tradition disappears suddenly, being replaced by Upper Paleolithic techno-complexes.

The review of the available data allows modeling Neanderthal settlement patterns in the area and to provide new insights on the biogeography of Neanderthal populations, a key argument for the understanding of the MP/UP transition.

We discuss the meaning and the implications derived by the notion of *technical stasis* detected in the Mousterian lithic assemblages from the Pre-Pyrenees.

Finally, the reliability of some of the commonly used proxies for assessing the Neanderthal presence is discussed, with special attention to the use of radiometric data.

ORAL

## 17. DIACHRONIC VARIATION IN THE MIDDLE PALEOLITHIC SETTLEMENT OF ABRIGO DE LA QUEBRADA: A VIEW OF NEANDERTHAL TERRITORIAL MOBILITY

*Eixea, Aleix - (Departament de Prehistòria i Arqueologia. Universitat de València) alejo.eixea@uv.es*

*Villaverde, Valentín - (Departament de Prehistòria i Arqueologia. Universitat de València) valentin.villaverde@uv.es*

*Zilhão, João - (Departament de Prehistòria, Història Antiga i Arqueologia. Universitat de Barcelona) joao.zilhao@ub.edu*

There is an abundant literature on the difficulties generated by the assessment of space use in Middle Paleolithic archaeological levels as a result of the fact that, in a large proportion of cases, these levels correspond, following the terminology proposed by Bailey (2007), to cumulative palimpsests. In the Mediterranean area of Iberia, recent studies have focused on the finer dissection of the diachronic components of the different units of occupation subsumed in such palimpsests, based on the analysis of spatial distributions of raw material units (Machado *et al.*, 2011), hearths and the vertical projection of finds (Sañudo and Fernández-Peris, 2007; Marrero *et al.*, 2011), with little progress in the joint assessment of these aspects, as well as on stone and bone refits (Vaquero *et al.*, 2012). Our purpose is to establish the use of space within the site, focusing on the differences observed when comparing the upper levels (I-V) with the lower ones (VII-VIII). The results obtained are compared with other sites from the Valencian area and allow us to highlight some features characterizing the occupation of the territory by Neanderthal groups in the central region of the Iberian Mediterranean.

Abrigo de la Quebrada is a rockshelter situated near Valencia. The excavations, still in progress, have revealed 8 archaeological levels. The human occupation evidence is found in levels II-V, VII and VIII, while most intensive occupations are those in levels III, IV and V (Eixea *et al.*, 2012). Level III has a date around 40,500 BP, and level Level IV around 43,930 (Eixea *et al.*, 2012; Villaverde *et al.*, 2008). The lower levels (VII-VIII) probably date back to MIS5. In the stratigraphy different rates of sedimentation and therefore different possibilities for spatial analysis can be observed.

Level IV is a cumulative palimpsest with a high density of finds and where isolating the different phases of occupation is very difficult. Processing of animal remains and knapping activities are structured by hearths that occupy the central part of the excavated surface. In contrast, occupations are better defined in Level VII, as shown by the study of hearths and refits. These contrasts reflect not only differences in the rate of deposition but also differences in mode of human use. Bearing in mind the time factor, the taphonomic analysis and spatial distributions of finds bring up significant differences in knapping systems, breakage patterns, abundance of carnivores, raw material procurement and blank selection. These data suggest differences in both function and duration, with the Level VII occupations being shorter and seemingly characterized by less intensive processing of the faunal remains.

ORAL

**18. DID STONES SPEAK ABOUT PEOPLE? FLINT CATCHMENT AND NEANDERTHAL BEHAVIOUR FROM AREA 3 (CAÑAVERAL, MADRID-SPAIN).**

*Ortiz Nieto-Márquez, Irene - (Universidad Autónoma de Madrid) irene.ortiz@uam.es*

*Baena Preysler, Javier - (Universidad Autónoma de Madrid.) javier.baena@uam.es*

Middle Paleolithic catchment patterns have been exhaustively studied in the past. However, it is essential to clearly define Neanderthal technical and strategic abilities in relation to raw materials self provide, from a temporal perspective.

Here we present a study of quarrying activities in open air sites occupied during Mousterian period in Madrid (Spain), with different patterns of lithic catchment. For that, we have used technological studies, spatial analysis and refits information.

At El Cañaveral archaeological complex, several sites has been identified, in relation with natural flint outcrops. Those examples have provided information about flint supplying patterns, both in primary and secondary deposits. In addition, different "operative chains" and diverse systems of ramification and recycling process were employed depending on the final objectives.

It could be possible to appreciate the addition actions by analyzing the diacritic superposition of knapping series in blanks, cores and supports of different qualities.

Changes into categories, dimensions and raw material qualities, allows a first identification of lithic actions along the time as a proxy of standardize or random human behavior when catchment actions took place.

POSTER SESSION 2

POSTER

**19. RAW MATERIAL ECONOMY ON THE MIDDLE PALAEOOLITHIC SITES OF THE CSERHÁT REGION, NORTHERN HUNGARY**

*Markó, András - (Hungarian National Museum) markoa@hnm.hu*

In the Cserhát region, northern Hungary a large number of Middle Palaeolithic sites have been discovered during the intensive field works since 2000. The assemblages yielded bifacially worked and leaf shaped implements together with numerous Middle Palaeolithic side-scrapers and very few Upper Palaeolithic tool types. A common characteristic trait of the collections is elevated ratio of etralocal felsitic porphyry (imported from at least 95 km) among the raw material and in some cases the obsidian variants with the sources lying 160-190 km from the archaeological sites were used also.

In the presentation two different industries will be discussed. The sites of the Bábony-type industry (local variant of the Micoquian or Keilmessergruppe) are known mainly after surface collections, while a quite original assemblage was excavated near Vanyarc after the field trips around this village.

Our filed observations showed that the lithic artefacts were found in a hard, decalcified clay, close to the present-day surface, but the archaeological level was only slightly disturbed and clear spatial patterning of the artefacts were observed.

The ratio of the felsitic porphyry in the excvataed assemblage from Vanyarc reached 33% of the inventory, which means 650 pieces of this long distance raw material. Moreover, the refits in one of the find concentrations show that the tools were retouched on the site and even primary flaking of felsitic porphyry could have been proved.

These results may shed light to the raw material economy of the assemblages, known after filed surveys until today.



Our result from the study of both the surface collected and excavated assemblages of at least two different Late Middle Palaeolithic industry show, that the open-air sites in this region are traces of short term occupation of mobile groups of humans. On the other hand, both the archaeological connections and the raw material types suggest strong eastern connections of the assemblages with linear raw-material procurement system, reaching at least for 100 km as the crow flies.

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POSTER

**20. PLANT RESOURCES POTENTIALITY FOR NEANDERTHAL GROUPS SETTLED DOWN IN THE LOZoya VALLEY (C SPAIN) AT THE BEGINNINGS OF THE UPPER PLEISTOCENE**

*Uzquiano Ollero, Paloma - (UNED) p\_uzquiano@hotmail.com*

*Ruiz Zapata, M<sup>a</sup> Blanca - (Universidad de Alcalá de Henares) blanca.ruiz@uah.es*

*Gil García, M<sup>a</sup> José - (Universidad de Alcalá de Henares) blanca.ruiz@uah.es*

*Martín Arroyo, Tomás - (Universidad de Alcalá de Henares) blanca.ruiz@uah.es*

*Baquadano, Enrique - (MAR Comunidad de Madrid) enrique.baquadano@madrid.org*

*Arsuaga, Juan Luís - (ISCIII-UCM) jlsarsuaga@isciii.es*

*Pérez-González, Alfredo - (CENIEH) alfredo.perez@cenieh.es*

The archaeopaleontological sites of Pinilla del Valle (Madrid, Central Spain) have provided a set of important items: i.e. Neanderthal teeth, lithic assemblages and domestic hearths, which show the development of human occupations at the beginnings of the Upper Pleistocene in Central Spain.

Palynological and anthracological analyses conducted have provided in turn key information about vegetation dynamics and wood uses developed at the beginnings of the Upper Pleistocene, a period of time still characterised by scarce and fragmentary palaeovegetational information in central Spain.

Pollen data have shown the progressive installation of an open landscape in the area in accordance with the global scale increasingly colder conditions.

Based on these previous data this work focuses on the potential resources that such vegetal environments can provide to the dietary, subsistence and uses of territory by the Neanderthal community settled there. The taxa

identified by pollen and charcoal analyses are grouped into four categories (food, medicinal use, manufacturing and firewood), in order to know the range of uses that neanderthals may have made from plants. Charcoal data revealed the use of wood from different plant communities which demonstrates the potential of woody plant resources that such open environments hosted inside.

On the other hand the studies on oral dental microwear have proved that Neanderthal not only consumed meat, but seafood, fish and some cooked vegetables were also present in his diet.

Correlations between climate change on paleoecosystems and Neanderthal subsistence patterns have been established, showing how flexible was the Neanderthal diet and his ability of adaptation to changes in food resources over time.

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POSTER

**21. ARCHÉOZOOLOGIE DES NÉANDERTALIENS DU ROC DE MARSAL : ENTRE SUBSISTANCE ET ACTIVITÉS TECHNIQUES**

*Castel, Jean-Christophe - (Muséum de Genève) jean-christophe.castel@ville-ge.ch*

*Soulier, Marie-Cécile - (Trent Universitx & Université de Toulouse) mariecsoulier@gmail.com*

*Chauvière, François-Xavier - (OPAN Neuchâtel, Suisse) francois-xavier.chauviere@ne.ch*

*Discamps, Emmanuel - (University of Bergen & Université de Bordeaux) ediscamps@gmail.com*

The Roc-de-Marsal cave (Campagne, Dordogne, France) presents an important stratigraphic sequence for the Middle Palaeolithic, with lithic assemblages attributed to the Denticulate Mousterian, Typical Mousterian and Quina Mousterian. This communication compares the archaeozoological data obtained for the Typical Mousterian and Quina Mousterian assemblages, two techno-complexes that are distinguished by important differences in their lithic industries. The large number of faunal remains discovered allows an exploration of the impact of this technical diversification on the methods of game exploitation.

Nearly 36,000 animal remains were analysed (7000 identified). Reindeer was the most abundant species in all the layers, with a small proportion of horse. Other species were present, but of marginal importance. The bone surfaces were well preserved, and many traces of human

activity could be observed, while evidence of consumption by carnivores was rare.

To compare the subsistence behaviours of the different Neanderthal groups that occupied the Roc-de-Marsal cave, we present a chronological comparison of the strategies employed in hunting game and the methods of butchery employed.

Although the overall similarities are clear, there are differences in the details that illustrate variability in the behaviour of Neanderthal populations. These observed differences are discussed to distinguish those representing a response to natural constraints (the health of the prey, etc.) and those that may relate to cultural traditions.

The bone material collected at Roc-de-Marsal is characterised by the abundance of anthropic marks not related to butchery. There is a very high proportion of *retouches*, but also various kinds of superficial marks, blunt tips and series of notches along the edges of some diaphyses.

These indicate that the animals were not used solely for food and that their exploitation gave rise to varied activities in the cave, and may be compared with the other types of archaeological data.

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## POSTER

### 22. THE SITE OF TATA (HUNGARY) REVISITED. MORPHO-FUNCTIONAL RESULTS SUGGEST HAFTING OF NEANDERTAL'S MICROLITHIC TOOLS

Borel, Antony - (UMR7194 - Département de Préhistoire, Muséum national d'Histoire naturelle) borel@mnhn.fr

Moncel, Marie-Hélène - (UMR7194 - Département de Préhistoire, Muséum national d'Histoire naturelle- CNRS) moncel@mnhn.fr

Several Western and Central European archaeological sites from the Marine Isotopic Stage (MIS) 5 to 3 yielded lithic artifacts odd by their small size (less than 30 mm long) into the Neanderthal world. However, the European Prehistory lacks a thorough study of these small artifacts to understand their potential function and to investigate Neanderthal capabilities, behaviours and conception of their tool kit.

We propose here a morpho-functional (morphometrics and usewear analysis) approach of the microlithic artifacts from Tata (Hungary), dated from the MIS 5, from 116

$\pm 1.6$  Kya to  $70 \pm 2$  Kya (U/Th), to understand how and for what purpose these tools were used. The open-air site of Tata yielded an extensive microlithic assemblage (more than 10,000 pieces) mainly made of local raw material: silicites-radiolarites (88 %), quartz and quartzite.

A sequential experimentation was carried out with local radiolarite in order to build a reference set of traces. The observation with a magnification glass (40x) of a sample of 7615 archaeological stone artifacts lead to the selection of 100 artifacts made of siliceous rocks with traces which could be due or intended to use. Both experimental and archaeological artifacts were observed with a reflected light microscope (50-500x) and a stereomicroscope (6.3-80x).

Morphometrics data consisted in the mass, length, width and thickness of each artifact selected for usewear analysis. Log shape ratios were used to gain insights into the variation of shape in the sample. The relationships between shapes and the presence of use traces were analyzed as well as the relation between shape and size and shape and mass with use traces.

The analysis of the archaeological sample resulted in the identification of 57 pieces with traces of use or hafting and 43 with indeterminate or no traces. The used artifacts have statistically significant larger dimensions than pieces with indeterminate or no traces. The tests on log shape ratios showed no significant difference of shape related to use. The primary mode of use identified was a transverse motion (N = 22) but some tools were also used in longitudinal mode (N = 9) and in percussive motion (N = 3). Hafting traces were identified on 24 flakes but only 6 pieces could be interpreted with a sufficient reliability score. The results were also crossed with previous typo-technological study of the assemblage.

In conclusion, the overall outline of the tools was probably not of great interest for the human (Neanderthal) from Tata. However, it seems that they were looking for artifacts with at least one sharp edge opposite a back, likely for better prehension or hafting. They used their production (pebble tools, raw and retouched flakes) hand held or hafted for several activities. The reason why they produced so small artifacts remains unknown as large pebbles were also available and the proportions among the studied sample, morphometric tests and usewear analysis showed that the smallest artifacts may not be the most frequently used.

POSTER

**23. TRANSPORTS OF STONE ARTEFACTS: INSIGHTS FROM LANGEDOCIAN LATE MIDDLE PALAEO-LITHIC ASSEMBLAGES**

*Lebègue, Frédéric - (UMR 7194, Muséum National d'Histoire Naturelle de Paris - UPVD, CNRS.) fred.lebague@gmail.com*

Raw material procurement and stone artefact handling strategies are key data sets for the study of Middle Palaeolithic hominin behaviour. Moreover, recent technological studies on Western Europe Mousterian assemblages underline the strong fragmentation of the *chaînes opératoires* and their close relationship with the mobile character of the Neandertal populations. These show also a more diversified nature of transported lithic items that what was commonly described for thirty years in the technological analysis. Ongoing research on the Langedocian Late Middle Palaeolithic provides new insights on the transport patterns of lithic objects made on non-local materials no matter the geographic scale.

This study integrates lithic technology and raw material data retrieved from the recent reassessment of the main regional Middle Palaeolithic series, which widely benefits from the last ten years progresses in cartography and detailed petrographic analysis of the Mediterranean north-western corner lithic resources. Based on fine-grained techno-economical analyses, the present contribution is specially focused on spatial fragmentation of the non-local and exotic materials reduction sequences and the identification of their transporting forms towards the diverse regional landscapes.

Data obtained on the languedocian assemblages, coming mostly from cave and rockshelter sites, confirm as well as add to the results of other works, conducted in the Aquitaine region, the Liguria or the nearby Rhône valley. They highlight the ubiquitous and continuous transport of stone artefacts of a wide variety of forms, despite the decrease in quantity and proportion of distant origin materials. Beside the usual Levallois flakes and retouched tools (scrapers), mobile toolkits regularly include different kinds of cortical or non-cortical flakes, thus not only desired end-products - among which very thin and sharp flakes, reshaping flakes, large thick flakes transformable into tools or cores - and already preformed cores. The transport, the exploitation and the passing through of cores upon 80 to 100 km as well as tool maintenance processes are widely documented in the Mediterranean area, both in coastal and hinterland sites, by refitting and different sets of byproducts (small

flakes, retouching flakes, fragments and chunks). Rather than specialized objects or specific tools, the toolkits of the Middle Palaeolithic groups seem to be composed by general purpose or multipurpose artefacts forming easily transportable and versatile reserves of raw material. Illustrating the Neanderthals abilities to anticipate their technical needs, the size of the imported equipment, as his composing and maintenance degree (resharpening/recycling) varies depending on the provisioning strategies, the planned activities on the site, but also on the techno-economical organization of the lithic techno-complexes (Quina, Levallois, ...).

Our results, matching with observations recently made on Middle Palaeolithic assemblages of other regions, underline the large scale of lithic artefacts moved by Neandertals, occasionally upon distances of 100km or more. This less stringent tool blanks selection criteria than usually assumed, illustrated by the transport and the use of all types of usable products (irregular flakes, 'wastes', ...) testifies to both the high flexibility of the raw material procurement strategies and the role of mobility in structuring Mousterian lithic assemblages.

ORAL CONTRIBUTIONS

ORAL

**24. NEANDERTHALS AMONGST NEANDERTHALS IN CENTRAL-SOUTHERN ITALY**

*Aureli, Daniele - (1Department of Physical Sciences, Earth and Environment - R.U. Prehistory and Anthropology - University of Siena, Italy 2Université Paris Ouest Nanterre La Défense UMR 7041 - ArScAn - équipe AnTET, France) danieleaureli@gmail.com*

*Moroni, Adriana - (Department of Physical Sciences, Earth and Environment - R.U. Prehistory and Anthropology - University of Siena, Italy) adriana.moroni@unisi.it*

*Arrighi, Simona - (Department of Physical Sciences, Earth and Environment - R.U. Prehistory and Anthropology - University of Siena, Italy) s.arrighi@hotmail.com*

*Boscato, Paolo - (Department of Physical Sciences, Earth and Environment - R.U. Prehistory and Anthropology - University of Siena, Italy) paolo.boscato@unisi.it*

*Boschian, Giovanni - (Department of Biology, University of Pisa, Italy) gboschian@biologia.unipi.it*

*Boschin, Francesco - (Department of Physical Sciences, Earth and Environment - R.U. Prehistory and Anthropology - University of Siena, Italy) fboschin@hotmail.com*

*Capecchi, Giulia - (Department of Physical Sciences, Earth and Environment - R.U. Prehistory and Anthropology - Uni-*

versity of Siena, Italy) [capecchigiulia@alice.it](mailto:capecchigiulia@alice.it)  
Crezzini, Jacopo - (Department of Physical Sciences, Earth and Environment - R.U. Prehistory and Anthropology - University of Siena, Italy) [crezzini@unisi.it](mailto:crezzini@unisi.it)  
Freguglia, Margherita - (Department of Physical Sciences, Earth and Environment - R.U. Prehistory and Anthropology - University of Siena, Italy) [margherita.freguglia@tiscali.it](mailto:margherita.freguglia@tiscali.it)  
Marciani, Giulia - (Instituto de Pesquisas Ambientais e Tecnológicas - IPAT - Universidade do Extremo Sul Catarinense - Santa Catarina, Brazil) [giuliamarciani@hotmail.i](mailto:giuliamarciani@hotmail.i)  
Parenti, Fabio - (Italian Institute of Human Palaeontology, Roma, Italy) [scriptoriumparenti@gmail.com](mailto:scriptoriumparenti@gmail.com)  
Ranaldo, Filomena - (Department of Physical Sciences, Earth and Environment - R.U. Prehistory and Anthropology - University of Siena, Italy) [filomenaranaldo@gmail.com](mailto:filomenaranaldo@gmail.com)  
Ricci, Stefano - (Department of Physical Sciences, Earth and Environment - R.U. Prehistory and Anthropology - University of Siena, Italy) [stefano.ricci@unisi.it](mailto:stefano.ricci@unisi.it)  
Spagnolo, Vincenzo - (Department of Physical Sciences, Earth and Environment - R.U. Prehistory and Anthropology - University of Siena, Italy) [orpheus.85@hotmail.it](mailto:orpheus.85@hotmail.it)  
Ronchitelli, Annamaria - (Department of Physical Sciences, Earth and Environment - R.U. Prehistory and Anthropology - University of Siena, Italy) [annamaria.ronchitelli@unisi.it](mailto:annamaria.ronchitelli@unisi.it)

The Italian Peninsula seems to be playing an important role in the debate on the cultural occurrences connected to Neanderthals. Its particular geographical position, as a peripheral appendix of the European continent, gives origin to a territory constrained in a long and narrow strip of land which, differently from the vast plains of Northern Europe, acts as a *cul de sac* in the population dynamics of humans and animals.

At the same time, the highly variable and fragmented landscapes, sprouting from a great geomorphological variety (Apennine Chain - coastal areas), create the conditions for a wide range of resources and for a mosaic-like peopling of the Peninsula. From a chronological standpoint too, a narrowing of the time range of Neanderthal record is observable, particularly in Southern Italy. This is defined, in comparison to the wider European context, by a late appearance of *Levallois* in lithic industries (OIS 5) and by an early arrival of the first cultures connected to *Homo sapiens* (Uluzzian, about 45-44 kys BP).

For this reason, the study of Neanderthal communities who occupied Southern Italy during that time span provides a very interesting viewpoint for the understanding of their actual variability and complexity. Over the last decade, Middle Palaeolithic research in Italy has experienced an important methodological renewal thanks not only to the diffusion of technological approach in

lithic studies, but also to the broader attention paid to behavioural expressions of these human groups: exploitation strategies of the territory and of the mineral and food resources, spatial organization, mobility within territories, stone tool production, fire technology, symbolic expressions, etc.

Investigations carried out by Research Unit in "Prehistory and Anthropology" of the University of Siena fit within this framework of methodological renewal and focus the on key sites located in different regions of Central-Southern Italy.

This work wants to present and compare the results obtained over the last few years from the sites of Cala dei Santi (Southern Tuscany), Castelcivita, Molare and Grotta Grande (Campania), Oscuruscuito and Santa Croce (Apulia), with the aim of shedding light on Neanderthals' behavioural variability.

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ORAL

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**25. NEW INTERDISCIPLINARY DATA TO UNDERSTAND THE SHORT-TERM OCCUPATIONS AT TEIXONERES CAVE (MOIÀ, BARCELONA, SPAIN)**

Rosell, Jordi - (IPHES, Institut Català de Paleoecologia Humana i Evolució Social, C. Marcel·lí Domingo s/n, Campus Sescelades URV (Edifici W3), 43007 Tarragona, Àrea de Prehistòria, Universitat Rovira i Virgili (URV), Av. Catalunya 35, 43002 Tarragona (Spain) [jordi.rosell@urv.cat](mailto:jordi.rosell@urv.cat)  
Blasco, Ruth - (The Gibraltar Museum, 18-20 Bomb House Lane, PO Box 939, Gibraltar) [rblascolopez@gmail.com](mailto:rblascolopez@gmail.com)  
Rivals, Florent - (IPHES, Institut Català de Paleoecologia Humana i Evolució Social, C. Marcel·lí Domingo s/n, Campus Sescelades URV (Edifici W3), 43007 Tarragona, Àrea de Prehistòria, Universitat Rovira i Virgili (URV), ICREA, Barcelona (Spain) [frivals@iphes.cat](mailto:frivals@iphes.cat)  
Chacón, María Gema - (IPHES Institut Català de Paleoecologia Humana i Evolució Social, C. Marcel·lí Domingo s/n, Campus Sescelades URV (Edifici W3), 43007 Tarragona, Àrea de Prehistòria, Universitat Rovira i Virgili (URV), UMR7194 - Département de Préhistoire, Muséum national d'Histoire naturelle, 1, rue René Panhard, 75013 Paris, France) [gchacon@iphes.cat](mailto:gchacon@iphes.cat)  
Blain, Hugues-Alexandre - (IPHES Institut Català de Paleoecologia Humana i Evolució Social, C. Marcel·lí Domingo s/n, Campus Sescelades URV (Edifici W3), 43007 Tarragona, Àrea de Prehistòria, Universitat Rovira i Virgili (URV)) [hablain@iphes.cat](mailto:hablain@iphes.cat)  
López-García, Juan Manuel - (Sezione di Scienze Preistoriche e Antropologiche, Dipartimento di Studi Umanis-

*tici, Università degli Studi di Ferrara, C. so Ercole I d-Este, 32, 44100 Ferrara, Italy) lpzjmn@unife.it*

*Picin, Andrea - (Neanderthal Museum, Mettmann, Germany, IPHES Institut Català de Paleoecologia Humana i Evolució Social, C. Marcel·lí Domingo s/n, Campus Sescelades URV (Edifici W3), 43007 Tarragona, Àrea de Prehistòria, Universitat Rovira i Virgili (URV) ) picin@neanderthal.de*

*Camarós, Edgard - (IPHES Institut Català de Paleoecologia Humana i Evolució Social, C. Marcel·lí Domingo s/n, Campus Sescelades URV (Edifici W3), 43007 Tarragona, Àrea de Prehistòria, Universitat Rovira i Virgili (URV) edgard.camaros@gmail.com*

*Rufà, Anna - (IPHES Institut Català de Paleoecologia Humana i Evolució Social, C. Marcel·lí Domingo s/n, Campus Sescelades URV (Edifici W3), 43007 Tarragona, Àrea de Prehistòria, Universitat Rovira i Virgili (URV) arufa@iphes.cat*

*Sánchez, Carlos - (IPHES Institut Català de Paleoecologia Humana i Evolució Social, C. Marcel·lí Domingo s/n, Campus Sescelades URV (Edifici W3), 43007 Tarragona, Àrea de Prehistòria, Universitat Rovira i Virgili (URV) carsanher88@gmail.com*

*Arilla, Maite - (IPHES Institut Català de Paleoecologia Humana i Evolució Social, C. Marcel·lí Domingo s/n, Campus Sescelades URV (Edifici W3), 43007 Tarragona, Àrea de Prehistòria, Universitat Rovira i Virgili (URV) lacasadelpresa@gmail.com*

*Gómez de Soler, Bruno - (IPHES Institut Català de Paleoecologia Humana i Evolució Social, C. Marcel·lí Domingo s/n, Campus Sescelades URV (Edifici W3), 43007 Tarragona, Àrea de Prehistòria, Universitat Rovira i Virgili (URV) bgomez@iphes.cat*

*Bustos, Guillermo (IPHES Institut Català de Paleoecologia Humana i Evolució Social, C. Marcel·lí Domingo s/n, Campus Sescelades URV (Edifici W3), 43007 Tarragona, Àrea de Prehistòria, Universitat Rovira i Virgili (URV)) - guillermo.willbustos@gmail.com*

Different types of human settlements can be found both in caves and rock-shelters during the Middle Palaeolithic (e.g., camp-sites, seasonal occupations, short settlements, etc.). Distinguishing these types of occupations is not an easy task. Furthermore, the palimpsest character documented in the most of the archaeological sites difficult still more the interpretation of them. Nevertheless, data from multidisciplinary studies can help making approaches and characterizing in a more accurate way these accumulations.

Level III of Teixoneres Cave (Moià, Barcelona, Spain) has provided a significant record belonging to the Late Pleistocene (MIS 3). It corresponds to a palimpsest alternating human and carnivorous activities. The stratigraphic sequence, spanning more than 7 m high, is dated between  $100.3 \pm 6.1$  ka and ca. 14-16 ka BP.

The multidisciplinary works carried out on Level III assemblage since 2007 showed a significant biological dynamic related to carnivore activities, mainly bears and hyenas. This constant dynamic was perturbed occasionally by the presence of human groups, with an occupational model based on the use of the cave as an occasional shelter by small groups of Neanderthals during very short periods of time. This was mainly demonstrated by:

- (1) the reduced dimensions and the thinness of the hearths and the limited spatial extension of the activity areas related to them (discrete areas);
- (2) the high diversity of large mammals and low integrity of their skeletons;
- (3) the low number of anthropogenic bone damage (cutmarks, burning damage and intentional bone breakage);
- (4) high carnivore damage;
- (5) presence of characteristic remains of carnivore dens (immature individuals, coprolites, etc.);
- (6) the diversity of allochthonous stone raw materials;
- (7) the fragmented character of the lithic operative chains realized on allochthonous raw materials in opposition of the complete reduction sequences realized on local stones (basically the quartz).

A multiproxy palaeoecological approach based on studies of pollen, charcoal, small vertebrates (amphibians, squamates and small mammals)- and large-mammal dental wear indicates temperate and humid conditions for Level III (López-García et al. 2012). More recently, the identification of few remains of cold-adapted ungulates, such as woolly mammoth and woolly rhinoceros –which does not fit with the previous climatic interpretation–, suggests the occurrence of climatic shifts during the sedimentary formation of this unit. The presence, in the same level, of both cold and temperate taxa clearly supports that Level III correspond to a palimpsest of several occupations. Moreover, the new results obtained from the zooarchaeological and taphonomic analysis of small preys such as the leporid remains corroborate the expeditious character of the human occupation patterns (Rufà 2013). In addition, tooth microwear study on ungulates permits to identify a succession of short and seasonal events (Sánchez Hernández 2013) and allow to distinguish a higher intensity of human activities at the lower part of the palimpsest of Level III. Studying the hu-

man occupational pattern provides a framework focused on understanding the Neanderthal groups' behaviour in a territory. The aim of this study is to characterize the short-term occupations and value the human-carnivore interactions at Teixoneres Cave level III and by extension in the European Middle Palaeolithic.

ORAL

## 26. LAS CALLEJUELAS (MONTEAGUDO DEL CASTILLO, TERUEL): A HIGH-ALTITUDE SITE OCCUPIED DURING THE OIS 5

*Utrilla Miranda, Pilar - (Universidad de Zaragoza) utrilla@unizar.es*

*Domingo Martínez, Rafael - (Universidad de Zaragoza) rdomingo@unizar.es*

*Torres Pérez-Hidalgo, Trinidad de - (Universidad Politécnica de Madrid) trinidad.torres@upm.es*

*Ortiz Menéndez, José Eugenio - (Universidad Politécnica de Madrid) joseeugenio.ortiz@upm.es*

Las Callejuelas is an open-air, high-altitude (1450 m) site located in a strategic area in the Sierra de Gúdar – Maestrazgo region. It occupies the margins of a small ravine that serves as a corridor to canalize the faunal displacements and links two different biotopes: a dry, semi-step-pic zone in the southern area and an endorreic, more humid valley in the northern slope. Even today, the region presents severe challenges for the human life: it is one of the coolest in the Iberian Peninsula, with a continental, dry climate influenced by the notable altitude and its location in the heart of the Iberian range.

There, groups of Neanderthal people hunted Bovidae and horses as well as some Cervidae. The coarse and small-sized lithic industry is based mainly in non-canonical endscrapers and perforators that have been knapped on low-quality raw materials.

Recently, some teeth have been dated by racemization, with interesting and coherent results: the upper part of the stratigraphy has been dated in 116 ky, the middle part in 122 ky and the lower part in 135 ky. The site was occupied during the OIS 5, in coincidence with some of the human presences in Bolomor and Cuesta de la Bajada, with whom Las Callejuelas shares technological similitudes. The human occupation of the site during the interglacial period is well suited with the extreme climate that characterizes the region and its condition of open-air butchery camp.

ORAL

## 27. PERSISTENCE AND EVOLUTION OF NEANDERTAL BEHAVIOR IN THE ARBREDA CAVE DURING THE UPPER PLEISTOCENE SOLER, JOAQUIM - (UNIVERSITAT DE GIRONA) JOAQUIM.SOLER@GMAIL.COM

*Soler, Narcís - (Universitat de Girona) narcis.soler@udg.edu*

The Neandertals occupied the Arbreda cave (located in Serinyà, NE Iberian Peninsula) since the beginning of the Upper Pleistocene until their disappearance around 40.000 bp. Although most occupations have low spatial and vertical resolution, there are no other sites in the region with wider or even similar chronological limits. Therefore the evidences provided by this site could contribute to describe the evolution of the Neandertal behavior in the long term scale.

More than 30.000 lithic artifacts and good preserved faunal remains distributed in a 4 meters deep stratigraphy have been documented. They have been chronologically framed by Uranium series results for the bottom, which we introduce for first time in this paper, and radiocarbon results for the top.

The archaeological remains of their occupations in the Arbreda cave confirm the commonly admitted idea about the persistence of their technological traditions, which only seem to evolve slightly at the end of the sequence just before the arrival of the Archaic Aurignacian. However several components and choices of their technological behavior may be considered unreasonable if analyzed only under the actual and dominant economic logic, which is commanded by the idea of productivity. In opposition to that evidence for technological stability, the way in which the cave was occupied differs significantly between the beginning of the Upper Pleistocene and the interruption of the Mousterian traditions. This evolution should be explained in relation to the alternating uses of the cave between the *Homo neanderthalensis* and the *Ursus speleaeus*, whose remains are absent in the bottom of the Mousterian sequence but omnipresent at the end.

In order to study the Neandertal behavior in the long term scale, the evidences discovered in the Mousterian levels of the Arbreda cave show the need to combine the ideas of the technological stability, occupational variability and economic singularities. A better understanding of those phenomena might be obtained with more spatial and temporal resolution. Therefore the Mouste-

rian sequence of the Arbreda cave should be enlightened with the evidence provided by the sites with true occupational resolution, which are fortunately present in different landscapes of Catalonia.

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ORAL

**28. SOME CLUES TO NEANDERTHAL BEHAVIOR FROM A HIGH-RESOLUTION RESIDENTIAL CONTEXT: LEVEL M OF ABRIC ROMANI (CAPELLADES, SPAIN)**

Chacón, María Gema - (IPHES, URV, UMR7194-MNHN) gchacon@iphes.cat

Vaquero, Manuel - (IPHES, URV) manuel.vaquero@urv.cat

Vallverdú, Josep - (IPHES, URV) jvallverdu@iphes.cat

Gómez de Soler, Bruno - (IPHES, URV) bgomez@iphes.cat

Marín, Juan - (IPHES, URV (Tarragona, Spain)) juan.marin.hernando@gmail.com

Picin, Andrea - (Neanderthal Museum, IPHES(Germany), URV (Tarragona, Spain)) picinandrea@gmail.com

Romagnoli, Francesca - (Università degli Studi di Firenze (Italy)) f.romagnoli2@gmail.com

Solé, Alex - (IPHES, URV (Tarragona, Spain)) alexsole1@gmail.com

Allué, Ethel - (IPHES, URV (Tarragona, Spain)) eallue@iphes.cat

Bargalló, Amèlia - (IPHES, URV (Tarragona, Spain)) ameliabarg@gmail.com

Bartrolí, Raül - (Àrea de Patrimoni Arqueològic, Ajuntament de Capellades (Barcelona, Spain)) bartroliir@capellades.cat

Blain, Hugues-Alexandre - (IPHES, URV (Tarragona, Spain)) hblain@iphes.cat

Burjachs, Francesc - (ICREA (Barcelona), IPHES, URV (Tarragona, Spain)) fburjachs@iphes.cat

Cáceres, Isabel - (IPHES, URV (Tarragona, Spain)) icaceres@iphes.cat

Campeny, Gerard - (IPHES, URV (Tarragona, Spain)) gcampeny@iphes.cat

Expósito, Isabel - (IPHES, URV (Tarragona, Spain)) iexpósito@iphes.cat

Fernández, Mónica - (IPHES, URV (Tarragona, Spain)) monica.fernandez.garcia90@gmail.com

Gabucio, María Joana - (IPHES, URV (Tarragona, Spain)) mj.gabucio@gmail.com

López-García, Juan Manuel - (Università degli Studi di Ferrara (Italy)) lpzjmn@unife.it

Rivals, Florent - (ICREA (Barcelona), IPHES, URV (Tarragona, Spain)) frivals@iphes.cat

Rosell, Jordi - (IPHES, URV (Tarragona, Spain)) jordi.rosell@urv.cat

Saladié, Palmira - (IPHES, URV (Tarragona, Spain)) psala-

die@iphes.cat

Carbonell, Eudald - (IPHES, URV (Tarragona, Spain), IVPP (Beijing, China)) ecarbonell@iphes.cat

Neanderthal behavior is a much-debated topic in current archeological and paleoanthropological research, mostly due to the particular role of Neanderthals in the discussion about the emergence of modern behavior. Neanderthal behavioral patterns have been too often approached from the study of low-resolution lithic and faunal assemblages, which tend to reduce the range of variability by merging together different activity events. This time-averaging problem may yield an inaccurate picture of Neanderthal behaviors. High resolution assemblages in which palimpsest dissection is a feasible endeavor are therefore particularly suitable for approaching the behavioral variability of Neanderthals. This high-resolution approach is enhanced when the analysis of archeological remains is coupled with a detailed spatial perspective allowing to put activities in context.

Our approach to Neanderthal behavior is based on the study of level M of Abric Romaní (Capellades, Spain). This level, dated to c. 51-55 kyr BP, can be considered as a good example of a high-resolution and spatially-controlled assemblage even if some data suggest that it is an archeological palimpsest. The analysis of different types of archeological remains (including wood imprints) with a multidisciplinary approach is focused on identifying activity events and defining activity areas through spatial distributions and refittings.

The results of this study have allowed to show the behavioral variability of level M dwellers, especially concerning lithic technology. Besides characterizing provisioning and reduction strategies, lithic analysis will emphasize the importance of intrasite artifact transport and recycling in assemblage formation. On the other hand, the faunal remains indicate that humans were the main agent in assemblage formation as in the rest of the archaeological layers of the stratigraphic sequence. Different hearth-focused activity areas have been identified, some of them connected by refits, which opens the possibility to scrutinize the temporal relationship between the spatial units forming level M.

The focus on the high-resolution events forming an archeological assemblage highlights the variability of Neanderthal behavior in the short term. Moreover, the comparison between level M and other layers of the Abric Romaní sequence suggests that some behavioral patterns change according to factors acting at long-term temporal scales. The example of level M illustrates how

Neanderthal behavior is conditioned by different factors operating at different temporal scales and underscores the importance of temporal issues in the debate on behavioral variability.

## ORAL

### 29. NEANDERTHAL POPULATION UPS AND DOWNS IN THE ALCOY REGIONS, SPAIN

*Hernández Gómez, Cristo M. - (U. de La Laguna) chergomw@gmail.com*

*Galván Santos, Bertila - (U. de La Laguna) bgalvan@ull.es*

*Carolina Mallol Duque - (U. de La Laguna) cmallol@ull.es*

*Machado Gutiérrez, Jorge - (U. La Laguna) jorgemachado85@gmail.com*

*Sistiaga Gutiérrez, Ainara - (U. de La Laguna) ainarasistiaga@gmail.com*

*Pérez Luis, Leopoldo - (U. Rovira i Virgil) leoperezluis@gmail.com*

*Molina Hernández, Francisco Javier - (U. de Alicante) jamonite@gmail.com*

*Vidal Matutano, Paloma (U. de Valencia) - p.vidal.mat@gmail.com*

El Salt is a Middle Palaeolithic site situated at the headwaters of the Serpis River (Alcoy, Spain). It is an open air place at the foot of a 38 meter-high cliff, located in a mountainous region of Alicante. It is near abundant flint sources and it occupies a strategic position at the confluence of two rivers with different biotopes and a freshwater spring system. This archaeological site is currently being the subject of a multidisciplinary research project mainly focused on the disappearance of Neanderthals and the earliest Upper Palaeolithic evidences of the Iberian Mediterranean.

In this communication geoarchaeological, chronological and paleoanthropological data from its Middle Palaeolithic sequence are presented. Alongside with those of other sites, they cast doubts on the hypothesis of survival of Iberian Neanderthals south of the Ebro River.

Our multidisciplinary perspective is oriented to the integration of geoarchaeological techniques (chronostratigraphy, geomorphology, paleobotany, geochemistry and micromorphology) and lithic and faunal studies in order to approach Neanderthal occupations at a high temporal resolution of analysis.

From the base of the sequence (SU XII) up to SU IX (around 50 thousand years ago) data show a pattern

of frequent but of short duration human occupations. These are materialized in a complex archaeological palimpsest in which site abandonment periods have been identified through archaeostratigraphic, micromorphologic and of biomarker analysis. Combustion structures are abundant in this part of the sequence, and their spatial distribution in relation to other archaeological remains indicates that they were a focus of human activity. From SU VIII up to SU lower V, human impact as reflected on artifact and faunal remains shows decline, coinciding with the end of Heinrich 5 event.

The base of SU V (around 47 thousand years ago), which is the uppermost and archaeologically poorest layer of the entire sequence, yielded teeth from the upper maxilla of a young adult individual. It is identified as a Neanderthal in a clearly Mousterian context. These fossils possibly represent some of the last Neanderthals of the region. There is no other evidence of Neanderthal presence in the area after this date.

This evidence -the latest Middle Palaeolithic of El Salt- is overlaid by a thick archaeologically sterile deposit. A similar discontinuity pattern has been attested at the nearby site of Cova Beneito, as well as in other Iberian sites.

These preliminary results from El Salt point to a gradual decrease of Neanderthal presence since 50 thousand years ago, coinciding with a paleoenvironmental shift towards driest conditions. The impact produced by such shift on regional human dynamic needs to be further investigated, but all data seem to indicate some degree of regional depopulation prior to the instalment of the earliest Upper Palaeolithic groups.

## POSTER SESSION 3

## POSTER

### 30. SYMBOLIC CHARACTER PRODUCTIONS IN THE MOUSTÉRIAN SITE OF LA ROCHE-COTARD IN LANGEAIS (INDRE-ET-LOIRE, FRANCE).

*Marquet, Jean-Claude - (CITERES/LAT/UMR 7324) jcmarquet@wanadoo.fr*

*Lorblanchet, Michel - (CNRS) michel.lorblanchet@wanadoo.fr*

The site of La Roche-Cotard is located on the right side of the Loire valley about twenty kilometers downstream from Tours. The cave, probably discovered in 1846, following the extraction of materials in front of the cave,



was excavated in 1912 to give mousterian industry. Researches start again in 1975 during 3 years and then from 2008 till now.

The first retaking of excavations in 1975 allowed the discovery, in front of the entrance of the cave, at the foot of the chalk cliff limestone, of a bit of beach of Loire river on which Neandertal have lit a fire, left mousterian industry and a protofigurine called by M. Lorblanchet the "mask of La Roche-Cotard" (Marquet and Lorblanchet, *Paleo* n°12/2000 and *Antiquity* 77/298/2003). A very low shelter was also found, containing some pieces of lithic industry and developments of blocks on the ground.

The second resumption of excavations in 2008 allowed the discovery of a small cave shelter filled with sediments and whose entrance was completely obscured by deposits on the slope. The imposing stratigraphy also revealed evidence of occupation by Neandertal. But these renewed excavations especially allowed to continue working within the main cavity.

Thorough examination of the walls, made with help of M. Lorblanchet, P. Paillet and E. Man-Estier, allowed to recognize, without any chronological hypothesis then preferred, three panels of traces using fingers or using an instrument giving the same type of traces, and a panel of punctuations.

These traces are visible because there were material removal on the wall of limestone weathered chalk covered with a thin film of clay and silt. On one of the panels, there is a circular representation; another triangular area is completely covered with parallel, organized, rhythmic, applied traces; a third rectangular panel has yet parallel tracks. On the other hand, four red ocher stains, three were discovered in a hidden place of a narrow tunnel and another one in the same tunnel near a wide crack.

The geometric size and morphological studies of deposits of all four loci of the site, as well as numerous bones datings from the  $^{14}\text{C}$  and sediments by the OSL method permit to show that after the occupation of the cave by hyenas which followed that one of Neandertal, the entrance of the cavity was completely obscured and that it was reopened only in 1846 or even in 1912.

No direct dating of plots is obviously possible. However, their local alteration, very strong in some areas (friction due to furs?), much more lighter elsewhere (draught?), datings of bones and sediments just in front of panels and naturally the shutting of the entrance of the cave after occupation by Neandertal allow to exclude a recent age for these plots.

Mask, tracks and traces of paint in an inaccessible cavity for *Homo sapiens* until 1846 (geometry of deposits and not any Upper Paleolithic tool discovered in the four loci) give the site of La Roche-Cotard a great interest at a moment when we reconsider seriously the question about competency of Neandertal.

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POSTER

**31. THE EARLY MIDDLE PALAEOLITHIC OF THE CANTABRIAN CORNICHE AND THE AQUITAIN BASIN. A TECHNO-ECONOMIC STUDY OF PREHISTORIC SETTLEMENTS FROM CANTABRIA AND PERIGORD.**

*Djema, Hélène - (Conseil général du Val-d'Oise UMR 7041 ArScAn) helene.djema@free.fr*

In this study, the author considers the advances in the archaeological, anthropological and chrono-climatical domains to understand the place which occupies the ancient middle Palaeolithic (M.I.S.9 to 6) in the technical evolution of the past societies.

By revising the theoretical models of the technical evolution, it turns out that the question of the cultural phenomenon is situated in the heart of the problematic. Also, the purpose of the analysis is to enrich the documentation and to pursue the reflection on the existing relations between the cultural phenomenon and the technical data of the first neandertalians. The comparative techno-economic approach seems to answer in part of those expectations. Six lithics assemblages are studied : Petit Bost, Combe Brune III, Vaufrey cave, El Hondal, La Verde and El Castillo cave.

The study of those six lithics assemblages from Perigord and Cantabria supports the idea that the cultural phenomenon would be a process of progressive complexity, a process of "individuation" according to Gilbert Simondon's terms, of which "Moustérien" constitute a particular case.

The first neandertalians' comportemental strategies are certainly complex. Their technical systems are not strong marker pens of cultural entities. It is necessary to wait for news discoveries and fall on sites rich in information about these ethnocultural aspects. One day we will put in evidence of others comprtemental strategies, certainly more complex than what we imagine and propose more realistic scenarios on the meaning of the variability but also on the evolutionary processes of those technical systems.

POSTER

**32. NEANDERTHAL BEHAVIOUR AT THE MIDDLE PALAEOLITHIC SITES OF ABRI DU MARAS AND BAUME-VALLÉE (SOUTH-EASTERN FRANCE): PRODUCTION AND FUNCTION OF CONVERGENT STONE TOOLS.**

*La Porta, Alice Oriana - (Muséum National d'Histoire Naturelle, Département de Préhistoire, Paris, France) alice\_laporta@hotmail.it*

*Moncel, Marie-Hélène - (Département de Préhistoire, UMR 7194, Muséum National d'Histoire Naturelle, Paris, France-CNRS) moncel@mnhn.fr*

*Raynal, Jean-Paul - (CNRS, UMR 5199 PACEA-PPP, Université Bordeaux 1, F-33400 Talence, France) jpraynal@wanadoo.fr*

Recent research have shown that Neanderthal's subsistence and hunting strategies were much more complex than those of passive scavengers. Further discoveries in European and Levant Middle Palaeolithic contexts might suggest the growing importance of throwing systems in hunting equipments.

In an attempt to better understand Neanderthal behaviours connected with the production of stone tools possibly linked with the manufacture of hunting weapons, convergent stone tools from the Middle Palaeolithic sites of Abri du Maras (Ardèche, France) and Baume-Vallée (Haute-Loire, France) were examined to establish how they were produced and their possible use.

A multi-analytical approach has been followed using technological analysis; morphometry and macro-use wear analysis.

From a corpus of 162 pointed tools, Levallois points have been compared to triangular flakes to identify the operational schemes involved. Tip cross-sectional area (TCSA) value has been calculated to testy the penetration degree of stone-tips. Moreover a low power approach with a binocular microscope Olympus SZ-PT (10–63 magnification) was used to observe impact fractures and hafting traces.

Technological studies at Abri du Maras have shown that pointed tools, issued from several knapping methods (Levallois, Discoid), were mostly unretouched Levallois points obtained by five main recurrent or preferential operational schemes (OS), (unipolar convergent OS, unipolar longitudinal OS, bipolar OS, centripetal OS and peripheral-orthogonal). Whereas at Baume-Vallée convergent and Quina scrapers, extensively retouched, represented the largest portion.

The morphometric TCSA values for the corpus of points have indicated low values compared to ethnographic darts, arrow tips and experimental thrusting spear data. Moreover TCSA values fell well within the expected values observed for experimental throwing spear and dart tips.

Preliminary macro use-wear analysis on a small sample of artefact showed evidence of possibly diagnostic impact fractures on their tip (step termination, burin-like fractures and spin-off) presumably connected with throwing activities.

The initial results from Abri du Maras and Baume-Vallée show a technological purpose to produce convergent tool shape using several reduction sequences, nonetheless relationship between shape and function cannot be easily established. At Abri du Maras TCSA values match the range proposed for throwing spears and dart tips and the existence of impact fractures suggest that even being multi-functional tools, either hafted or used as hand tools, a small sample of convergent artefacts may have functioned as projectile points, probably connected with hunting activities.

Stone tool projectile technology has generally been linked to the early African modern humans, therefore plausible evidences of Neanderthal projectile weapons at Abri du Maras during European Middle Palaeolithic, although being sporadic, should be able to question on current Neanderthal behaviours.

POSTER

**33. THE GRAJAS CAVE OF ARCHIDONA (MÁLAGA, SPAIN). ONE EXAMPLE OF HUMAN OCCUPATION IN CAVES IN THE LATE MIDDLE PLEISTOCENE IN THE SOUTH OF IBERIAN PENÍNSULA.**

*Toro Moyano, Isidro - (Museo Arqueológico de Granada) isidro.toro@juntadeandalucia.es*

*Jiménez Arenas, Juan Manuel - (Departamento de Prehistoria y Arqueología Universidad de Granada) jumajia@ugr.es*

Las Grajas cave of Archidona (Málaga, Spain) represent one of the oldest examples of human occupation in caves in the south of the Iberian peninsula. Levels belonging to the late middle Pleistocene offers us a interesting portrait of environmental conditions and how interact and use resources by groups of hunter-gathered equipped with a Mousterian lithic technology aspect, typical of early middle Paleolithic.

POSTER

**34. NEW INSIGHTS INTO NEANDERTHAL DIET USING THE FAECAL BIOMARKER APPROACH**

*Sistiaga, Ainara - (Universidad de La Laguna, Massachusetts Institute of Technology) msistiag@ull.es*

*Summons, Roger E. - (Massachusetts Institute of Technology) rsummons@mit.edu*

*Mallol, Carolina - (Universidad de La Laguna) cmallol@ull.es*

*Galván, Bertila - (Universidad de La Laguna) bgalván@ull.es*

Neanderthal dietary interpretations have, until now, been based on indirect evidence and may disregard the role of plants as a food source. At present, there is some ambivalence in the paleodietary information available from the fossil record. While zooarchaeological and stable isotope data portray Neanderthals as prime carnivores, evidence of plant intake from dental calculus and paleobotanical remains warn us about the possible importance of plants in the hominin diet. Thus, our current view of Neanderthals diet does not provide information about the relative amounts of different kinds of foods that contributed most to their diets. What were Neanderthals' regular meals.

GC-MS analyses were carried out using a sensitive and selective detection method, that is, multiple reaction monitoring (MRM). We used precursor-product mass spectrometric transitions for sterol and stanols in combination with gas chromatographic retention times to establish the composition of steroidal lipids isolated from combustion structures from El Salt Middle Paleolithic site Unit X.

The sediment samples belong to the stratigraphic unit under current excavation (S.U. X) and are associated with archaeological remains and sedimentary facies were excavated, sampled and documented according to a methodology geared to the identification of human occupation episodes. The selected combustion features belong to diachronous archaeological facies association.

Our gas chromatography-mass spectrometry results from El Salt (Spain), a Middle Palaeolithic site dating to ca. 50,000 yr. BP, represents the oldest positive identification of human faecal matter. Our study demonstrates that Neanderthals, like anatomically modern humans, exhibit a high rate of conversion of cholesterol to coprostanol related to the presence of necessary gut bacteria. Analysis of five sediment samples from different occupation floors suggests that Neanderthals predominantly consumed meat, as indicated by high coprostanol propor-

tions, but also had significant plant intake, as shown by the presence of 5 $\beta$ -stigmastanol. This study highlights the potential of the biomarker approach in Pleistocene contexts as a provider of direct palaeodietary information and supports the opportunity for further research into cholesterol metabolism throughout human evolution.

POSTER

**35. THE HOMINID TEETH FROM THE CAVE OF LE PORTEL-OUEST (ARIÈGE, FRANCE)**

*Becam, Gaël - (UPVD-CERP-MNHN) gael.becam@cerptautavel.com*

*Chevalier, Tony (UPVD-CERP-MNHN) tony.chevalier@cerptautavel.com*

*Grégoire, Sophie (UPVD-CERP-MNHN) sophie.gregoire@cerptautavel.com*

*Braga, José (AMIS) jose.braga@univ-tlse3.fr*

*Balzeau, Antoine (UPVD-CERP-MNHN) abalzeau@mnhn.fr*

*de Lumley, Marie-Antoinette (UPVD-CERP-MNHN) lumley@mnhn.fr*

*Régis Vézian (UPVD-CERP-MNHN)*

The cave of Le Portel-Ouest (Loubens, France) is the only site in Ariège that contains a stratigraphic sequence that extends from the Middle Paleolithic to the Upper Paleolithic. Between 1949 and 1985, 33 human remains were discovered (dental, cranial and postcranial remains) in successive Mousterian layers dating from the end of IOS 3 (44 ky). This study aims to establish the taxonomic affinities of Le Portel's hominid fossils from dental elements.

The series of Le Portel-Ouest is composed by twenty three teeth (12 deciduous and 11 permanent), representing a minimum of 5 individuals. Dental remains are compared with a Neandertal and Modern Human samples. Coronary dimensions and non-metric characters of the outer enamel surface (OES) and the enamel-dentine junction (EDJ) are considered (data from  $\mu$ CT-scan).

The external metric analysis reveals low coronary dimensions (M-D; V-L) of deciduous and permanent teeth from Le Portel-Ouest. On the other hand, some of the non-metric morphological features of OES and EDJ have clear similarities with Neandertal teeth. Several of non-metric features, characteristics of Neandertals, were observed on both the deciduous and permanent teeth of the same dental class. However, lower definitive incisors are less taxonomically discriminating.

Thus, the occlusal morphology of deciduous and permanent teeth from Portel-Ouest presents some affinities with Neandertals. The Neandertal occlusal morphology combined with especially coronary reduced dimensions has been already reported for Neandertal individuals from Hortus (Hérault, France), which has a geographical and chronological proximity to Le Portel-Ouest.

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POSTER

### 36. UPDATING THE WESTERN LANGUEDOC AND ROUSSILLON MOUSTERIAN WORLD

*Saos, Thibaud - (CERP UPVD UMR 7194) saos@cerptautavel.com*

*Magniez, Pierre - (CERP UPVD UMR 7194) magniez@cerptautavel.com*

*Moigne, Anne-Marie - (CERP MNHN UMR 7194) moigne@mnhn.fr*

*Gregoire, Sophie - (CERP UPVD UMR 7194) gregoire@cerptautavel.com*

The Languedoc-Roussillon french region contains numerous and rich mousterian sequences mostly revealed by old excavations, and the findings were recently reviewed by university works in different fields (paleontology, technology, petrography,...). These studies confirmed the great potential and interest of these sites in the aim of characterizing the regional mediterranean Mousterian.

However, this pluridisciplinary studies are almost curbed by gaps, particularly on levels dating or confuse stratigraphic context of remains discovery, and the extensive exploitation of those old collections requires a field back to validate archeostratigraphic and chronostratigraphic results.

It's the aim of the multiannual PCR (Research Collective Program) "The western Languedoc and Roussillon Mousterian world" supported by French Culture Ministry, started in 2013 with four key sites (Tournal cave, Crouzade cave, Ramandils cave, Montou cave) and now extended to the entire region, which first results will be submitted for discussing the status of this regional area in the global mousterian sphere.

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POSTER

### 37. LITHIC ASSEMBLAGES OF AZOKH CAVE (NAGORNO KARABAGH, LESSER CAUCASUS)

*Asryan, Lena - (IPHES, Institut Català de Paleoecologia Humana i Evolució Social, C/ Marcel·lí Domingo s/n (Edifici W3), Campus Sescelades, 43007 - Tarragona - SPAIN) lenap-rehistoria@gmail.com*

*Ollé, Andreu - (IPHES, Institut Català de Paleoecologia Humana i Evolució Social, C/ Marcel·lí Domingo s/n (Edifici W3), Campus Sescelades, 43007 - Tarragona - SPAIN) aolle@iphes.cat*

*Moloney, Norah - (Museo Nacional de Ciencias Naturales (CSIC), C/José Gutiérrez Abascal, 2, 28006 - Madrid - SPAIN) tcfa305@ucl.ac.uk*

Azokh Cave is a Middle Pleistocene to Holocene site located in Nagorno Karabagh (Lesser Caucasus). The geographic region forms a corridor linking Africa, Europe and Asia, and was important for early hominin and other animal expansion. Azokh Cave is part of a karstic system with several fossiliferous chambers located 850 m a. s. l and 200 m above the nearby village of Azokh. The main entrance, Azokh 1, is a large cave that has two geological sequences (lower and upper) with nine geo-archaeological units of which only the upper ones (Units I to V) have a significant archaeological record. The faunal remains and lithic artefacts present in these units indicate different kinds of human involvement, for example for occupation or animal exploitation.

The lithic artefacts presented here were recovered from Unit V, Unit III and Unit II during 2002 – 2012 excavation seasons. The available chronological data indicates an age between 293 – 100 Ka for these units. The study sample consists of 1199 artefacts: cores, simple and retouched flakes, flake fragments and fragments, some of which may be considered as debris. The Logical Analytical System (LAS) and aspects established by Anglo-Saxon and French schools form the theoretical and methodological framework of lithic analysis, used in this study. Different local and non-local raw materials were exploited in all units for the production of lithic artefacts, although the range of raw materials is more varied in Unit II. Local chert, flint and basalt were used most commonly, probably due to their easy accessibility. Limestone, jasper and sandstone, from local and non-local sources, are present in small quantities in Units V and II. Obsidian is the only raw material that possibly originates from more distant sources. Flint and chert appear to have been preferentially exploited for flake tool production in all units, but the toolmakers show a preference for better quality raw material (flint, basalt, obsidian) for retouched pieces in Units V and II, and for Levallois production in Unit II. The operational chain is incomplete and artefacts found in the cave are primarily end-products dominated by flake-tools. The assemblage of Unit V is composed primarily of

simple, unretouched flakes with a minimal presence of retouched flakes and cores. The Unit II lithic assemblage includes a substantial Levallois component, although with fewer cores and retouched flakes. Unit III contains a small number of flakes and flake fragments.

While it is still difficult to assign the Unit V assemblage to a techno-typological group or complex (i.e. Acheulean, Mousterian or other local techno-complexes such as the Kudarian), the Unit II assemblage is clearly associated with the Mousterian techno-complex.

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#### POSTER

### 38. UNDO KLDE - MIDDLE AND UPPER PALEOLITHIC CAVE SITE ("SIMA DE LOS HUESOS" OF GEORGIA)

*Tushabramishvili, Nikoloz - (Ilia State University) nikoloz\_tushabramishvili@iliauni.edu.ge*

*Javakhishvili, Zurab - (Ilia State University) zurab\_javakhishvili@iliauni.edu.ge*

*Elashvili, Mikheil - (Ilia State University) mikheil\_elashvili@iliauni.edu.ge*

*Mamiashvili, Vaja - (Ilia State University) vazha.mamiashvili.1@iliauni.edu.ge*

*Gabekhadze, Bachana - (Ilia State University) bachana.gabekhadze.1@iliauni.edu.ge*

*Dvalishvili, David - (Akaki Tsereteli State University) dato1686@mail.ru*

The unique cave site Undo Klde is situated in the karstic region of Western Georgia, in Upper Imereti, which is one of the richest and well-known by the Paleolithic sites regions. The uniqueness of the site is: Temporary camp-site of hunters; Presence of the MP and UP layers which are in contact with each other; Presence of the deep karstic pit at the end of the corridor; Paleontological and Anthropological materials on the bottom of the pit; The evidence of the earthquake in Paleolithic Age.

**Methods.** All kind of common multidisciplinary researches have been used for study of the cave. The elevator was installed to study the 50 m deep karstic pit.

**Stratigraphy.** For the present time 8 lithological layers have been determined in the cave. 7 of them contain the materials of different ages and cultures: Medieval, Upper Paleolithic and Middle Paleolithic.

**Middle Paleolithic stone industry.** The percent of the tools is quite high. Most of the tools are the elongated Mousterian points. Other materials are represented by

some flakes and elongated blades. The materials belong to the levallois facies.

**Faune.** 99% (12 ind.) belong to *Ursus* sp. Big number of *Ursus* sp broken remains have been found just under the big rocks.

**Microfaune.** The microfauna is represented by *Arvicola* sp. and *Microtus* sp.

**Paleoanthropology.** The fragment of the human tooth was found during the sieving of the sediments of the Middle Palaeolithic layer.

**Karstic Pit.** At the end of the Cave horizontal corridor (length-80 m) a rather deep (48 m) natural karstic pit has been discovered, which is rich with faunal and anthropological remains. The pit is extremely difficult to reach as it is situated at the end of a long and narrow passageway. It is rather probable that animal and human remains were intentionally thrown or fallen into the pit.

*Ursus* sp. *Canis lupus*, *Cervus elaphus*, *Capreolus capreolus* and some other species have been identified. Besides, human remains were found there too. The study of the bone materials show us that part of them appeared in the pit after mortality.

We would like to note that we could not find any archaeological material in the pit.

**Rock Art.** The engraved marks were found deeply inside on the wall of the cave. It can be considered as the unique and the oldest trace in the region of the Rock Art. We have one more Cave site in the region with Middle and Upper Paleolithic Layers without sterile layer between them. Undo Cave is giving us more possibilities to understand human behaviours and the problems of Middle to Upper Paleolithic transition.

Conclusions:

1. The cave was used by Middle and Upper Paleolithic hunters as a temporary camp;
2. The cave periodically was used by the cave-bears.
3. Possibly, the part of them was killed by the fallen rocks (result of earth-quake).
4. The cave was used for some kind of initial rituals;
5. The layer with big number of *Ursus spelaeus* remains

possible correlated with the Bondi Cave layers where are confirmed the results of paleo-volcanism and paleo-earthquake.

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POSTER

**39. NEANDERTHAL ATTENTION TO THE DEAD AT SIMA DE LAS PALOMAS DEL CABEZO GORDO (MURCIA, SPAIN)**

*Walker, Michael J - (Dept of Zoology and Physical Anthropology, Biology Faculty, Murcia University, Campus Universitario de Espinardo Edificio 20, 30100 Murcia, Spain. Tel: 0034-620-267104) mjwalke@gmail.com*

*López-Martínez, Mariano - (Calle Pintor Joaquín 10-4º-I, 30009 Murcia, Spain (MUPANTQUAT Murcian Ass for Study of Palaeoanthropology and Quaternary) marianolopez@hotmail.com*

*María Haber-Uriarte - (Dept of Prehistory, Archaeology, Ancient and Mediaeval History and Historiographical Techniques, Faculty of Letters, Murcia University, Campus Universitario de La Merced, Calle Santo Cristo 1, 30001 Murcia, Spain) mariahaber@pi-ma.es*

*Ortega-Rodrigáñez, Jon - (Dept of Zoology and Physical Anthropology, Biology Faculty, Murcia University, Campus Universitario de Espinardo Edificio 20, 30100 Murcia, Spain) ventepalportus@yahoo.es*

Articulated skeletons of two Neanderthal adults and a child excavated in this cave system were positioned before rigor mortis occurred because both a woman and the child were found with flexed knees and elbows, their hands against their faces. Nearby finds suggest attention was paid to the deceased. Scattered remains of at least another six individuals may have been afforded less attention.

Systematic excavation began in 1994 and despite finding scattered Neanderthal teeth and bone fragments before 2005 only then did deeply-lying bones in anatomical connexion appear, though technical problems had to be overcome in order to extract from a heavily-cemented rock tumble more articulated skeletal parts which by 2008 corresponding to three Neanderthals lying above one another: from above downwards SP96 ("Paloma"), SP97 ("Paloma's child"), and SP92 to which may belong a mandible cemented in articulation with the maxillae, extracted by a spelaeologist in 1991.

SP96 ("Paloma") was a 16-20 year-old woman of short stature, lying on her left side (head West, ankles East). Her skeletal parts lay connected anatomically, including

shoulder and pelvic girdles, flexed knees and elbows, both hands held against her crushed skull. Cranium, mandible, and >70 different bones are present, including all major limb bones. Laboratory removal of adherent breccia with vibroscalpels continues. A metacarpal gave a direct U-series date of 54,100±3850 BP (APSLP-1), in broad agreement with other dates from the excavation (Walker *et al.*, 2012, *Quaternary International* 259: 7-21). CAT scanning, undertaken to enable virtual reconstruction, has rendered visible also bones hidden in hard sediment cemented to the SP97 child's forehead, resembling SP96's manual arrangement. Found with knees and arms flexed, this Neanderthal child has cranium, mandible and >34 different bones. SP92 is represented by 60 different bones excluding the 1991 crushed mandible and cranial fragment which if they belonged to would accord with its W-E orientation because its articulated foot bones lay at E. The three skeletons lack cut-marks or traces of burning, though charred articulated horse ankle bones were excavated close to them, as were two unburnt articulated leopard paws, evidence of flint-knapping and Mousterian artifacts. There was no burial pit.

Were rocks thrown in disorderly fashion over the bodies (a family group?) to prevent disturbance by leopards or hyaenas? A hyaena tooth comes from the site. A burnt leopard temporal bone from the site suggests Neanderthal dominance. Articulated skeletal parts of humans and leopards imply Neanderthals deterred scavengers. Arranging cadavers before rigor mortis set in implies attention paid to flexing the elbows and knees of the dead. Regourdou, Shanidar 7 and Skhul 4 and 7 were Mousterian skeletons found with flexed elbows and hands against the face, though knee flexion is more widespread (A. Defleur, 1993, *Les sépultures moustériennes*, CNRS, esp. p. 233). The contrast is intriguing between the three articulated skeletons and scattered remains of other Neanderthal individuals found at the site (including some burnt bones). Layers under excavation below the articulated skeletons have provided Mousterian artifacts and burnt animal bones but as yet lack human remains.

# A21b Technological change and behavioral variability in the MSA

Commission on Settlement Dynamics of the Middle Paleolithic and Middle Stone Age  
(Organisers: Nicholas Conard, Anne Delagnes, Guillaume Porraz)

Tuesday 2nd (14:30-19:30)  
Meeting Room B08



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ORAL CONTRIBUTIONS

ORAL

## 1. A SYSTEMATIC APPROACH FOR ANALYSING INNOVATIONS AND CULTURAL CHANGE: THE BONE ARTEFACTS OF THE MIDDLE STONE AGE OF SOUTH AFRICA.

*Stolarczyk, Regine - (Research project "The role of culture in early expansions of humans" of the Heidelberg Academy Of Sciences And Humanities, Senckenberg Research Institute, Senckenberganlage 25, D-60325 Frankfurt/m., Germany) regine\_stolarczyk@yahoo.de*

The middle stone age (MSA) of southern Africa is an interesting period for analysing innovations, because of its essentially modern and cognitively and behaviourally complex artefacts. In the context of an ongoing DFG (Deutsche Forschungsgemeinschaft) project the material remains of the MSA of South Africa and Lesotho are analysed. The goal is to reconstruct past behaviours on the basis of artefacts, because innovations can be detected in various aspects of object behaviour, like material, function, technology of production or the cognitive complexity (Haidle & Bräuer 2011). The class of bone artefacts seem to be innovations of this period and region and are therefore of special significance for a detailed insight into the innovative behaviour.

A systematic approach was designed to analyse the organic artefacts, both qualitatively and quantitatively. The data is acquired based on ROAD, the data base of ROCEEH (the role of culture in early expansions of humans), a project of the heidelberg academy of sciences and humanities, and the current literature. Through quantitative analyses of the different types of artefacts it is possible to reconstruct cultural change during this period and to identify new artefact types. By using effective chains and cognigrams, two methods developed by Haidle (2012; Lombard & Haidle 2012), the object behaviour and its cognitive foundation can be coded and illustrated in a systematic way. In doing so, a variety of aspects of the tool behaviours are acquired. These can be evaluated by comparative analyses regarding their innovativeness.

Within the class of bone artefacts of the middle stone age of South Africa, various innovations can be detected. Beside new tool types like awls and arrow heads, diverse aspects of the reconstructed tool behaviours, like new production techniques or complementary tool sets, seem to be innovations of this period and region.

During the MSA of South Africa new problem-solution-concepts seemed to be developed, which are most likely based on evolvments of cognitive abilities.

ORAL

## 2. THE NORTH AFRICAN MIDDLE STONE AGE DURING MARINE ISOTOPE STAGE 5

*Scerri, Eleanor - (University of Bordeaux) eleanor.scerri@u-bordeaux.fr*

*Drake, Nick (Kings College London) nick.drake@kcl.ac.uk*

*Groucutt, Huw (University of Oxford) huw.groucutt@wolfson.ox.ac.uk*

*Jennings, Richard (University of Oxford) richard.jennings@rlaha.ox.ac.uk*

North Africa during Marine Isotope Stage 5 (MIS 5, ~130-75 thousand years ago) is linked with the emergence of regionally distinctive stone tool (lithic) industries and complex material culture. However, the structure and variation of these lithic industries remains unclear and their articulation with human dispersals, while debated, is not well understood. Here, we present the results of an integrated multivariate analysis of 300,000 attribute measurements of 'Aterian', 'Nubian Complex' and 'Mousterian' assemblages from across North Africa. We first compared discrete stages of stone tool manufacture while accounting for the effects of differential raw materials, site function and mobility strategies. We then integrated these results with a palaeoclimate model of North Africa during MIS 5. The results of our multivariate analyses first revealed the presence of a number of distinct, spatially defined technological clusters, which did not correlate with traditional industrial nomenclatures. Similarly, our climate model showed that the Sahara was not uniformly green during MIS 5, as has been stated. Instead, variable environmental and hydrological resource gradients structured a patchwork of ecological bottlenecks and corridors, which we were able to link with the distribution of arid/wet palaeofauna. Final integration of the multivariate results with the climate model demonstrated that the spatial organization of the technological clusters correlated with the modelled palaeobiomes. The degrees of similarity between technological clusters were such that they decreased with distance except where connected by palaeohydrological networks. These results provide a new framework for understanding the lithic technology of North Africa during the Late Pleistocene and indicate for the first time how dispersal may have taken place across the Sahara during periods of environmental amelioration in MIS 5.



ORAL

### 3. GARBA III (MELKA KUNTURE, ETHIOPIA): RE-ANALYSIS OF THE SPACE PATTERNING AND DWELLING STRUCTURES OF AN EARLY MSA SITE

Mussi, Margherita - (Università di Roma Sapienza) [margherita.mussi@uniroma1.it](mailto:margherita.mussi@uniroma1.it)

Altamura, Flavio - (Università di Roma Sapienza) [flavio.altamura@uniroma1.it](mailto:flavio.altamura@uniroma1.it)

Melis, Rita T. (Università di Cagliari) - [rtmelis@unica.it](mailto:rtmelis@unica.it)

Spinapolice, Enza E. - (Max Planck Institute for Evolutionary Anthropology, Leipzig) [enza\\_spinapolice@eva.mpg.de](mailto:enza_spinapolice@eva.mpg.de)

Garba III, in the upper Awash Valley of Ethiopia, is one of the many sub-sites of Melka Kunture, where the archaeological record starts with the Oldowan, continues with a rich Acheulean sequence, and also includes MSA and LSA industries. Garba III was excavated in the Seventies of last century, under the direction of Francis Hours who discovered in layers B2 and B3 lithic assemblages now recognized as belonging to the Early MSA (EMSA). Ever since the first publication, it was stated that it was “*un habitat in situ*” where the crushing and grinding of bones was going on. Small basins with vertical sides and flat bottoms were also described, together with space patterning in the distribution of stone tools and bone fragments. Garba III is one of the few EMSA sites that also yielded human fossils, which belong to archaic *Homo sapiens*. New investigations were started to update the record and assess if site patterning was part of the innovations related to the emergence of modern human behaviour.

In 2011 the original site was re-located and tested, the stratigraphy was re-established, site formation processes were studied, and the lithic collections were re-analysed. A grid allowing the spatial distribution of the original finds was also prepared. U-series dating of bones and a combination of ESR and U-series analyses on teeth were planned.

Complex site formation processes were evidenced, including cyclic phases of erosion and re-deposition of pre-existing soils and deposits, together with prolonged phases of stability when pedogenetic processes developed. The fossil fauna is derived from earlier deposits, while the accumulation of lithic implements in layers B2 and B3 is the outcome of other distinct processes. The lithic assemblages are coherent and relatively well preserved. No major differences were noticed in alteration patterns. Obsidian was mostly used, and is largely affected by a thick grey patina. Edges are generally well

preserved, which is not compatible with long distance fluvial transport, suggesting a limited degree of disturbance and displacement. Comparing B2 to B3, however, there are differences in assemblage composition and in knapping methods.

Overall, the analysis of post-depositional modifications does not show any apatial patterning. While bone and teeth fragments do not allow dating the lithic assemblages, circumstantial evidence suggests an age not later than an early phase of MIS 5e. The differences between the industry of B2 and B3 may be the outcome of diachronic changes and/or of differential water transport. Accordingly, Garba III possibly gives information on technological developments in lithic production and use at the time of the emergence of *Homo sapiens*, but not on space patterning.

ORAL

### 4. CONTINUITY AND CHANGE ? THE INITIAL BLADE TECHNOLOGY OF THE LATE MIS 3 OCCUPATION AT MOCHENA BORAGO ROCKSHELTER, PROVINCE WOLAITA, ETHIOPIA

Parow-Souchon, Hannah - (University of Cologne) [hp-arows1@uni-koeln.de](mailto:hp-arows1@uni-koeln.de)

An increase in technological variability and a decrease in artefact size of lithic inventories from the horn of africa towards the end of MIS 3 might give an important indication for the spread of modern humans from africa to eurasia, though its mechanisms are not well researched to date.

This paper presents a detailed comparative technological study of artefacts from the younger layers (~43.5-41 ka) of mochena borago rockshelter, province wolaita, ethiopia. The analysis was mostly concerned with the reconstruction of the *chaine operatee* and the secondary flaking characteristics.

In comparison to the older, mainly flake-based, inventories from mochena borago, the youngest (~41ka) already shows all the necessary technological capabilities required for a formal blade production. In contrast to this intra-site development towards an initial blade production, several aspects of these inventories remain quite constant through time and seem to form site-specific characteristics. The most important raw material used (obsidian) remains constant, as well as the uncommonly small size of the pieces recovered and the very low significance of the levallois concept.

This analysis provides first insights into the technological variability of the lithic inventories described; mainly environmental and climatic factors are suggested to have influenced these inventories as well as the climatically driven accessibility of the raw material source. A regional hypothesis will remain a task for the future, since comparative studies on other sites from the horn of africa are currently lacking. The analysis of the blade production in mochena shows the great analytical potential of this outstanding site, and highlights the complex task of thoroughly understanding the regional developments in the horn of africa towards the end of MIS 3.

ORAL

## 5. CHARACTERIZING THE STRATIGRAPHY OF BIFACIAL TECHNOLOGY IN THE ASSEMBLAGES FROM THE DEEP SOUNDING AT SIBUDU CAVE, IN KWA-ZULU NATAL

*Conard, Nicholas J.- (University of Tübingen) nicholas.conard@uni-tuebingen.de*

*Schmid, Viola - (University of Tübingen) viola.schmid@student.uni-tuebingen.de*

*Zeidi, Mohsen - (University of Tübingen) mohsen.zeidi@ifu.uni-tuebingen.de*

*Porraz, Guillaume - (CNRS, UMR 7041, Paris X) guillaume.porraz@mae.u-paris10.fr*

Since 2011 a team from the University of Tübingen has conducted annual excavations at Sibudu Cave in Kwa-Zulu Natal, South Africa. This research has extended the cultural stratigraphic sequence at the site beyond the classic sequence defined by Lyn Wadley. Excavations in the Deep Sounding of the site document a strong signature of bifacial technology well below what was previously considered the base of the Still Bay. This paper presents the lower part of the stratigraphic sequence at Sibudu and tests the hypothesis that the Still Bay reflects a narrowly defined cultural stratigraphic unit in southern Africa.

ORAL

## 6. INTRODUCTION TO BUSHMAN ROCK SHELTER IN SOUTH AFRICA

*Porraz, guillaume - (CNRS, IFAS / ESI, University of the Witwatersrand) guillaume.porraz@mae.u-paris10.fr*

*Val, Aurore - (ESI, University of the Witwatersrand) aurore\_val@yahoo.com*

*Douze, Katja - (ESI, University of the Witwatersrand) douze-katja@gmail.com*

*de la Pena, Paloma - (ESI, University of the Witwatersrand) paloma.delapena@gmail.com*

*Schmid, Viola C. - (Eberhard Karls University of Tübingen) viola.schmid@student.uni-tuebingen.de*

Over the last decades, Stone Age studies in Southern Africa have moved their attention from Later to Middle Stone Age contexts, with a specific interest towards the MIS4 and 3. Results have emphasized the antiquity of modern-type behaviors in this area, but uncertainties still surround the scenarios and mechanisms behind the appearance of these cultural changes. One direction of research is to look for a longer-term perspective and to compare the forms and rhythms of changes in different environments. With its 7 m thick deposits, Bushman Rock Shelter (BRS, Limpopo) represents one of the classic Stone Age sites in South Africa. Located in the margin of the great escarpment at about 1500 m a.s.l., its sequence contains well stratified deposits of Later and Middle Stone Age occupations with a good organic preservation. Though the site is well-referred in the literature, very few data contextualizing the archaeological collections have been published. In this communication, we summarize J.F. Eloff's excavations conducted in the 1970's, basing our observations on his unpublished field notes and on our own 2014 field campaign. We emphasize the meticulousness of these old excavations which in many ways conform to modern standards, and we position the sequence of BRS in the current southern African chronological framework. We develop further on the upper MSA deposits where bifacial pieces have been identified and confirm recent observations that the MSA bifacial technology is more diverse than previously thought.

ORAL

## 7. PATTERNS OF CHANGES OVER THE HOWIESONS POORT SEQUENCE AT KLIPDRIFT SHELTER (SOUTH-AFRICA)

*Delagnes, Anne - (PACEA-CNRS, France) a.delagnes@pacea.u-bordeaux1.fr*

*Douze, Katja - (ESI, University of the Witwatersrand) douze-katja@gmail.com*

*Wurz, Sarah (Department of Archeology, History, Cultural Studies and Religion University of Bergen, Norway) Sarah.Wurz@wits.ac.za*

*Henshilwood, Christopher S. (1Institute for Archaeology, History, Culture and Religion, University of Bergen, Norway) christopher.henshilwood@ahkr.uib.no*

*van Niekerk, Karen (Institute for Archaeology, History, Culture and Religious Studies, University of Bergen, Norway) Karen.niekerk@ahkr.uib.no*

The coastal site of Klipdrift Sheter (southern Cape region of South-Africa), currently excavated by C.S. Henshilwood and K.L. van Niekerk, contains a Howiesons Poort (HP) sequence characterized by rich assemblages of marine and terrestrial faunas, engraved ostrich eggshells, hearths and ash deposits, lithics. The lithic assemblages are typical of the Howiesons Poort complex, as documented in a number of sites within the same regional context, eg. Klasies River and Diepkloof. They evidence a number of combined raw material, technological and typological changes over the sequence which echoes the changes already described in the sites mentioned above. These patterns of changes allow to correlate the upper part of the sequence to the Intermediate and Late HP phases. The different time intervals covered by these HP sequences, as inferred from the available radiometric data, raise questions as to the validity of the chronological framework commonly used for the Middle Stone Age of southern Africa.

ORAL

## 8. THE LATE PLEISTOCENE MSA LITHIC TECHNOLOGY OF SIBUDU, KWAZULU-NATAL, SOUTH AFRICA

*Will, Manuel - manuel.will@uni-tuebingen.de (Department of Early Prehistory and Quaternary Ecology, University of Tübingen)*

*Bader, Gregor D - gregor.bader@uni-tuebingen.de (Department of Early Prehistory and Quaternary Ecology, University of Tübingen)*

*Conard, Nicholas J.- (Department of Early Prehistory and Quaternary Ecology, University of Tübingen) nicholas.conard@uni-tuebingen.de*

Studies of the African Middle Stone Age (MSA) have become central for defining the cultural adaptations that accompanied the evolution of modern humans. While much of recent research in South Africa has focused on the Still Bay (SB) and Howiesons Poort (HP), periods following these technocomplexes were often neglected. Yet, in order to track technological change in the southern African MSA, all of its phases must be studied with the same intensity.

Here we examine lithic assemblages from Sibudu that post-date the HP to further the understanding of MSA cultural variability during the Late Pleistocene. Sibudu

preserves an exceptionally thick, rich and high-resolution archaeological sequence that dates to ~58 ka, which has recently been proposed as type assemblage for the "Sibudan". This study presents a detailed analysis of the six uppermost lithic assemblages from these deposits (BM-BSP) that we excavated from 2011-2013. We define the key elements of the lithic technology and compare our findings to other assemblages post-dating the HP.

The six lithic assemblages provide a robust cultural signal, closely resembling each other in various technological, techno-functional, techno-economic and typological characteristics. While we observed several parallels with other contemporaneous MSA sites, the lithic assemblages at Sibudu demonstrate a distinct and so far unique combination of techno-typological traits.

These findings support the use of the name Sibudan as a working unit for structuring the Late Pleistocene MSA after the HP. The nature of the Sibudan stone artifact assemblages also refute assertions that modern humans living during this period possessed an unstructured and unsophisticated lithic technology. Our results illustrate the important contribution of research focusing on periods before and after the HP and SB to our understanding of the cultural evolution of *Homo sapiens* in southern Africa.

ORAL

## 9. HEAT TREATMENT OF SILCRETE IN THE SOUTHERN AFRICAN MSA: THE HEATING PROCEDURE AND ITS IMPLICATIONS FOR THE CHAÎNE OPÉRA-TOIRE

*Schmidt, Patrick (University of Tübingen, Department of Prehistory and Quaternary Ecology, Germany) - patrick.schmidt@uni-tuebingen.de*

*Porraz, Guillaume (CNRS, USR 3336, UMFRE 25, and Evolutionary Studies Institute, University of the Witwatersrand, South Africa) guillaume.porraz@mae.u-paris10.fr*

*Delagnes, Anne (Université Bordeaux, PACEA CNRS UMR 5199, France) a.delagnes@pacea.u-bordeaux1.fr*

*Douze, Katja (Evolutionary Studies Institute, University of the Witwatersrand, South Africa) katjadouze@yahoo.fr*

*Henshilwood, Christopher S. (Institute for Archaeology, History, Culture and Religion, University of Bergen, Norway) christopher.henshilwood@ahkr.uib.no*

*Parkington, John (University of Cape Town, South Africa) john.parkington@uct.ac.za*

*Texier, Pierre-Jean (CNRS, UMR 5199-PACEA, Université de Bordeaux 1, France) pierrejean.texier@pacea.u-bordeaux1.fr*

*Wurz, Sarah (Department of Archeology, History, Cultural Studies and Religion University of Bergen, Norway) Sarah.Wurz@wits.ac.za*

*Bellot-Gurlet, Ludovic (Sorbonne Universités, UPMC Université Paris 6, MONARIS, France) ludovic.bellot-gurlet@upmc.fr*

*van Niekerk, Karen (Institute for Archaeology, History, Culture and Religious Studies, University of Bergen, Norway) Karen.niekerk@ahkr.uib.no*

*Conard, Nicholas J.- (Department of Early Prehistory and Quaternary Ecology, University of Tübingen) nicholas.conard@uni-tuebingen.de*

In recent years, South Africa has gained increasing importance for our understanding of the evolution of “modern human behaviour” during the Middle Stone Age (MSA). A key element in this suite of behaviours linked with modern humans is heat treatment of materials such as ochre for ritual purposes and stone prior to tool production. Until now, there has been no direct archaeological evidence for the exact procedure used in the heat treatment of silcrete.

Through the analysis of heat-treated artefacts from the Howiesons Poort from two South African sites, Diepkloof Rockshelter and Klipdrift Shelter, we identified a series of technological markers that shed light on the processes used for heat treatment in the MSA. These markers include distinct fracture surfaces due to heat-induced non-conchoidal (HINC) fracturing that happened during heat treatment and a previously unknown tempering residue. This tempering residue, presenting itself as a black film on the silcrete surface, is an organic tar that contains microscopic fragments of charcoal. It formed during the direct contact of the artefacts with hot embers of green wood. We also observed numerous HINC-fracture-surfaces on the artefacts, resulting from heat-induced breakages that occurred during heat treatment in an environment producing rapid heating to high temperatures. Our results suggest that heat treatment of silcrete was conducted directly using an open fire, similar to those likely used for cooking.

While our findings add to the discussion about investment in time and resources necessary for the used heat treatment procedure, they especially highlight the intentional, innovative and systematic character of this transformative technology that was used in a number of Howiesons Poort sites from the Cape region of South Africa.

# Movements in and Out for Africa: Assemblage variability and population dynamics in Northeast Africa and Southwest Asia during the MSA and Middle Paleolithic

Commission on Settlement Dynamics of the Middle Paleolithic and Middle Stone Age  
(Organisers: Knut Bretzke, Nicholas Conard)

Thursday 4th (14:30 to 19:30)  
Meeting Room B05



2014 burgos  
1-7 sept.

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XVII World UISPP Congress  
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XVII Congreso Mundial de UISPP

ORAL CONTRIBUTIONS

ORAL

**1. GRASPING TEMPORAL VARIABILITY AND LANDSCAPE EVOLUTION: SPATIAL ANALYSIS OF SURFACE SCATTERS FROM THE NEJD PLATEAU, OMAN**

*Hilbert, Yamandu - (CNRS) yamandu.hilbert@mom.fr*  
*Usik, Vitaly (Ukrainian Academy of Science) vitaly.i.usik@gmail.com*  
*Marks, Antony E. (Southern Methodist University, Dallas, USA)*  
*Rose, Jeffrey I. (Ronnin Institut) jeffrey.i.rose@gmail.com*

For the past four years, the Dhofar Archaeological Project (DAP) has conducted survey and excavations across the Governorate of Dhofar, southern Oman. Numerous sites of different techno-complexes and lithic industries have thus far been reported. The majority of the discovered sites, however, are surface localities devoid of sediments and, therefore, lacking clear chronological attribution; or so one is taught to think.

Using three dimensional piece plotting, technological attribute analysis, and observations on the diverse patination states of artifacts found on the surface, we show that some degree of "horizontal stratigraphy" and, therefore, relative chronology can be established at many multi-period surface localities found across the Nejd Plateau in southern Oman.

Based on local geomorphology, we suggest that this horizontal stratigraphy is, to a greater part, associated with the availability of sheets of raw material, as its exposed face erodes through time. These low inselbergs are remnants of larger surfaces that are more resilient to the aggressive erosion to which the Nejd plateau is subjected. Across the quaternary, phases of erosion have occurred that, in turn, made available fresh raw material that, in turn, was exploited by diverse hominid groups that inhabited South Arabia.

Our methodology indicates the existence of a relative chronology that is re-enforced by data from stratified and dated sites. This methodology and theory can and may be applicable to other comparable geomorphological environments. Especially for Southern Arabia, phases of population influx, persistence and some degree of local adaptability by prehistoric groups can be seen.

ORAL

**2. GIS-BASED ANALYSIS OF VERTICAL AND SPATIAL LITHIC DISTRIBUTION PATTERNS AT THE EARLY MIDDLE PALEOLITHIC SITE OF MISLIYA CAVE, MOUNT CARMEL, ISRAEL**

*Kapul, Reuven - (Zinman Institute of Archaeology, University of Haifa) kapul1@walla.co.il*  
*Zaidner, Yossi - (Zinman Institute of Archaeology, University of Haifa, Institute of Archaeology, The Hebrew University of Jerusalem) yzaidner@research.haifa.ac.il*  
*Weinstein-Evron, Mina - (Zinman Institute of Archaeology, University of Haifa) evron@research.haifa.ac.il*

The Early Middle Paleolithic (250-160 kyBP) site of Misliya Cave, Mount Carmel, Israel, is characterized by the highest density of lithic artifacts (3000/M<sup>3</sup>) in the Levant. The site also contains rich faunal remains and a series of well-preserved hearths. No visible layers could be observed during the excavation, and the lithic assemblage is typologically homogeneous. We used a GIS program, to examine the distribution of lithic artifacts spatially and vertically in an attempt to differentiate layers and activity areas within the site. We entered into the program data on natural features such as rock falls, the hearths and the lithics, processed them and examined the interaction between the various elements. Our analysis reveals four distinct layers, two of which contain a hearth. We also identified an especially dense concentration of lithic artifacts in a central location of the site. This pattern recurs at approximately the same location among the four layers. Significantly, lithic concentrations were also less dense in proximity to the hearths, suggesting different activity areas. Together with various other data, this study highlights the complex nature of this early MP habitation site.

ORAL

**3. ARABIA AND THE EASTERN TRAJECTORY: BRIDGING THE AFRICAN AND EURASIAN LANDMASSES**

*Chu, Wei - (University of Cologne) wchu@uni-koeln.de*  
*Parow-Souchon, Hannah - (University of Cologne) h.parow-souchon@uni-koeln.de*  
*Hauck, Thomas - (University of Cologne) Thomas.Hauck@uni-koeln.de*  
*Richter, Jürgen - (University of Cologne) j.richter@uni-koeln.de*

While there is currently little doubt about the African origin of anatomically modern humans, there is only

limited understanding as to the timing, migration pathways, and environmental conditions of these prehistoric settlers once they entered Eurasia. It is still unknown which industries are indicative of the early groups of anatomically modern humans in Eurasia, and what subsistence strategies they used in different chronological and geographic phases of their exodus. While we know that anatomically modern humans crossed specific climatic and environmental zones on their way into Europe, the capacity of their cultural adaptation is still largely unexplored.

To answer these questions, we present recent data obtained from the Collaborative Research Center's "Our Way to Europe" project which combines new sedimentological, geomorphological, and archaeological work in key locations in the eastern Mediterranean region representing different ecozones and environments. These areas, including the recently excavated site of Wadi Sabra, Jordan, all form part of the hypothesized "Eastern Trajectory" that anatomically modern humans may have followed in their initial ascent towards Central Europe.

Our results suggest that different environmental factors encountered by anatomically modern humans may have influenced the nature and the timing of their movements into the Eurasian continent and that these in turn, are reflected in the nature of stone tool residues that they characteristically left behind.

The implications of these recent results may help us to understand how anatomically modern humans were able to thrive in the region while pre-existing hominin populations may, at least locally, have diminished. They may also help explain the origin of Upper Palaeolithic industries in Central Europe including many of the so-called "transitional" industries and their creators.

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ORAL

#### **4. LATE PLEISTOCENE SETTLEMENT DYNAMICS IN SOUTHERN ARABIA? CONTEXTUALIZING LITHIC TECHNOLOGY, PALEO-ENVIRONMENT AND GEOGRAPHY**

*Bretzke, Knut - (University of Tübingen) knut.bretzke@uni-tuebingen.de*

*Conard, Nicholas J. - (University of Tübingen) nicholas.conard@uni-tuebingen.de*

Southern Arabia is a focus region regarding movements of hominins into and out of Africa. The growing archaeo-

logical record from the Late Pleistocene of the region allows us to begin characterizing chronological and spatial patterns related to this process.

Of critical importance in this setting is the deep archaeological stratigraphy from Jebel Faya, UAE. Between 2009 and 2014 we excavated seven archaeological horizons containing in total 8690 lithic artifacts. This talk presents the variability of lithic technological systems captured in the archaeological sequence and contextualizes this information in a diachronic approach with paleo-environmental and geographic data to model settlement dynamics in Southern Arabia during the late Middle and Late Pleistocene. Given a strong relationship between settlement history in South Arabia and the potential for hominin dispersals through this area, we contrast our regional model with global models of hominin expansions out of Africa.

Our results indicate a complex pattern of connectivity between the Southwest and Southeast of Arabia during the late Middle and Late Pleistocene. This argues against simple conclusions about the role of Arabia for hominin dispersals out of Africa and calls for more regional studies to facilitate critical assessments of the competing models for human dispersals.

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ORAL

#### **5. NEW DISCOVERIES ON THE MIDDLE PALEOLITHIC FROM CENTRAL AND NORTHERN SAUDI ARABIA AND THEIR IMPLICATIONS ON DEMOGRAPHIC DISPERSALS**

*Crassard, Rémy - (CNRS UMR5133 Lyon) remy.crassard@mom.fr*

*Hieronymus Hilbert, Yamandú - (CNRS UMR5133 Lyon) yamandu.hilbert@mom.fr*

We present here new archaeological data from central and northern Saudi Arabia. Since 2010 we have conducted archaeological survey across the Al-Kharj region, 100 km south of Riyadh, and since 2013 expanded our research focus towards the north of the Kingdom of Saudi Arabia, into the Al-Jawf province. Survey activities have revealed a high number of surface sites as well as one stratified site with a well preserve sequence. The majority of these sites are attributed to the Arabian Middle Paleolithic based on the presence of Levallois blank production methods. As such, this period shows great regional diversity across the Saharo/Arabian arid belt and is central to questions involving late Pleistocene human dispersals.

Special consideration was given to the identification of Paleolithic sites during these survey activities. Specific loci within the research areas were sampled based on raw material availability and general topographic location. Archaeological sites that yielded sufficient indications of being pristine were sampled. Artifacts were analyzed using morphological, typological and technological parameters chosen deliberately to provide insightful account as to the assemblages' cultural affiliation and general categorization.

In central Arabia, technological analyses on cores retrieved from the Rufa graben (Al-Kharj region) have revealed specific reduction modalities used to produce flakes with predetermined shapes. The identified modalities, which are anchored within the greater Levallois concept of core convexity preparation and exploitation, correspond with those utilized during the Middle Stone Age Nubian Complex of northeast Africa and southern Arabia. The discovery of Nubian technology at the Al-Kharj sites represents the first appearance of this blank production method in central Arabia.

The Al-Jawf Quadrangle in northern Saudi Arabia, which thus far experienced only sporadic prehistoric investigation, provided data adding to debates on demographic movements across Africa and Arabia. Sites attributed to the Arabian Middle Paleolithic show diverse types of blank production systems of which the Levallois Method certainly holds a central role. Given the growing complexity of the Arabian Prehistoric record the sites from the Al-Jawf Quadrangle will be discussed, first in a regional frame and then in an extended intra-regional context.

Here we demonstrate how a rigorous use of technological and taxonomic analysis may enable intra-regional comparisons across the Arabian Peninsula and beyond. Given the geographical location of the Al-Jawf Quadrangle, close to the desert areas of southern Levant, Negev, Sinai, Nafud, and given the location of the Rufa graben, close to other important regions experimenting more systematic surveying such as southern Arabia, the archaeological record described here may greatly add to the growing body of data on Arabian Prehistory, and suggests new dynamics of population movements between the southern, central and northern regions of the Peninsula.

ORAL

## 6. THE EMERGING PICTURE OF THE ARABIAN MIDDLE PALAEOOLITHIC AND ITS RELATIONSHIP TO SURROUNDING REGIONS

*Groucutt, Huw (University of Oxford) huw.groucutt@rlaha.ox.ac.uk*

*Scerri, Eleanor - (Université Bordeaux) eleanor.scerri@u-bordeaux.fr*

*Jennings, Richard - (University of Oxford) richard.jennings@rlaha.ox.ac.uk*

*Petraglia, Michael - (University of Oxford) michael.petraglia@rlaha.ox.ac.uk*

The Arabian Peninsula connects some of the key areas discussed in hominin evolutionary studies, such as northeast Africa, the Levant and southern Asia. A number of recent analyses have suggested that lithic assemblages in Arabia demonstrate dispersal into the peninsula by Middle Palaeolithic hominins. Emerging evidence allows the testing of these initial hypotheses. As well as being an important route for hominin dispersal from and between more intensively studied areas, the biogeographical and environmental structure of Arabia – plus emerging archaeological evidence – suggests considerable complexity to demographic processes and that Arabia was not a passive conduit.

In this paper we: 1) report a number of newly discovered Middle Palaeolithic sites in Saudi Arabia, 2) describe a quantitative comparative study of Middle Palaeolithic assemblages in Arabia, Iran, the Levant, and northeast Africa. We use a variety of techniques of comparison, including Principal Components and Correspondence Analyses to objectively describe the nature of similarities and differences between assemblages, and therefore moves beyond debates on the typology of individual artefact forms and on industrial nomenclature.

Our findings demonstrate considerable diversity in Middle Palaeolithic technologies in Arabia as well as a complex pattern of similarities and differences with assemblages in surrounding regions.

Our results demonstrate how robust comparative studies are starting to elucidate the nuances of demographic and cultural relationships between Africa and southwest Asia in the Late Pleistocene.



ORAL

**7. WHAT IF ANYTHING DOES THE MIDDLE PALEOLITHIC OF WESTERN SYRIA TELL US ABOUT MOVEMENTS IN AND OUT AFRICA?**

*Conard, Nicholas - (University of Tübingen) nicholas.conard@uni-tuebingen.de*

*Bretzke, Knut - (University of Tübingen) knut.bretzke@uni-tuebingen.de*

In much of the Levant the record of technological changes from the late Middle Paleolithic through the early Upper Paleolithic documents a gradual transition from the dominant use Levallois systems of knapping to the production of laminar assemblages from platform cores. This general pattern is reflected in studies from the Syrian Desert, the Negev and the Mediterranean coast. The results from our excavations and surveys in the Damascus Province on the eastern side of the Anti-Lebanon Mountains do not fit easily into this pattern and suggest that the record of cultural change at the end of the Middle Paleolithic preserves more variability than is usually argued. Data from excavation at Wadi Mushkuna, Kaus Kozah, Baaz Rockshelter and the famous sites in Yabroud excavated by Alfred Rust suggest that this region reflects a different pattern of technological evolution. While the signal for the shift from the Middle to the Upper Paleolithic in western Syria is not yet ideally documented and the civil war in Syria has stopped fieldwork, we summarize what is known about this important transition and its implications for testing the various Out of Africa hypotheses.

ORAL

**MODES OF HUMAN OCCUPATION AT THE OPEN-AIR MIDDLE PALEOLITHIC SITE OF NESHER RAMLA, ISRAEL**

*Shemer, Maayan - (Zinman Institute of Archaeology, University of Haifa, Haifa, Mount Carmel 3498838, Israel; Israel Antiquities Authority, P.O. Box 35, 10600 Nahlal, Israel) shemerma@hotmail.com*

*Weinstein-Evron, Mina - (Zinman Institute of Archaeology, University of Haifa, Haifa, Mount Carmel 3498838, Israel) evron@research.haifa.ac.il*

*Zaidner, Yossi - (Zinman Institute of Archaeology, University of Haifa, Haifa, Mount Carmel 3498838, Israel; 2Institute of Archaeology, the Hebrew University of Jerusalem, Jerusalem 91905, Israel.) yzaidner@research.haifa.ac.il*

A recently discovered eight-meter-thick open-air sequence at Neshar Ramla (Israel) provides new evidence regarding Levantine Middle Paleolithic adaptations during most of MIS 6 and 5 (OSL dates:  $167 \pm 11$  ?  $78 \pm 6$  ka). The site is located in a karst depression formed by gravitational deformation and sagging into underground voids. During the deposition of the archaeological sequence the formation of the site was primarily shaped by a cyclic mechanism of deposition of eroded soils, water-logging and pedogenesis. Such a geomorphological context and formation mechanism are profoundly different from Levantine Middle Paleolithic cave and open-air sites. Excavations at the site yielded rich lithic and faunal assemblages, combustion features, hundreds of manuports, hammerstones and anvils, and ochre. The eight-meter-thick archaeological sequence was divided into six stratigraphic units, in which several horizons and vertically distinct concentrations of lithics and bones were identified.

Lithic assemblages from two horizons from the upper Units I and II were studied. The studied assemblages are dated to  $115 \pm 9$  ?  $78 \pm 6$  ka, the same time span to which the Early Modern Human remains from Qafzeh and Skhul caves are assigned.

Both studied assemblages show close similarity in technological and economic features and suggest continuity in the use of the site throughout the period of their accumulation. Several reduction sequences were identified among which Levallois is the most common. The frequency of Levallois products, however, is not high (11% and 13% for the studied horizons), contrary to the Levantine cave sites in which Levallois products are much more frequent. The Levallois assemblage at the site shows no clear preference to either unipolar or centripetal methods of reduction, making it difficult to assign it to one of the recognized Levantine Middle Paleolithic chrono-stratigraphic stages, originally defined on the basis of differences within the Levallois technology. The mode of exploitation of raw materials points to complex technological organization with evidence of both curated and expedient behaviors. The evidence point at the existence of curated tool-kits composed of Levallois products, Mousterian points, convergent side-scrapers and composite tools all made of Eocene chert. The tool-kit was complemented by simple and cortical flakes, backed knives, notches and pieces with light retouch made on Campanian (Mishash Formation) chert. Campanian chert was knapped onsite, while Eocene chert shows no evidence for onsite knapping, except for some tool resharpening and maintenance.

. The technological and economic characteristic of the lithic assemblages presented here indicates that in many aspects of human behavior Neshar Ramla differs from other Levantine sites, thus contributing to our understanding of the processes that led to behavioral modernity in the Levant.

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ORAL

## 8. KURAN BUZAN VALLEY: NEW EVIDENCE FOR THE PLEISTOCENE HUNTER GATHERER OF THE CENTRAL ZAGROS, IRAN

*Alibaigi, Sajjad - (Department of Archaeology, University of Tehran, Iran) sadjadalibaigi@gmail.com*

*Niknami Kamal, Aldin - (Department of Archaeology, University of Tehran, Iran) kniknami@ut.ac.ir*

*Khosravi, Shokouh - (Department of Archaeology, University of Tarbiat Modarres, Iran) shokouh.khosravi@gmail.com*

*Nikzad, Meisam - (Department of Archaeology, University of Tarbiat Modarres, Iran) meisam\_nikzad@yahoo.com*

The Kuran Buzan valley is a long and narrow valley is located in the Central Zagros mountainous region comprising the eastern parts of *Lurestan* as well as the north-eastern parts of *Ilam*. The valley environment and the flow of *Saimareh* River in the centre of valley potentially have given the valley an ideal space to attract human occupation from the very earlier times. To locate the real sequences of human occupations and their distributions across the valley a systematic archaeological survey conducted in the area in spring 2010. Since the dam reconstruction in the area seemed to have threatened the archaeological sites and also because of the topography of the valley which would obscured the sites appearances, a full coverage and intensive gridded system of survey was applied to enhance the probability of finding not only the actual locations of sites but rather the of-sites which were assumed to be distributed everywhere in the valley. By such a technique in an area about 71 km<sup>2</sup> we were enabled to explore some 110 Palaeolithic seasonal sites as well as about 12 sites from the other archaeological periods. The abundance of Palaeolithic sites in tour study area may be related to the geophysical patterns of the area where so many outcrops of the chert and limestone raw materials (Amirn formation) were appeared by the erosions on the surface and made it possible that the Palaeolithic stone tool makers being able to have easy accesses to the abundant resources. Through a typological classification of the Palaeolithic assemblages we assigned 3 sites to have been occupied by the lower

Palaeolithic peoples while 107 of which were assigned to have been used by the Middle Paleolithic. The assemblages are consisted of Acheulian bifacial axes as well as large chopping tools, cores, scrapers and other Lower Palaeolithic tool types. They also comprise a variety of the Middle Paleolithic stone industry including the large tools which were generally made by the Levallois techniques. Considering the locational pattern of the sites as well as studying the frequency distribution of tools and their technological characteristics may account for the fact that the Kuran Buzan valley attracted the different groups of Pleistocene's hunter-gatherer to occupy the valley, since the resources were available here could reinforced the populations living struggles.

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ORAL

## 9. TECTONIC AND PALEOLITHIC OCCUPATIONAL RECORDS IN THE ZAGROS MOUNTAINS

*Heydari-Guran, Saman - (Department of Early Prehistory and Quaternary Ecology, University of Tuebingen, Germany) saman.heydari@ifu.uni-tuebingen.de*

*Michael Märker (Heidelberger Akademie der Wissenschaften Forschungsstelle: The role of culture in the early expansions of humans) michael.maerker@geographie.uni-tuebingen.de*

*Conard, Nicholas - (Department of Early Prehistory and Quaternary Ecology, University of Tuebingen, Germany) nicholas.conard@uni-tuebingen.de*

The Zagros fold and thrust geological zones have formed by collision in between two tectonic plates of Eurasian and Arabia. Recent geological studies across these mountains demonstrate that the collision is still active and resulting a high rate of deformations. For instance GPS measurements across this region show that the current rate of shortening in SE Zagros is at about 10 mm yr<sup>-1</sup> and in the NW Zagros is around 5mm yr<sup>-1</sup>.

Meanwhile, the geographical position of the Zagros Mountains in the middle of the Middle East proposes it as part of the probable migratory path of Homo from Africa to East and North Asia. Despite of strong archeological evidences from Later Paleolithic including late Middle, Upper Paleolithic and Epipaleolithic sites in the caves and rockshelters across the Zagros Mountains, this region has not yielded convincing Earlier Paleolithic records (Lower to Early Middle Paleolithic periods) either as open air or sheltered places compared to the adjacent regions, such as Levant. The lack these Paleolithic occu-

pational records across the vast region of the Zagros Mountains has raised questions among the paleoanthropologists concerning the interpretation early hominin migration from west to east Asia.

This paper examines the probable influence of the Zagros rapid orogeny phenomenon, including erosional and depositional activities as a result of uplifting, fault scarps and truncated folds on the early human occupational records. The research, which is part of the Tuebingen-Iranian Stone Age Research Project (TISARP), has the goal of creating geomorphological models for prediction the location of Lower and Early Middle Paleolithic sites in the Zagros Mountains. The following processes are reflected in the outline of the paper:

Background studies of the Zagros orogeny;

Synchronic and diachronic patterns of the Paleolithic records across the Zagros Mountains;

Geological setting of the known Lower and Early Middle Paleolithic sites in the Zagros Mountains;

Monitoring the areas with high probability of having Middle to Upper Pleistocene records.

Sambhar and Jogpura. Comparisons will be made with Arabia and North Africa to identify which aspects of Middle Palaeolithic technology appear within the Saharo-Arabian deserts, which present disjunct distributions, and whether commonalities across the region can be best understood as independent adaptations to similar ecological settings or relating to population dispersals.

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## ORAL

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### 10. THE PASSAGE TO INDIA: DISPERSALS AT THE EASTERN EDGE OF THE DESERT BELT

*Blinkhorn, James - (UMR 5199 PACEA, Université de Bordeaux) jblinkhorn@outlook.com*

The interface of Africa and Eurasia comprises the desert landscapes of the Saharo-Arabian belt, stretching from the Atlantic coast in the west to the Thar Desert of India in the east. While these regions are by no means homogeneous, they share a number of environmental and biogeographic features that stand in stark contrast to sub-Saharan Africa, the Oriental zone of India and SE Asia, or Palearctic central and northern Eurasia. The resumption of widespread humidity in the Saharo-Arabian belt during MIS 5 opened up habitable but uninhabited landscapes, providing the potential for hominin expansions from Africa (modern humans), west and central Eurasia (Neanderthals) and India (archaic *Homo*). This talk will focus on the eastern extent of the Saharo-Arabian desert belt, presenting the most recent evidence from the field for the Palaeolithic occupations of the Thar Desert in the Late Pleistocene, including excavations at Katoati,

# Chronostratigraphic data about the Middle A21d to Upper Palaeolithic cultural change in Western Europe

Commission on Settlement Dynamics of the Middle Paleolithic and Middle Stone Age

(Organisers: Julià Maroto, Álvaro Arrizabalaga, Javier Baena, Jesús Jordá, Pedro Rasines, Manuel Vaquero)

Wednesday 3rd (9:00 to 14:30)  
Meeting Room A02



2014 burgos  
1-7 sept.

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XVII World UISPP Congress  
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XVII Congreso Mundial de UISPP

ORAL CONTRIBUTIONS

ORAL

## 1. GRADUAL POPULATION MOVEMENTS FROM ASIA TO EASTERN EUROPE

Otte, Marcel - (Université de Liège) [Marcel.Otte@ulg.ac.be](mailto:Marcel.Otte@ulg.ac.be)

This presentation focuses on the different forms of acculturation following the east-west axis of Eurasia. Movement of the new modern human population led to very different reactions depending on region and local Mousterian cultures. This is thus a long-term demographic process, in particular involving the modes of thinking that were encountered. The abrupt anatomic changes are due to the isolation of Europe where populations reproduced by endogamy, in contrast to the vast Asian continent where genetic changes were much more common and thus accentuated the gradual tendencies proper to all humanity throughout its entire history. Examples will be presented during the session.

ORAL

## 2. THE LATE PLEISTOCENE SEQUENCE OF ROCCIA SAN SEBASTIANO CAVE (MONDRAGONE, CASERTA) IN SOUTHERN ITALY. CHRONOSTRATIGRAPHIC DATA AND TECHNICAL BEHAVIORS

Collina, Carmine - (Museo Civico Biagio Greco (Mondragone, Caserta-Italy)) [carmincollina\\_1972@libero.it](mailto:carmincollina_1972@libero.it)

Piperno, Marcello - (Museo Civico Biagio Greco (Mondragone, Caserta-Italy)) [m.piperno@tin.it](mailto:m.piperno@tin.it)

The cave of Roccia San Sebastiano is a cave of tectonic-karstic origin at the foot of the southern versant of Monte Massico, in the territory of Mondragone (Caserta) in Campania, in Southern Italy. Systematic excavation campaigns have been conducted here since 2001, under the direction of Marcello Piperno, leading to the partial exploration of an important Pleistocene deposit, extraordinarily rich in archaeological and paleontological remains. The cavity is divided into two distinct parts: a shelter, about 12 m long and 3 m deep, and a cave whose dimensions have not yet been ascertained because it is still partially obstructed by reworked sediments. The excavation campaigns carried out since 2001 lead to the exploration of the first *in situ* level, called C, over a surface of about 4 m<sup>2</sup>; furthermore, the stratigraphic sequence was tested in a 2 m<sup>2</sup> sounding, localized within the excavation area, to a depth of about 3 m.

The preliminary stratigraphic study evidenced an alternation of detrital productions and collapse episodes, spaced by concreting phases. Level C is characterized by a deposit of compact and cemented clays, containing collapse clasts of variable dimensions. A first date of this level, obtained on burnt bones, was carried out by G. Calderoni of the C14 Laboratory of the Sapienza University of Rome (Belluomini *et al.* 2007), and provided an age of 19.570±210 BP. The excavation of level C and of the stratigraphic sounding yielded a total of over 20000 lithic artifacts that still need to be analyzed in detail.

The deepening of the sounding evidenced a thick stratigraphic and cultural sequence. At the present state of the research, at least six major phases, from different Gravettian horizons to Aurignacian until the Final Mousterian level, have been recognized in the deposit, whose chronological framework is based on a series of C14 dates on the fauna included between 19.570±210 BP and 38.980±950 BP.

The gravettian deposit appears to be especially rich in lithic industry - microlithic backed points being especially abundant - and fauna, mainly consisting of numerous remains of horse, *Equus hydruntinus*, and red deer. The excavation of level C also yielded several fragments of the skeleton of a single human. These display alterations of the bone tissue indicating prolonged exposure to climatic agents. As regards symbolical manifestations, traces of cuts and incisions made with flint tools on bones may have had aesthetic purposes. A tooth of child attributed to Neanderthal has been found in the mustertian levels.

Thus, the evidence as a whole indicates that the cave-shelter of Roccia San Sebastiano hosted a complex set of activities centered on the production of lithic tools and the butchering of preys. In this paper we will present the chronostratigraphic data of the archaeological sequence and we shall take into consideration data from lithic assemblages attesting the variability of technical behaviors among the gravettian lithic assemblages and the techno-economic structures of Aurignacian and Mustertian phases.

ORAL

## 3. LIVING ON THE EDGE? A MULTIREGIONAL APPROACH FOR STUDYING THE BEGINNING OF THE AURIGNACIAN

Bataille, Guido - (Insitute of Prehistoric Archaeology; University of Cologne) [gbataill@uni-koeln.de](mailto:gbataill@uni-koeln.de)

*Tafelmaier, Yvonne - (Institute of Prehistoric Archaeology; University of Cologne & Neanderthal Museum, Mettmann) tafelmaier@neanderthal.de*  
*Weniger, Gerd-Christian - (Neanderthal Museum, Mettmann) weniger@neanderthal.de*

At the moment a geographical source area for the Aurignacian is not recognizable. To the contrary, assemblages yielding fundamental Aurignacian elements, such as specific bladelet cores (e. g. carinated & nosed endsrapers) and its end-products (e. g. unilaterally, bilaterally & alternately retouched bladelets & microblades), occur prior to the Heinrich 4 event within a vast region between the river Don in the East, the Atlantic shore in the West and the Mediterranean in the South.

In the present study the beginning of the Aurignacian is examined from a multiregional point of view. For that approach empiric data from Aurignacian assemblages of the Western and the Eastern margin of Europe were techno-typologically analyzed and compared with secondary information including assemblage composition, chronology and environmental data from Western, Central and Southern European Aurignacian sites.

Of special importance is the Proto-Aurignacian (stage 0) and Early Aurignacian (stage 1) dichotomy, suggesting a temporal succession reflecting the initial migration of AMH groups into and through Europe (Banks et al. 2013, Teyssandier et al. 2010). On the basis of empiric studies of lithic assemblages from Northern Spain (Labeko Koba & Ekain), the Middle Don region (Kostenki 14) and Crimea (Siuren 1) the integrity of the Aurignacian stages 0 and 1 is critically analyzed. On the one hand the study of the Labeko Koba sequence reveals a high share of common technological knowledge within the analysed assemblages. On the other hand investigations of Aurignacian assemblages of Eastern Europe show a mixture of Aurignacian elements belonging to different stages of the established Western European Aurignacian sequence. Inter-assemblage variability seems to reflect predominantly regional specific adaptation mechanisms. A high share of Aurignacian tool/core types within the lowest initial Upper Palaeolithic complex IVb1-2 of Kostenki 14 emphasizes an early multi-regional spread of specific adaptive elements. Moreover, a technological shift in the bladelet production of the Siuren 1 Aurignacian sequence in connection with a technological and typological continuity regarding tool composition and blade production militates in favour of a regional *in situ* development.

In the framework of the current study the Aurignacian is understood as a specific set of adaptive elements (*Model*

*of adaptive segments*) which plays a fundamental role in the onset of the European Upper Palaeolithic. In this context the present day favoured interpretation of the Aurignacian as physical output of an unilineal spread of AMH through Europe is challenged. In contrast to that, a model of multilineal information transfer, which allows for movements of ideas or human groups back and forth, is postulated. Thus, both regional similarities and differences can be explained.

ORAL

#### 4. NEANDERTHALS AND MODERN HUMANS AROUND 40 KYR CALBP AT COVA GRAN (SOUTH-EASTERN PREPYRENEES, IBERIA)

*Martínez Moreno, Jorge - (Centre d'Estudis del Patrimoni Arqueològic de la Prehistòria.UAB) jorge.martinez@uab.cat*  
*Benito Calvo, Alfonso - (CENIEH) alfonso.benito@cenieh.es*  
*Mora Torcal, Rafael - (Centre d'Estudis del Patrimoni Arqueològic de la Prehistòria.UAB) rafael.mora@uab.cat*  
*de la Torre Sainz, Ignacio - (Institute of Archaeology. UCL) i.torre@ucl.ac.uk*

Appearance of the Upper Paleolithic across Western Eurasia is the subject of intense debate. Iberian Peninsula plays a fundamental role in these discussions, since it is considered one of the last refuges of Neanderthals during the spread of anatomically modern humans across Europe.

Cova Gran de Santa Linya contains Late Middle Paleolithic (LMP) and Early Upper Paleolithic (EUP) sequence which provides contextual, techno-typological and radiometric elements that contribute to the debate on the MP/UP transition.

We analyze the geometry, stratigraphy and resolution of the archaeological levels from Cova Gran. These contextual indicators lead us to discuss the role of syn/post depositional processes and their impact on the homogeneity of the archaeological levels.

Technology of the Middle and Upper Paleolithic levels is compared, with special emphasis on the lithic assemblage of the most recent LMP unit (S1B) and the first EUP level (497D). Finally, series of 14C AMS dates of the LMP and EUP archaeological units is presented and discussed within the Iberian regional context.

Cova Gran contributes to the debate on the MP/UP transition. Given the paucity of well contextualized transi-

tional levels in Iberia, Cova Gran record fills a gap in the regional sequence.

This sedimentary geometry of S1B/497D levels is particularly relevant to the discussion of the MP/UP transition. Limited thickness of the levels suggests that the archaeological assemblages are homogeneous entities and reveals no evidence of mixing between layers, either by percolation of materials, cryoturbation, or deficient recording of artifacts.

Between Middle and Upper Paleolithic a systemic technological rupture can be described with no elements of cultural continuity. Technical attributes ascribe levels S1B to the Middle Paleolithic, since they present similar features in other MP levels of Cova Gran to other nearby Mousterian sites.

Otherwise, level 497D lithics main characteristic is to obtain elongated products, from large blades to bladelets and flakes. Retouched artifacts, pieces with denticulate edges and side scrapers on flake predominate. However, retouched blades, end scrapers, burins, and truncations produced on blades, plus backed points and backed bladelets are represented.

Finally, Cova Gran LMP-EUP radiocarbon series show ambiguities usually affecting chronometric data from radiocarbon older than 30 kyr BP. Although these uncertainty, we sustain  $^{14}\text{C}$  data from S1B/497D are relevant in the discussion MP/UP Transition debate.

Cova Gran indicates clear disjunction between Middle and Upper Paleolithic. The archaeological record clearly defines two traditions that represent different technical behaviors. Cova Gran opens up interesting perspectives to analyze the emergence of the Upper Paleolithic in the Iberian Peninsula and to discuss the possible coexistence of Neanderthals and modern humans.

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ORAL

### 5. DISSECTING THE MIDDLE TO UPPER PALAEO-LITHIC TRANSITION AT LEZETXIKI (BASQUE COUNTRY, NORTHERN IBERIA)

*Arrizabalaga, Álvaro (Universidad del País Vasco)*  
*alvaro.arrizabalaga@ehu.es*

*Iriarte-Chiapusso, María José (IKERBASQUE/ Universidad del País Vasco)*  
*mariajose.iriarte@ehu.es*

*Pedro Castaños (Sociedad de Ciencias Aranzadi)*  
*pedrocastanos@yahoo.es*

*Villaluenga, Aritza - (Monrepos Archaeological Research Centre and Museum for Human Behavioural Evolution)*  
*villaluenga@rgzm.de*

*Domínguez-Ballesteros, Eder - (Universidad del País Vasco)*  
*eder.dominguez.ballesteros@gmail.com*

*Prieto, Alejandro - (Universidad del País Vasco), Rachel Wood - rachel.wood@anu.edu.au (The Australian National University)*  
*alejandroprieto@ehu.es*

The cave of Lezetxiki (Arrasate) has been excavated in two series of seasons. Between 1956 and 1968, José Miguel de Barandiarán, together with a number of collaborators, excavated a large area of the deposit (some 100m<sup>2</sup>), and since 1996 a new series of fieldwork has been carried out under the direction of Alvaro Arrizabalaga, in a much smaller area. Owing to the taphonomic circumstances of this deposit, the difficulties in obtaining a consistent geochronological framework for it, and the complex nature of the lithic assemblage, great confusion has arisen about the stratigraphic units that should be included in a discussion about the Middle to Upper Palaeolithic transition at Lezetxiki. Strictly speaking, the only level that can be attributed to this period is Level III, which is sub-divided into IIIa and IIIb, separated by an erosional contact. Sublevel IIIa, with abundant industrial remains, is dated in the Aurignacian, whereas Sublevel IIIb, in which hardly any lithic industry or remains of fauna associated with human activity were found, corresponds to a very late phase of the Mousterian. As a result of the circumstances in the initial series of excavations, mixing of some materials between the two sublevels may have taken place, although their original differentiation was made by José Miguel de Barandiarán, and these possible cases should be regarded as few in number.

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ORAL

### 6. ARRILLOR CAVE (ÁLAVA). CHRONOLOGICAL, PALAEO-ENVIRONMENTAL AND CULTURAL NOTES ON A LONG MOUSTERIAN SEQUENCE

*Iriarte-Chiapusso, María José (IKERBASQUE-Universidad del País Vasco)*  
*mariajose.iriarte@ehu.es*

*Wood, Rachel (Australian National University / University of Oxford)*  
*rachel.wood@anu.edu.au*

*Sáenz de Buruaga, Andoni (Universidad del País Vasco)*  
*andoni.buruaga@ehu.es*

Arrillor is located in the southern foothills of the Gorbea Massif (Murua, Álava). It has yielded evidence of several human occupations, alternating with times when the cave was abandoned. All these occupations are assigned

to the Mousterian except for the most recent level (Level La), which is only conserved in the cave in a small side-passage where the remains are attributed to the Magdalenian.

The changing climate that existed during the formation of the sedimentary deposit in Arrillor influenced a series of frost-weathering and fluvial phenomena. At the base of the sequence (Levels Cag, Blm, Car, Cglm and Clm), the effect of frost-shattering predominates, although layers with a fluvial origin (Lgj) are inter-bedded. Except for the last level, which is archaeologically barren, the small numbers of artefacts found in the other levels confirm that the first occupations in the cave took place in the Mousterian. The middle part of the sequence had a clearly fluvial origin, as a series of sandy layers contain different amounts of clay in their composition and display varying colours. The Amk and Smkl Levels are significant within this part of the sequence. The former is characterised by a Mousterian industry already displaying some leptolithic proto-forms. However, the raw materials still come from locations near the site. In this level, a 9-13 year-old child's deciduous second molar was found. These occupations took place in more benign climate conditions in which hazel and alder shared the tree cover with pine and birch at, or beyond, the limit of radiocarbon c.50 ka cal BP. The Mousterian assemblage in Level Smkl, where the Levallois technique has been identified, displays a certain preference for side-scrapers and points. Between this middle sequence and the upper levels, erosion affected part of the sedimentary record. The Smc (denticulate Mousterian) and Lmc Levels appear to coincide with two different times of climatic deterioration occurring prior to 45 ka cal BP. A change of strategy manifested above all in the provenance of raw materials is attested in Level Lmc. Now, in addition to local material, artefacts are found made from flint from Urbasa (Navarre), Treviño (Burgos) and Flysch (Biscay) outcrops. The Mousterian industry includes types with a leptolithic character.

ORAL

## 7. THE LOWER LEVELS OF THE ROCK SHELTER OF EL CUCO (CANTABRIA, SPAIN)

*Rasines del Río, Pedro (Junta de Patrimonio Monumental y Arte Religioso de Laredo.) prasines@hotmail.com*  
*Gutiérrez Zugasti, Igor (Department of Archaeology, Bio-Arch. University of York, Biology S-Block, Wentworth Way, York YO10 5DD England (UK) igorgutierrez.zug@gmail.com*  
*Muñoz Fernández, Emilio (GAEM Arqueólogos)*

*gaem@gaemarqueologos.com*  
*Santamaría Santamaría, Silvia (GAEM Arqueólogos)*  
*gaem@gaemarqueologos.com*  
*Morlote Expósito, José Manuel (GAEM Arqueólogos)*  
*gaem@gaemarqueologos.com*

The rock shelter of El Cuco is located next to the cave with the same name, in Castro Urdiales (Cantabria, a northern region of the Iberian Peninsula), at the foot of a cliff of limestone and massive calcarenite of the Early Cretaceous. This lies 350 m from the present coastline. It has a length of about 35 m and one small cave in both ends; the west one has also an archaeological site. On October and November 2005 we carried out two archaeological sondages. In one of them (2 x 1 m in area and 254 cm depth) we identified fourteen archaeological layers.

Lower levels provided a malacological series with *Patella*, which brings one of the first evidences of collection and consumption of these resources in the Atlantic Façade.

ORAL

## 8. COVALEJOS CAVE (PIÉLAGOS, CANTABRIA, SPAIN). NUMERICAL DATES AND ARCHAEOLOGICAL DATA IN THE LIMIT MIDDLE / UPPER PALAEO-LITHIC.

*Montes Barquín, Ramón - (A.I.CARP) rmontes@prehistour.eu*  
*Muñoz Fernández, Emilio - (CAEAP)*  
*gaem@gaemarqueologos.com*

Covalejos cave is located in Autonomous Region of Cantabria (Spain), next to Arce (Municipality of Piélagos), very near of Santander's Bay.

Although it was excavated from 1876 to 1969, the cave retains a large sequence of 380 cm in thickness (with an unknown thick at the bottom), even though the Upper Palaeolithic levels are practically disappeared.

A total of 15 archaeological levels have been discriminated recently. In the basis there is an interglacial level with lithic artefacts and skeletal remains of *Dicerorhinus kirstbergensis* dated in the OIS. 5. Above, 7 levels contain Mousterian evidences, alternating with sterile levels. Following to the top, levels 2 and 3 contain Aurignacian elements (Aurignacian 0 and classic Aurignacian). The level that currently is in the top of the sequences is a sterile level with some remains from the Upper Palaeolithic levels that the old Archaeological excavations destroyed completely. From 2002 to nowadays, we have obtained an important



Numerical dates batch, specially into the framework of the Radiocarbon dating program that is coordinated by Dr. J. Maroto.

In this paper, we present all the results (Chronological and Archaeological data) and we define the state of the question Neanderthal / Modern Human substitution in the Cantabrian Region, from Covalejos' data point of view.

ORAL

### 9. RADIOCARBON DATING OF EL CASTILLO, CANTABRIA, AND THE MIDDLE TO UPPER PALAEOLITHIC TRANSITION OF NORTHERN IBERIA

*Wood, Rachel (Australian National University)*

*rachel.wood@anu.edu.au*

*Bernaldo de Quirós, Federico (Universidad de León)*  
*f.bquiros@unileon.es*

*Maíllo-Fernández, José Manuel (Universidad Nacional de Educación a Distancia)*  
*jmaíllo@geo.uned.es*

*Tejero, José-Miguel (Universitat de Barcelona)*  
*jose-miguel.tejero@mae.cnrs.fr*

*Neira, Ana (Universidad de León)*  
*ana.neira.campo@unileon.es*

*Higham, Thomas - (University of Oxford)*  
*thomas.higham@rlaha.ox.ac.uk*

The integrity and significance of the assemblage in El Castillo (Cantabria, Spain) unit 18, or Aurignacian delta, has been extensively debated for over two decades. Whilst some suggest that it is transitional between the preceding Mousterian and the later Aurignacian, others contend that it is a mixture of older and younger material.

We present new radiocarbon dates on ultrafiltered collagen from butchered bone and bone tools from units spanning the Middle to Upper Palaeolithic transition at El Castillo. Samples have been taken from both the modern and early 20<sup>th</sup> century excavations to explicitly test the chronological integrity of the purportedly transitional assemblage.

The data demonstrate that younger material, similar in age to the Aurignacian in Cantabria, exists within the early 20<sup>th</sup> century excavations. In contrast, all radiocarbon dates in level 18 from the modern excavation pre-date 42 ka cal BP, and the arrival of the Aurignacian in the region.

It is possible that the assemblage in unit 18 falls into a unique timeframe in the region, being later than other Mousterian units at sites such as Cueva Morin and Arriñor, and earlier than the Aurignacian and Châtelperronian.

Further dating of late Middle Palaeolithic assemblages in the region is required to test this conclusion.

ORAL

### 10. MOUSTERIAN INSIDE THE UPPER PALAEOLITHIC?

*Baena Preysler, Javier (UAM)*  
*javier.baena@uam.es*

*Carrión Santafé, Elena (Ministerio de Cultura)*

*elena.carrion@mecd.es*

*Vaquero Rodríguez, Manuel (URV)*  
*manuel.vaquero@urv.net*

*Torres Navas, Concepción (UAM)*  
*conxi\_@hotmail.com*

El Esquilieu cave has provided one of the most interesting sequences the last decades. The Upper part of it has provided significant lithic materials to be studied through a techno-typological analysis and to be compared in the light of the whole sequence, and some other Mousterian and Upper Paleolithic assemblages. In this paper, we present those material together with the resulting dates, in order to discuss their significance and possible cultural meaning.

ORAL

### 11. DOES SIZE MATTER? LOOKING FOR PROXIES FOR AGE AND GENDER ACTIVITIES IN THE LATE MIDDLE AND EARLY UPPER PALAEOLITHIC OF SOPEÑA (NORTHERN SPAIN)

*Pinto Llona, Ana C. (c/o J. Villarías, ILLA CCHS-CSIC)*  
*acpintoll@gmail.com*

Lithic analyses is chiefly directed to the identification of culture "types" that are frequently equated to cognitive stages or/and human species. Such interest in tool types of necessity leaves behind the most abounding evidence, which is flaking debris. The analyses of operative sequences and others cover partially the gap, but are slow work that still does not include the whole assemblage in the analyses. Efforts to distinguish the inputs from different intra-population sectors, namely females and young, are rarer, and their observations are difficult to interpret. However the subject is vital since the very existence of any population depends on the status and role of the females and young in it.

Here I review the literature dealing with alternative lithic analyses and principally on material properties such as raw material, size and weight in relation to such variables, then offer the observations recorded on materials from the late Middle and early Upper Palaeolithic of

Sopeña (northern Spain), a new site with a fairly continuous *in situ* stratigraphic sequence from c. 60 Ky to c. 25 Ky, relatively well dated by absolute methods.

Distinct patterns are observed and an attempt is made to interpret these in relation with demographic change during the later millennia of the Mousterian and the first millennia of early Upper Palaeolithic material cultures established soon thereafter in this site.

ORAL

## 12. CHRONOSTRATIGRAPHY OF THE MP / UP TRANSITION IN GÜELGA CAVE. ASTURIAS. SPAIN.

*Menéndez, Mario - (UNED) mmenendez@geo.uned.es*

The cave of the Güelga is located on the bottom of a blind valley in the Eastern part of Asturias (Spain), 200 m above sea level and 15 km away from the coast. It currently comprises a group of caves that were occupied during the Middle and Upper Palaeolithic periods. In recent years we have been studying the sediments of the Zone D proposing a sequence for the MP/UP transition: Châtelperronian - Aurignacian-Mousterian. Namely, an aurignacian interstratification, which we review in this paper. We also provide new dates for the different levels. The materials studied are the lithic and bone assemblages obtained in archaeological excavations, as well as the fauna remains. A Neanderthal premolar tooth has also been found in mousterian occupation. Both, sedimentological and micromorphological analysis have been carried out at the different levels. All the data that is presented in this paper is AMS14C on bone, with ultrafiltration pretreatment.

The results that have been obtained so far can not confirm the theoretical assumption regarding the aurignacian interstratification. Sedimentological and micromorphological analysis, also according to the levels data, show a likely stratigraphic inversion of the Châtelperronian level (42/45 Ky calBP). This situation must be explained in future geoarchaeological studies. We also present cultural and chronological analysis of the Aurignacian (38 Ky calBP) and Mousterian (45/50 Ky calBP) occupation, as well as of the sterile layers that are between them.

The Güelga Cave is an interesting site for transition MP / UP studies. It shows an early Aurignacian and Mousterian long occupation. Between these two periods the cave was abandoned for about 7/10 ky. Future work must explain the inverted position of the châtelperroni-

an and increase the information about the Aurignacians and Mousterian levels.

ORAL

## 13. NEANDERTHALS AND SAPIENS IN THE FINIS-TERRAE. STATE OF THE ART ON THE MIDDLE TO UPPER PALEOLITHIC TRANSITION IN NW IBERIA.

*de Lombera-Hermida, Arturo (Institut Català de Paleoecologia Humana i Evolució Social (IPHES) C/ Marcel·lí Domingo s/n Campus Sescelades URV (Edifici W3) 43007 Tarragona) artulomb@gmail.com*

*Rodríguez-Álvarez, Xose Pedro (Institut Català de Paleoecologia Humana i Evolució Social (IPHES) C/ Marcel·lí Domingo s/n Campus Sescelades URV (Edifici W3) 43007 Tarragona) xprodriguez@iphes.cat*

*Cunha, Pedro (Universidade De Coimbra Faculdade De Ciências E Tecnologia Departamento de Ciências da Terra) pcunha@dct.uc.pt*

*Pérez-Alberti, Augusto (Dpto. Xeografía. Universidade de Santiago de Compostela) augustoperez@usc.es*

*Ameijenda, Alicia (GEPN, Dpto. Historia I. Universidade de Santiago de Compostela) aameijenda.iglesias@gmail.com*

*Grandal D'Anglade, Aurora (Facultade de Ciencias. Universidade de Santiago de Compostela)*

*aurora.grandal@udc.es*

*Fábregas Valcarce, Ramón (GEPN, Dpto. Historia I. Universidade de Santiago de Compostela) ramon.fabregas@usc.es*

The Iberian Peninsula has become a key region for the understanding of the Middle and Upper Paleolithic Transition in Europe. Several scenarios have been proposed, where the Cantabrian Rim seems to play a key role. From the Cantabrian point of view, NW Iberia becomes a *Finis-terrae*, but the coastline acts as a link between the Cantabrian and Atlantic regions, where several Late Middle Paleolithic sites have been identified. Recent research projects carried out in the Galician karstic formations have revealed the existence of two sites framed in this period.

We shall deal with the archaeological and chronological data from two caves located in the Eastern ranges of Galicia: Cova Eirós (Triacastela, Lugo) and Cova da Valiña (Castroverde, Lugo).

Cova Eirós has a 3.4 m thick sedimentary infill at the entrance. The archaeological works carried out since 2008 have only excavated the upper part (1.2 m deep), revealing the existence of several archaeological layers related to the Middle Paleolithic (Levels 4 and 3), Early Upper Paleolithic (Levels 2 and 1) and Late Upper Paleolithic (Level B). Their lithic assemblages, although based

on quartz, show diagnostic features of the Middle and Upper Paleolithic technocomplexes, respectively. The sedimentary analysis and the radiocarbon and OSL dating mark the existence of an erosive hiatus between the Levels 3 and 2, the latter dated *circa* 32.000 BP.

The radiocarbon dates from Cova da Valiña are nearly equivalent to those from the Level 2 of Cova Eirós. Nevertheless, its lithic assemblage, also dominated by quartz, is quite scanty and ambiguous. Initially ascribed to the Chatelperronian, recent reviews point to their Mousterian character. Besides, the accidental find of several bone sagaies in the 1960's adds to the uncertainty since they are interpreted as either belonging to the excavated occupation or considered as an evidence of a later Upper Paleolithic occupation.

The well preserved and dated stratigraphic sequence of Cova Eirós has greatly increased our knowledge about the Middle and Upper Paleolithic transition in NW Iberia. Its contextualization within the Cantabrian record will allow us to understand the Early Upper Paleolithic settlement in the region and the technological and behavioural strategies related to anatomically modern humans.

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ORAL

#### **14. ACROSS THE DUERO RIVER? ABOUT THE NEANDERTHAL OCCUPATION IN CENTRAL IBERIA: RESEARCHES IN "ABRIGO DEL MOLINO" SITE (SEGOVIA, SPAIN)**

*Álvarez-Alonso, David (UNED) dalvarez@gijon.uned.es*

*de Andrés-Herrero, María (Neanderthal Museum)  
mdeandres@neanderthal.de*

*Díez-Herrero, Andrés (IGME) andres.diez@igme.es*

*Rojo Hernández, Julio A. (UNED) julio.a.rojo@gmail.com*

Interior part of the Iberian Peninsula, specially the Southern part of the Duero basin, is an area with scarce archaeological information concerning human settlements during the Upper Pleistocene. There are few known and excavated Mousterian sites, and most of them are open air sites. About these last sites there is more information than in karstic deposits sites, but most of them have not quantitative chronologies.

This area, between Central System Mountain range and Duero's valley, has short evidences of Middle Palaeolithic deposits, and most of them consist in lithic industries in open air sites in fluvial deposits. Archaeological excavations of Pinilla del Valle's sites confirm the presence of

Neanderthal groups since the final part of Middle Pleistocene OIS 6-5, and the beginning of OIS 4; Jarama VI site contains evidences of settlement during OIS 3 and the last OIS 4; and other sites as Los Casares or Peña Capón confirm the Neanderthal presence in the Southern Central range in the same period. The recent discovery of Abrigo del Molino is dated in OIS 4, increasing Mousterian remains in karstic environments. With this information we can check that from the beginning of the Upper Pleistocene until the end of Mousterian, there is a continued presence of Neanderthal groups in this area. We present the results of this recent discovery, as well as other mousterian sites in Duero basin, that fill existing gaps.

Karstic archaeological sites provide us great information what is completed with lithic evidence recovered in Mousterian open air sites between Central System mountain range and the South of the Duero basin, that results very interesting for studying of Neanderthal occupation in the South of northern Iberian plateau, particularly in the Duero Valley.

A matter of prime importance is how the interior part of the Iberian Peninsula was populated and what the settlement model for the different Neanderthal populations was. The possible barrier imposed by the Duero and the inexistence of endo-karstic reliefs (great caves) in the interior of the northern plateau, makes that our vision is the product of a combination between open air sites in fluvial valleys and cave settlements in the limestone-dolomite border that is in the boundary by East and South of this great interior basin. This duality makes us to consider different models of Neanderthal settlements and another important question, how was the replacement of these human groups by the AMH in this area? Is required to take into account that the evidences of Early Upper Palaeolithic are scarce and they appear more late that in other regions of the Iberian Peninsula. Furthermore seems to be a gap in the population between the last Neanderthals and the first AMH. In this work we will consider these issues.

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ORAL

#### **15. JARAMA VI (GUADALAJARA, SPAIN): NEW CHRONOSTRATIGRAPHIC AND CULTURAL DATA ABOUT THE LATE NEANDERTHALS IN CENTRAL IBERIA**

*Jordá Pardo, Jesús F. (Laboratorio de Estudios Paleolíticos, Departamento de Prehistoria y Arqueología, Universidad Nacional de Educación a Distancia.) jjorda@geo.uned.es*

*Navazo, Marta (Área de Prehistoria, Departamento de Ciencias Históricas y Geografía, Universidad de Burgos.)  
mnavazo@ubu.es*

*Kehl, Martin (Institute of Geography, University of Cologne.)  
kehlm@uni-koeln.de*

*Burow, Christoph (Institute of Geography, University of Cologne), Alexandra Hilgers (Institute of Geography, University of Cologne) christoph.burow@uni-koeln.de*

*Pastors, Andreas (Neanderthal Museum)  
pastors@neanderthal.de*

*Weniger, Gerd-Christian (Neanderthal Museum) weniger@neanderthal.de*

*Wood, Rachel (Research School of Earth Sciences, The Australian National University) rachel.wood@anu.edu.au*

Jarama VI is located on the NW edge of the Guadalajara province (Castilla-La Mancha, Spain). It is a rock shelter partially filled up by sediments which were excavated between 1989 and 1994. The archaeological excavation shows a lithostratigraphic sequence formed by three Pleistocene sedimentary units (Jordá 2007) with thousands of archaeological remains. Initially, the two lower units were attributed to the Middle Palaeolithic while the upper unit were assigned to the Early Upper Palaeolithic. In 1992 we obtained three conventional radiocarbon dates which indicated that the lower units were situated between 41 and 30 ky cal BP while the upper unit was dated around 29 ka cal BP (Jordá 2007). In the last years we have reviewed the stratigraphy, the chronology and the lithic assemblages of the three units. We present here the results of these works.

The materials studied are the sediments of the three units, all of the technological lithic remains and two different groups of samples for dating. Sediments have been studied from samples obtained in 2010 for sedimentological and micromorphological analysis carried out at the University of Cologne (Germany) and the National Museum of Natural Sciences of Madrid (Spain). The lithic assemblages (2.346 items) have been analyzed at the University of Burgos. Concerning dating, 30 bone fragments with cut marks were screened for dating in 2008/2010 at the Oxford Radiocarbon Accelerator Unit (U.K.) and 6 samples of sediments were obtained in 2010 for luminescence dating at the the University of Cologne with the collaboration of the Neanderthal Museum (Germany).

The grain-size distribution, mineralogical composition, geochemical fingerprints and micromorphological observations corroborate the notion that the middle unit of the sequence is a fluvial deposit of superfloods which

did not experience significant postdepositional changes. The lower and upper units received sediment inputs by sheet-wash and cave spall and shows features of more frequent frost. The results of a comprehensive analysis and the review of the lithic technological materials confirm that the three units belong to the Middle Paleolithic. With respect to AMS radiocarbon dating, only three bones provided results, two of them with infinite ages greater than 47 and 50,2 ky BP, from the lower and upper units, and the third with a date of  $49,4 \pm 3,7$  ka BP for the middle unit (Wood et al. 2013). The IRSL results are coincident with the dates of ORAU and place the human occupations between 60 and 50 ka BP (Kehl et al. 2013). The results of new research carried out in Jarama VI allow us to asseverate that the archaeological remains of the three sedimentary units belong to the Middle Palaeolithic and its age is older than 50 ka BP. Therefore, these human occupations correspond to later Neanderthal populations who lived in central Iberia many years before the arrival of the first modern humans to this area.

#### ORAL

### 16. CHRONOLOGY OF ZAFARRAYA, SPAIN, AND ITS RELEVANCE TO THE DEBATE ON THE DISAPPEARANCE OF THE LAST NEANDERTALS IN THE SOUTH OF THE IBERIAN PENINSULA

*Cecilio Barroso Ruiz - Fundación Instituto de Investigación de Prehistoria y Evolución Humana, Lucena (Córdoba)  
cecilibarroso1@hotmail.com*

*Miguel Caparrós - Muséum National d'Histoire Naturelle, Département de Préhistoire, Paris - capmig@aol.com*

Neandertal human remains corresponding to a minimum number of 9 individuals with ages of between of 14 months and 30 years were unearthed in the cave of the Boquete de Zafarraya, Spain, during archaeological excavations led by Cecilio Barroso Ruiz (2003, 2006) in 1982-1983 and 1992-1994. These fossils were found in Mousterian stratigraphic levels with a significant lithic assemblage characterized by a large Levallois technology percentage with a typology including flakes, side scrapers, denticulates, Mousterian points, etc. These beds included also a substantial faunal record made up of large herbivores (*Capra pirenaica*, *Cervus elaphus*, *Sus scrofa*, *Bos primigenius*, *Rupicapra pirenaica*, *Equus caballus*, *Equus hydruntinus*), carnivores (*Panthera pardus*, *Cuon alpinus*, *Crocota crocuta*, *Ursus arctos*, *Vulpes vulpes*, *Lynx pardina*), lagomorphs (2 species), insectivores (5 species), chiropters (6 species), and avifauna (30 spe-

cies). These assemblages were found in a precise stratigraphic context with a rigorous excavation methodology.

The initial chronology attributed to the site, based on biostratigraphy, suggested that the Pleistocene sedimentary levels were late in their formation (inter Würm II-III or even Würm III) which, should it be true, reflected a late survival of Neandertals in Andalusia, Southern Spain.

Various dating techniques (Michel et. al., 2006) such as C-14, U/Th, ESR and RAA were utilized with the aim of finding a more reliable age of the late presence of Neandertals in Zafarraya (Hublin et.al., 1995). Recent dating results obtained by Michel (2013) and Wood (2013) are significant and shed new light on the debate related to the paradigm of the late survival of Neandertals in the site.

On the basis of recently published chronology studies, we suggest that the question of the "late survival of Neandertals" in other archaeological sites of the South of the Iberian Peninsula must be raised in order to clarify such an important issue in European human palaeontology and prehistory.

largely based on chronological data, since a reliable temporal framework is essential to interpret the Middle-Upper Palaeolithic boundary and the interactions between Neanderthals and Modern humans. As a consequence, radiometric data have been closely scrutinized, revealing serious problems related to the archaeological context of dated samples and the dating methods. Nevertheless, in recent years, various research groups and laboratories have prioritized efforts to obtain new reliable dates, essentially through radiocarbon, from well stratified contexts. At the same time, studies of both environmental and material culture in such contexts have increased. Our contribution is aimed to discuss new chronostratigraphic data and their derived interpretations.

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ORAL

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**17. CHRONOSTRATIGRAPHIC DATA ABOUT THE MIDDLE TO UPPER PALAEOLITHIC CULTURAL CHANGE IN WESTERN EUROPE**

*Maroto, Julià (Universitat de Girona) julia.maroto@udg.edu*

*Arrizabalaga, Álvaro (Universidad del País Vasco)*

*alvaro.arrizabalaga@ehu.es*

*Baena, Javier (Universidad Autónoma de Madrid)*

*Javier.Baena@uam.es*

*Baquedano, Enrique (Museo Arqueológico Regional de Madrid) enrique.baquedano@madrid.org*

*Jordá, Jesús (Universidad Nacional de Educación a Distancia) jjorda@geo.uned.es*

*Julià, Ramón (Institut de Ciències de la Terra Jaume Almera-CSIC) rjulia@ija.csic.es*

*Montes, Ramón (Asociación Internacional CARP)*

*rmontes@prehistour.eu*

*Rasines, Pedro (CAEAP) prasines@hotmail.com*

*Vaquero, Manuel (Institut Català de Paleoecologia Humana i Evolució Social (IPHES)) manuel.vaquero@urv.cat*

Cultural change from the Middle Palaeolithic to the Upper Palaeolithic in Western Europe is subject to on-going debates because it is directly related to the replacement of Neanderthals by modern humans. This debate is

# A22 Origins and evolution of Modern Humans Behaviour: a view from North Africa

Commission on Palaeolithic Landscapes, Techniques and Cultures of Western North Africa  
(Organisers: Abdeljalil Bouzouggar, Nick Barton, Nabihha Aouadi Abdeljaouad)

Tuesday 2nd (9:00 to 13:30)  
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XVII Congreso Mundial de UISPP

ORAL CONTRIBUTIONS

ORAL

**1. RECENT RESEARCH INTO THE NORTH AFRICAN MIDDLE/LATE STONE AGE**

*Bouzouggar, Abdeljalil - (Institut national des sciences de l'archéologie et du patrimoine (Morocco) and Institute of archaeology, Oxford University, UK) abouzouggar@yahoo.fr*

*Barton, Nick - (Institute of archaeology, Oxford University, UK) nick.barton@arch.ox.ac.uk*

In the nineteenth century the first Aterian pedunculate lithic artefacts were discovered in North Africa. Since then many other *North African Middle Stone Age (NAMSA)* sites have come to light, but so far little has been published on any of the associated human fossils or their stratigraphic relationship with clearly diagnostic *NAMSA* finds. A point that also needs emphasizing is that up until now the majority of *NAMSA* human remains have come from western Morocco in a restricted area of the coastal zone between Rabat (Dar es Soltane 2) and Temara (Contrebandiers Cave and El Harhoura I Cave). This is almost certainly connected with a focus of fieldwork in this area over the past fifty years. It does not detract from the view that human remains in *NAMSA* contexts are relatively scarce and that the understanding of their evolutionary relationship with human fossils found in the *NAMSA* and Upper Palaeolithic is still problematic and controversial.

Any scope for discussing the *NAMSA* is still severely limited by the paucity of secure dating evidence. Although well-known sites, including those with human fossils, have been recorded on the Atlantic coast, very little dating evidence exists for the sequences in these caves. This is a major gap in our knowledge which we are hoping to rectify with new stratigraphic studies that are now in progress.

If we accept the dating from some caves, it is clear that the very late record of the Aterian of 40-20,000 B.P. can certainly now be extended back well to MIS6.

Another area for discussion concerns the whole question of the nature and identity of the *NAMSA* technology which we feel is urgently in need of review and redefinition. Up until now it has largely been accepted that the *Mousterian/Aterian* lithic technology is characterised by a dominance of flake tools and the Upper Palaeolithic by a dominance of tools on blades and bladelets. This

definition, which was already questioned by early researchers, has now come under renewed challenge after recent studies of finds from sites in Eastern Morocco and the Atlantic coast.

In consequence, it is now increasingly clear that this technology is a very flexible one, which in addition to flake tools includes evidence for the use of "Middle Palaeolithic" blades and flake tools and even occasionally pebble tools. Much of the existing interest in the *NAMSA* has tended to concentrate on the very narrow issue of pedunculate tools, rather than considering a wider set of variables. Finally, we feel that more consideration should be given to non-lithic aspects of the technology such as the manufacture and use of beads.

ORAL

**2. CULTURAL TRANSITIONS IN THE NORTH AFRICAN MIDDLE STONE AGE: A VIEW FROM MOROCCO**

*Bouzouggar, Abdeljalil - (Institut national des sciences de l'archéologie et du patrimoine (Morocco) and 2Department of Human Evolution, Max Planck Institute for Evolutionary Anthropology, Leipzig, Germany) abouzouggar@yahoo.fr*

*McPherron, Shannon (Department of Human Evolution, Max Planck Institute for Evolutionary Anthropology, Leipzig, Germany) mcpherron@eva.mpg.de*

*Ditchfield, Peter (Research Laboratory for Archaeology and the History of Art, University of Oxford, Oxford, UK) peter.ditchfield@rlaha.ox.ac.uk*

*Steele, Teresa (Department of Anthropology University of California, Davis, USA) testeele@ucdavis.edu*

*de Araújo Igreja, Marina (Centro de Arqueologia da Universidade de Lisboa, Portugal) maraujo\_mar@yahoo.com / dearaujo.igreja@mms.univ-aix.fr*

*Talbi, El Hassan (Université Mohamed 1er, Faculté des Sciences, Oujda, Morocco) talbi@sciences.univ-oujda.ac.ma*

*Boudchiche, Lahbib (Université Mohamed 1er, Faculté des Sciences, Oujda, Morocco) boudchichelahbib@yahoo.fr*

*Dörschner, Nina (Department of Human Evolution, Max Planck Institute for Evolutionary Anthropology, Leipzig, Germany) nina\_doerschner@eva.mpg.de*

*Fitzsimmons, Kathryn (Department of Human Evolution, Max Planck Institute for Evolutionary Anthropology, Leipzig, Germany) kathryn\_fitzsimmons@eva.mpg.de*

*Álvarez-Fernández, Esteban (Dpto. de Prehistoria, Historia Antigua y Arqueología, Facultad de Geografía e Historia, Universidad de Salamanca, Spain) epanik@usal.es*

*Jean-Jacques Hublin (Department of Human Evolution, Max Planck Institute for Evolutionary Anthropology, Leipzig, Germany) hublin@eva.mpg.de*

Numerous recent and on-going excavations are providing new data on North Africa's Middle Stone Age archaeological record. However, significant uncertainty remains on the nature, timing and meaning of the cultural variability this record documents across the period from 160,000 to 30,000 years ago, so much so that archaeologists are still debating how to organize and what to call these industries (e.g. Dibble et al. 2013). What is clear, however, given the rich hominin fossil record of North Africa, is that all major cultural transitions during this period occurred within *Homo sapiens* populations (Hublin 2001).

The definition of the North African MSA (Mousterian/Aterian) is based on inadequate archaeological evidence, and far from being a homogeneous or stable cultural entity, the MSA shows successive typological and technological changes through time. In this paper we seek to address some of the issues concerning these industries including their definition and the variability within them. A major problem is that much of the information concerning the evolution of the North African MSA is based on the very narrow issue of pedunculated tools. Microwear analyses from Rhafas have shown that some pedunculates appear to have been used for a range of tasks including scraping and butchery. When discussing the Aterian and late MSA variability, a wider set of variables should be considered including blades and bifacial foliates as well as changes in the core and blank morphologies.

One of the main aims of this paper is to provide information concerning the validity and significance of the two so-called "facies" (Mousterian/Aterian) of the North African MSA as there is still uncertainty whether these two are in fact distinct or whether they should be recognized as one unit with internal variability. Further, if they are indeed separate units, it is unclear whether they are a result of population replacement or a cultural transition. In this paper we discuss the nature of cultural variability in the late MSA based primarily on new data coming from excavations in Rhafas Cave compared to other sites in the region with similar sequences (Bouzouggar et al., 2007). We present new information on chronological developments within a sequence that also documents evidence for personal ornaments and symbolic shell artefacts

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### 3. QUELQUES CONSIDÉRATIONS TECHNO-COMPORTEMENTALES SUR DEUX SÉRIES LITHIQUES ET OSTÉOLOGIQUES DU PALÉOLITHIQUE MOYEN EN TUNISIE

*Aouadi Abdeljaouad, Nabiha - (Institut National du Patrimoine, Tunisie) aouadinabiha@gmail.com*  
*Belhouchet, Lotfi (Institut National du Patrimoine, Tunisie) lotfi\_belhouchet@yahoo.f*  
*Barton, Nick - (Institute of archaeology, Oxford University, UK) nick.barton@arch.ox.ac.uk*

Nous souhaitons présenter quelques considérations technico-typologiques et comportementales sur un certain nombre de sites tunisiens attribués au Paléolithique moyen et récemment fouillés (Oued el Akarit et Aïn el Guettar).

Dans le site de l'Oued el Akarit, les carcasses de grands ongulés ont été ramenées entières sur le site et dépecées en faisant appel surtout à de gros blocs de pierres présents *in situ*. Le mode de subsistance des Préhistoriques et la présence de l'industrie osseuse sur le site suggèrent des activités liées à des *Homo sapiens* modernes. Des pièces pédonculées à débitage microlithique ont été découvertes tout le long de la séquence. Suite aux observations faites, l'Atérien semble représenter un faciès parmi tant autres appartenant à cette période.

Les modes de subsistance des hommes préhistoriques durant le Pléistocène supérieur en Tunisie sont en étroite relation avec les changements paléoenvironnementaux. Ces économies de subsistances montrent que l'Oued el Akarit est un site d'habitat avec une exploitation maximale des carcasses de *Ceratotherium* et d'*Equus mauritanicus* sur place alors que le site de l'Aïn el Guettar est un camp de boucherie saisonnier avec dépeçage des espèces particulières qui sont *Equus melkiensis*, *Equus algericus*, et *Alcelaphus buselaphus* avec transport sélectif des parties les plus nutritives hors du site.

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ORAL

### 4. THE LATE STONE AGE OF HAUJA FTEAH CAVE IN NORTHERN CYRENAICA, LIBYA: ORIGINS, CHARACTERISTICS AND LATE PLEISTOCENE TECHNOLOGICAL SHIFTS.

*Mutri, Giuseppina - (Department of archaeology, University of Cambridge, UK) gm461@cam.ac.uk*  
*Sacha Jones (Department of archaeology, University of Cambridge, UK) scj23@cam.ac.uk*

In the last decade, research in North Africa has revealed new and interesting data on the Middle Stone Age (MSA) to Later Stone Age (LSA) transition and chronology. In Morocco, the cave sediments of Taforalt present a clear



stratigraphical discontinuity between the youngest Aterian (MSA) and the oldest Iberomaurusian (LSA) levels, where these two horizons appear to be culturally unrelated. Currently, the Iberomaurusian at Taforalt, dated to 23000 BP, is the oldest dated LSA context in the Maghreb (Barton, R. N. E., et al. 2013). In North-east Africa, and particularly in Cyrenaica, the Dabban is considered the oldest LSA context, dated to between 40000 and 17000 BP (Douka et al 2014). At Haua Fteah, the Dabban is overlain by the Oranian, a backed bladelet lithic complex very similar to the Iberomaurusian.

While the Aterian and Iberomaurusian at Taforalt are argued to be culturally unrelated, the same cannot be said for the relationship between the Dabban and Oranian at Haua Fteah. Although certain technological criteria and differential artefact frequencies do distinguish these latter two industries, their technological commonalities unite them into a single technological system.

In Cyrenaica, therefore, the MSA to LSA transition needs to be sought earlier than in the Maghreb, and most probably in the late "Levalloiso-Mousterian" (McBurney 1967) levels at Haua Fteah. In this paper, we are going to address this problem through an assessment of the technological features of the Dabban lithic artefacts, highlighting elements of continuity with the Oranian and demonstrating its association with a LSA technocomplex.

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#### ORAL

### 5. L'APPORT DU SITE DE KEF EN-NAGA (CHEFFIA, NORD-EST ALGÉRIEN) À LA QUESTION DE LA TRANSITION ÉPIPALÉOLITHIQUE-NÉOLITHIQUE. DONNÉES STRATIGRAPHIQUES, PALÉO-MAGNÉTIQUES ET ARCHÉOLOGIQUES.

*Latifa, Sari - (Centre national de recherches préhistoriques, anthropologiques et historiques (CNRPAH). Alger, Algérie.) sari.latifa@cnrpah.org*

*Abderrazak, Djerrab - (Université de Guelma, Département d'Histoire et d'Archéologie, Guelma, Algérie.) djerrab@yahoo.fr*

*Spasov, Simo - (Section du Magnétisme Environnemental, Centre de Physique du Globe de l'Institut Royal Météorologique de Belgique, B-5670 Dourbes (Viroinval), Belgique.) simo.spasov@meteo.be*

*Soudani, Lila - (Centre national de recherches préhistoriques, anthropologiques et historiques (CNRPAH). Alger, Algérie.) ait\_lei@yahoo.fr*

*Benslama, Lazreg - (Université Houari Boumediene, Faculté*

*des Sciences de la Terre, Alger, Algérie.) lazregb@yahoo.fr*

*Ali Sari - sariiali63@yahoo.fr (Centre de recherche nucléaire de Birine, BP 180, Algérie)*

*Bensadok, Saida - (Centre national de recherches préhistoriques, anthropologiques et historiques (CNRPAH). Alger, Algérie) ben.saida@ymail.com*

*Sehil, Nana - (Centre national de recherches préhistoriques, anthropologiques et historiques (CNRPAH). Alger, Algérie.) sanarch1982@yahoo.fr*

Il existe très peu de sites préhistoriques connus dans la région de la Cheffia (sud-est d'El Tarf), et les vestiges ibéromaurusiens n'ont jamais été trouvés sous-jacents aux vestiges néolithiques. Une fouille de sauvetage a été récemment opérée au niveau du site préhistorique de Kef en-Naga. La découverte de ce site inédit a été favorisée par l'exploitation d'une carrière en grès dont les travaux ont tronqué une grande partie du site sur son profil transversal, ce qui a eu pour conséquence la disparition d'une grande partie du potentiel archéologique.

Le site de Kef en-Naga était un site de plein air protégé par une imposante falaise en grès qui dominait la vallée de l'oued Krenga à une altitude de 130 m, au milieu d'un massif accidenté revêtu d'une broussaille épaisse. L'aire fouillée se trouve sur un glaci-cône d'accumulation au pied d'un escarpement gréseux peu étendu et en pente forte. L'épaisseur de la formation observée au niveau de la coupe stratigraphique dégagée atteint 5 m d'épaisseur. La couche archéologique, couverte pas les alluvions, est constituée de sables fins argileux de couleur gris foncé. Elle est sous-jacente à une couche jaune marneuse 'intermédiaire' qui repose sur une assise d'argiles stériles.

La confrontation des analyses granulométriques et diffractométriques des sédiments prélevés au niveau de la couche archéologique, ainsi que l'analyse de leurs propriétés magnétiques a permis de conclure à la présence de deux types de dépôts sablo-argileux, non encore datés, qui se seraient formés distinctement et dans des conditions paléoenvironnementales différentes.

Les diverses analyses des sédiments confortent les résultats de l'examen des restes archéologiques.

En effet, le premier dépôt se rapporterait à l'Ibéro-maurusien et serait caractérisé par une industrie lamellaire à microburins, alors que le second, trouvé en position remaniée, contiendrait une industrie néolithique sur éclats associée à la production de la céramique.

ORAL

**6. INDICES DU COMPORTEMENT MODERNE CHEZ LES HOMMES D'EL MNASRA (TÉMARA, MAROC) IL Y A PLUS DE 100 000 ANS.**

*El Hajraoui, Mohamed Abdeljalil - (Institut National des Sciences de l'Archéologie et du Patrimoine, Département de Préhistoire, Rabat, Maroc) maelhajraoui@gmail.com*

*Nespoulet Roland - (Muséum National d'Histoire Naturelle, Département de Préhistoire-UMR 7194, Paris, France) roland.nespoulet@gmail.com*

*Debenath, André - (Muséum National d'Histoire Naturelle, Département de Préhistoire-UMR 7194, Paris, France) andre.debenath16@orange.fr*

Située dans la région de Rabat-Témara, la grotte d'El Mnasra, dont les fouilles ont débuté depuis 1992, ne cesse de nous livrer de nouveaux indices archéologiques remarquables chaque année. Certaines de ces découvertes nous ont apporté énormément de renseignements sur le comportement moderne d'*Homo sapiens* au début du Pléistocène supérieur (Atérien). Outre leur très grande ancienneté, la présence simultanée de plusieurs indices dans les mêmes niveaux archéologiques nous amène à considérer que la grotte d'El Mnasra livre une documentation exceptionnelle.

Parmi les indices les plus représentatifs, nous retenons : Les foyers. Dans la couche 6, datée d'environ 110 ka, sept foyers ont été mis au jour sur une surface de 5 m<sup>2</sup>. Trois types de structures ont été identifiés : des foyers fermés, ouverts et enfin des foyers surcreusés. Ceci montre que la majorité des modes de construction d'une structure de ont été exploités, et que les atériens ont su maîtriser une large gamme de techniques liées à l'usage domestique du feu. Leurs fonctions présumées étaient la cuisson, la chauffe, la défense et l'éclairage. Des techniques d'entretien de la combustion a été mise en évidence dans les foyers creusés, indiquant un usage anticipé et répétitif de la même structure sur une assez longue période.

Les hématites. Les blocs d'hématite brute provenant des niveaux atériens d'El Mnasra sont de différentes variétés. Dans les couches 5 et 7, des blocs travaillés présentent des stries de raclage ainsi que des plages polies. Il s'agit, à notre connaissance, des premières découvertes de ce type dans l'Atérien du Maroc. Ces colorants sont accompagnés d'un galet de quartzite assez volumineux interprété comme une molette.

Les pièces en matières dures d'origine animale. Les niveaux atériens 5 et 6 d'El Mnasra ont livré 13 objets

façonnés en os. D'un point de vue fonctionnel, et comparativement aux outils lithiques, ces pièces indiquent qu'une même fonction, telle que racler et/ou percer, peut être accomplie avec des outils façonnés dans une matière première complètement nouvelle. Ceci témoigne d'une inventivité et d'une créativité permettant et se traduit par l'emploi et la maîtrise de plusieurs techniques, ainsi que l'utilisation de multiples outils pour accomplir des fonctions semblables.

Dans les niveaux 5, 6 et 7, 221 coquilles de *Nassarius* ont été recensées. Plus de 70 % d'entre elles sont perforées. Par comparaison avec des découvertes similaires dans des sites du Maroc, d'Algérie, d'Afrique du sud et du Proche-Orient, on peut considérer ces pièces comme des éléments artistiques et symboliques, puisque certaines perforations sont intentionnelles et présentent des traces d'usage de liens.

Avec ces trois types d'indices, nous pouvons conclure que l'esprit novateur, créateur, économe, social, prévisionnel, base du comportement moderne de l'Homme, se trouve bien documenté dans la grotte d'El Mnasra. Cette grotte constitue donc un jalon important de la question de la modernité comportementale des premiers *Homo sapiens* du Maghreb.

POSTER

POSTER

**7. FIRST INSIGHTS ON THE ECONOMIC-ORGANIZATION OF THE ATERIAN HUNTER-GATHERERS DURING THE OIS 5: EXAMPLES FROM THE TÉMARA COASTAL REGION (MOROCCO).**

*Campmas, Emilie - (PACEA-UMR 5199, Université de Bordeaux) em.campmas@gmail.com*

*Costamagno, Sandrine - (TRACES-UMR 5608, Université Toulouse le Mirail) costamag@univ-tlse2.fr*

*Amani, Fethi - (INSAP, Rabat) fethiamani124@gmail.com*

*Michel, Patrick - (PACEA-UMR 5199, Université de Bordeaux) patrick.michel@u-bordeaux1.fr*

*El Hajraoui, Mohamed Abdeljalil - (INSAP, Rabat) maelhajraoui@gmail.com*

*Nespoulet, Roland - (Département de Préhistoire-UMR 7194, MNHN, Paris) roland.nespoulet@mnhn.fr*

The Témara area is located near Rabat on the Moroccan Atlantic coast. During the OIS 5, human occupations were related to high sea levels when the shoreline was near to the caves (Jacobs *et al.*, 2012; Stoetzel *et al.*, 2014).

This presentation is build on taphonomic and zooarchaeological analyses of meso and macrofaunal remains of El Mnasra Cave layers dated to the OIS 5.

The example of El Mnasra Cave indicates that diverse resources were consumed by Aterian populations: terrestrial resources on one hand, such as tortoises and several ungulates (gazelles and other bovids, wildpigs, equines and maybe elephants, rhinoceros and hippos), and marine resources such as shellfishes on the other hand. A complete reduction sequence of butchery of ungulates (mainly gazelles) is identified despite the rarity of cut-marks. Frequencies of butchery-marks are lower than in Europe archaeofaunal assemblages. Several phenomenon can explain this difference: the presence of unobservable surfaces (concretions, burnt portions); the use of a low magnification; the influence of climate on butchery practices or specific butchery practices (Campmas, 2012).

In addition to the butchery, evidence for multiple activities is seen through stone tool artifacts (including tanged tools), *Nassarius* shells beads (N>200), bone industry, used pigments and fire places (El Hajraoui *et al.*, 2012). These indexes show that El Mnasra was not a specialized site dedicated to one activity. The low density of material and the low number of exploited prey suggest short time occupations.

Thus this site could be interpreted as a short-term residential camp within a larger mobility system of "forager" type with a significant mobility of the residential camp, exploitation of local resources and without storage of food (Campmas, 2012).

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ORAL

## 8. THE ARCHAEOLOGICAL RESULTS OF PREHISTORIC SOCIETIES OBTAINED IN THE ARCHAEOLOGICAL CHART OF NORTH AFRICA PROJECT

Ramos, José - (Universidad de Cádiz, Cádiz, España) jose.ramos@uca.es

Zouak, Mehdi - (Inspección Regional de Monumentos Históricos, Ministerio de Cultura. Tetuán, Marruecos) m\_zouak@yahoo.fr

Vijande, Eduardo - (Universidad de Cádiz, Cádiz, España) eduardo.vijande@uca.es

Cantillo, Juan Jesús (Universidad de Cádiz, Cádiz, España) - jesus.cantillo@uca.es

Domínguez-Bella, Salvador - (Universidad de Cádiz, Cádiz, España) salvador.dominguez@uca.es

Maate, Ali - (Universidad Abdelmalek Essaadi, Tetuán, Marruecos) alimaate@yahoo.fr

Abdelaziz, El Idrissi - (Museo Nacional de Arte Moderno, Rabat, Marruecos) elidrissi\_abdelaziz@yahoo.fr

Barrena, Antonio - (Universidad de Cádiz, Cádiz, España) antonio.barrena@uca.es

Gutiérrez, José María - (Museo de Villamartín, Villamartín, Cádiz, España) museovillamartin@hotmail.com

Almisas, Sergio - (Universidad de Cádiz) seralmcru@alum.us.es

This paper presents a synthesis of the results of the Archaeological Map Project in Northern Morocco, which has been carried out by researchers from the University of Cádiz, University of Abdelmalek Essaadi and Insap of Rabat.

There have been 4 prospecting archaeological campaigns in the region of Tetuán with excavations in the Cave of El Hafa and the Shelter of Marsa.

We provide data about the geomorphological context as well as explaining the kind of lithic resources used by the different human groups who had settled there. Moreover, the prospected areas and the settlement patterns studied in all of them are presented in this paper. We provide an updating of the relevant occupations corresponding to Palaeolithic hunter-gatherer societies, Neolithic tribal societies and also, of those ones corresponding to associated stages to Recent Prehistory.

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ORAL

## 9. THE SHELTER OF BENZU. A MIDDLE PALAEOLITHIC SITE WITH EXPLOITATION OF MARINE RESOURCES BY HUNTER-GATHERER SOCIETIES, SETTLED ON THE NORTH AFRICA

Ramos, José - (Departamento de Historia, Geografía y Filosofía. Facultad de Filosofía y Letras. Universidad de Cádiz (España)) jose.ramos@uca.es

Bernal, Dario (Departamento de Historia, Geografía y Filosofía. Facultad de Filosofía y Letras. Universidad de Cádiz) dario.bernal@uca.es

Vijande, Eduardo - (Universidad de Cádiz, Cádiz, España) eduardo.vijande@uca.es

Cantillo, Juan Jesús (Universidad de Cádiz, Cádiz, España) - jesus.cantillo@uca.es

Barrena, Antonio - (Universidad de Cádiz, Cádiz, España) antonio.barrena@uca.es

Domínguez-Bella, Salvador - (Universidad de Cádiz, Cádiz, España) salvador.dominguez@uca.es

*Clemente, Ignacio (Institució Milá i Fontanals, CSIC. Barcelona) ignacio@imf.csic.es*

*Rodríguez, Joaquín Vidal (Departamento de Geodinámica y Paleontología. Universidad de Huelva) jrvidal@uhu.es*

*Chamorro, Simón (Instituto de Estudios Ceutíes. Ceuta)*

*Durán, Juan José (Instituto Geológico y Minero de España. Madrid) jj.duran@igme.es*

*Abad, Manuel (Departamento de Geología. Facultad de Ingeniería. Universidad de Atacama (Chile))*

*Calado, David (Instituto Português do Património Arquitectónico. Faro (Portugal) dcalado@ippar.pt*

*Ruiz-Zapata, Blanca (Departamento de Geología. Universidad de Alcalá de Henares. Alcalá de Henares) blanca.ruiz@uah.es*

*Gil, María José (Departamento de Geología. Universidad de Alcalá de Henares. Alcalá de Henares) mjose.gil@uah.es*

*Uzquiano, Paloma (Universidad Nacional de Educación a Distancia (UNED) p\_uzquiano@hotmail.com*

*Soriguer, Milagrosa (Departamento de Biología. Facultad de Ciencias del Mar. Universidad de Cádiz) mila.soriguer@uca.es*

*Monclova, Antonio (Departamento de Historia, Geografía y Filosofía. Facultad de Filosofía y Letras. Universidad de Cádiz) anmonc@terra.es*

*Toledo, Jesús (Departamento de Historia, Geografía y Filosofía. Facultad de Filosofía y Letras. Universidad de Cádiz) shadoworld86@hotmail.com*

*Almisas, Sergio (Departamento de Historia, Geografía y Filosofía. Facultad de Filosofía y Letras. Universidad de Cádiz) seralmcru@alum.us.es*

The rockshelter of Benzú is located near the city of Ceuta, in North Africa. We have done an evaluation of geological, stratigraphic, chronological, and ecological data as well as of the different resources used by prehistoric societies.

We emphasize on technological data of the archaeological products and in lifestyles. Geological and paleoecological bases of the historical region of the Strait of Gibraltar provide great similarities between the European and North African shore.

The shelter of Benzú has a sequence of 7 archaeological levels with a clearly-defined technology belonging to Mode III concept. The similarities with the sets of the southern Iberian Peninsula are evident. We also emphasize the exploitation of marine resources by hunter-gatherer societies since the beginning of the Middle Pleistocene sequence.

## POSTER

### 10. TOOL USE AND HAFTING IN THE MIDDLE PALAEO-LITHIC OF NORTH AFRICA: PRELIMINARY RESULTS OF AN ON-GOING USE-WEAR ANALYSIS ON THE MOUSTERIAN/ATERIAN ASSEMBLAGES OF IFRI N'AMMAR (MOROCCO)

*Tomasso, Sonja - (Ulg/ Kaak-DAI) sonjatomasso@hotmail.com*

*Rots, Veerle - (Ulg) veerle.rots@ulg.ac.be*

The rock shelter of Ifri n'Ammar has a remarkable stratigraphy with alternating Mousterian and Aterian occupations within more than 6 meters of sediments dated from MIS 6 to 5a. The stratigraphy attributed to the Middle-Palaeolithic is divided in two units, separated by a calcareous crust, where upper and lower Aterian occupations can be identified.

Previous studies have characterised Aterian and Mousterian cultures on a typological and technological basis. Functional data on lithic industries from the Middle Palaeolithic in northern Africa is at present very scarce and detailed studies of the production, hafting and use of tools, particularly tanged pieces, have not yet been conducted.

Preliminary results of an on-going use-wear analysis of Middle Palaeolithic stone tools from the site of Ifri n'Ammar will be presented. Both low and high magnifications are combined for examining the macro- and microscopic wear traces on the stone tools. The interpretation of the archaeological material is based on comparisons with an experimental reference collection.

The long-term goal of the study is to understand how stone tools were used, whether hafted stone tools existed at the site and how these functional parameters compare to the typo-technological characteristics of the different assemblages and how they may have influenced assemblage variability.

## ORAL CONTRIBUTIONS

## ORAL

### 11. THE SHELTER OF BENZU. A MIDDLE PALAEO-LITHIC SITE WITH EXPLOITATION OF MARINE RESOURCES BY HUNTER-GATHERER SOCIETIES, SETTLED ON THE NORTH AFRICAN

Ramos, José - jose.ramos@uca.es (Universidad de Cádiz)  
Bernal, Dario - dario.bernal@uca.es (Universidad de Cádiz)  
Vijande, Eduardo - (Universidad de Cádiz) eduardo.vijande@uca.es  
Cantillo, Juan Jesús - (Universidad de Cádiz) jesus.cantillo@uca.es  
Barrena, Antonio - (Universidad de Cádiz) antonio.barrena@uca.es  
Domínguez-Bella, Salvador - (Universidad de Cádiz) salvador.dominguez@uca.es  
Ignacio Clemente - (CSIC.Institució Milà i Fontanals) ignacio@bicat.csic.es  
Rodríguez Vidal, Joaquín - (Universidad de Huelva) jrvidal@uhu.es  
Chamorro, Simón - (Instituto de Estudios Ceutíes) schamorro@wanadoo.es  
Durán, Juan José - (Instituto Geológico y Minero de España) jj.duran@igme.es  
Abad, Manuel - manuel.abad@uda.cl (Universidad de Atacama) jj.duran@igme.es  
Calado, David - (Instituto Português do Património Arquitectónico) calado.david@gmail.com  
Ruiz Zapata, Blanca - (Universidad de Alcalá de Henares) blanca.ruiz@uah.es  
Gil, María José - (Universidad de Alcalá de Henares) mjose.gil@uah.es  
Uzquiano, Paloma - (Universidad Nacional de Educación a Distancia) p\_uzquiano@hotmail.com  
Soriguer, Milagrosa - (Universidad de Cádiz) mila.soriguer@uca.es  
Monclova, Antonio - (Universidad de Cádiz) anmonc@terra.es  
Toledo, Jesús - (Universidad de Cádiz) jesustoledo86@gmail.com  
Almisas, Sergio - (Universidad de Cádiz) seralmcru@alum.us.es

The rockshelter of Benuz is located near the city of Ceuta, in North Africa.

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The similarities with the sets of the southern Iberian Peninsula are evident. We also emphasize the exploitation of

marine resources by hunter-gatherer societies since the beginning of the Middle Pleistocene sequence.

ORAL

## 12. WILD PLANT EXPLOITATION AND TOOTH DECAY DURING THE IBEROMAURUSIAN

Humphrey, Louise - (Natural History Museum) lth@nhm.ac.uk  
De Groot, Isabelle (Liverpool John Moores University) I.E.DeGroot@ljmu.ac.uk  
Jacob Morales (Universidad de Las Palmas de Gran Canaria) JACOBMOR@terra.es  
Barton, Nick - (Institute of archaeology, Oxford University, UK) nick.barton@arch.ox.ac.uk  
Collcutt, Simon (Oxford Archaeological Associates Ltd) professional.arch@conted.ox.ac.uk  
Ramsey, Christopher Bronk (University of Oxford) christopher.ramsey@rlaha.ox.ac.uk  
Abdeljalil Bouzouggar - (Institut national des sciences de l'archéologie et du patrimoine, Rabat, Maroc) abouzouggar@yahoo.fr

Archaeological deposits at Grotte des Pigeons in Morocco document extensive evidence for human occupation during the Later Stone Age (Iberomaurusian) and incorporate numerous human burials representing the earliest dated cemetery in the Maghreb. Recent excavations have focussed on undisturbed burial deposits situated at the rear of the cave (Sector 10) and a deep well stratified sequence of deposits situated closer to the cave opening (Sector 8), where there is no evidence of funerary activity.

Sector 8 deposits document a marked change in the use of the cave during the Iberomaurusian, leading to the rapid accumulation of massive ashy midden layers known as the 'Grey Series' between 15,000 and 12,700 cal BP. Charred macro-botanical remains from these well-stratified deposits provide evidence for numerous edible or economically useful wild plants including acorns and pine nuts, juniper, terebinth pistachio, wild pulses and wild oats. The presence of rhizome fragments of esparto grass suggests that baskets could have been made and used to collect, store and process wild plant foods and other resources. The abundance of acorns and pine nuts points to deliberate selection of seeds with a high nutritional value that could have been stored and used as a staple food for most of the year.

The more rapid formation of cultural deposits after 15,000 cal BP points towards an intensification of activ-

ity involving more prolonged occupation periods or a larger population. Systematic harvesting and processing of wild food resources including plants and edible land snails may have supported a more sedentary lifestyle during the late Iberomaurusian than previously recognised. Direct dates on human bone samples from Sector 10 yielded age estimations between 15,077 cal BP and 13,892 cal BP, indicating that the allocation of a spatially demarcated area at the back of the cave for funerary activity coincided with the base of the Grey Series, and implying a simultaneous intensification of ritual and economic activities at Grotte des Pigeons.

Analyses of the adult dentitions revealed evidence of severely impaired dental function due to poor oral health, heavy tooth wear and cultural modification of the anterior dentition. The exceptionally high prevalence of carious lesions implies that most adults at Taforalt were infected by cariogenic oral bacteria. The shift towards a disease associated oral microbiota is likely to reflect regular consumption of wild plants rich in fermentable carbohydrates and processing of plant foods to increase their stickiness. The Iberomaurusian inhabitants Taforalt represent the earliest example of a hunter gatherer population with a high prevalence of caries, predating other high caries populations and the first signs of food production by several thousand years.

ORAL

### 13. OCCUPATION DE L'ESPACE ET COMPORTEMENT ANTHROPIQUE PENDANT LE PLÉISTOCÈNE (NORD-OUEST DU PLATEAU CENTRAL MAROCAIN)

*Mostapha Belhilali - (Département de géographie physique, Université Mohammed V-Agdal, Rabat, Maroc) belhilali@hotmail.com*

*Abdeljalil Bouzouggar - (Institut national des sciences de l'archéologie et du patrimoine, Rabat, Maroc) abouzouggar@yahoo.fr*

*Mohammed Tailassane (Département de géographie physique, Université Mohammed V-Agdal, Rabat, Maroc) tailamed2005@yahoo.fr*

*Abderrahim Watfeh (Département de géographie physique, Université Mohammed V-Agdal, Rabat, Maroc) abderrahimbenali@yahoo.fr*

La région étudiée est rattachée à la partie septentrionale du Plateau central marocain. Elle relie le palier intermédiaire (Amont) et le palier inférieur (Aval). C'est un espace naturel de transition verticale et horizontale. En effet l'amont fournit l'eau et les matériaux détritiques et cal-

caire (rôle du substrat géologique) et l'aval constituée par les fonds de vallées reçoit sa richesse en matière première. La région représente alors, une toposéquence dont la dynamique de transport des matériaux sur les versants est l'origine d'un apport essentiel pour les vallées d'une part, et offre de meilleures conditions de vie d'autre part.

Les fonds de vallées avec leurs terrasses alluviales, correspondent à des milieux très riches en matières premières lithiques indiquant l'intensité de l'occupation et l'exploitation anthropique.

En effet, la découverte de plusieurs sites archéologiques qui témoigneraient d'une occupation dense de la région au cours du Pléistocène. Le matériel archéologique est essentiellement composé d'objets lithiques abondants en coupes, sur les surfaces des terrasses et des plateaux. Les traces de l'homme enregistrées sur les terrasses et sur les surfaces des plateaux, explique les déplacements sans cesse de l'homme.

Ce genre de comportement, nous pousse à poser la question suivante : pourquoi l'homme a essayé d'occuper des espaces topographiques différents et très dispersés ? Est-ce à cause des crises environnementales ou pour chercher la matière première pour perfectionner ces outils ?

En effet selon les vestiges, l'homme a toujours essayé d'inventer de nouveaux outils de travail soit pendant les crises climatiques, soit pendant les périodes de stabilité pour répondre à ses besoins.

ORAL

### 14. LA DYNAMIQUE ET LE PEUPEMENT HUMAIN DANS LES PLATEAUX DE LA MESETA ATLANTIQUE AU COURS DE L'HOLOCÈNE

*Watfeh, Abderrahim - (Département de géographie physique, Université Mohammed V-Agdal, Rabat (Morocco) watfeh@gmail.com*

*Tailassane, Mohammed - (Département de géographie physique, Université Mohammed V-Agdal, Rabat (Morocco) tailamed2005@gmail.com*

*Nafaa, Rachida (Département de géographie physique, Université Hassan II-Mohammedia) nrachida2005@yahoo.fr*

*Malek, Farid (Laboratoire des recherches, d'analyses techniques et scientifiques de la gendarmerie royale, Témara (Morocco) larsbruus@hotmail.com*

*Laouina, Abdallah (Département de géographie physique, Université Mohammed V-Agdal, Rabat (Morocco))*

Les plateaux de la meseta côtière longent l'espace littoral entre kénitra et Casablanca et forment son arrière pays (figure 1). Ils se composent des grès marins et dunaires plio-quaternaires qui couvrent en discordance majeure les flyschs du socle Primaire, ainsi que la molasse et les marnes messéniennes. Ils se présentent en forme de cordons dunaires bio-détritiques consolidés, en prenant une disposition parallèle à la ligne du rivage.

La période de l'Holocène en Afrique du Nord a connu un développement accéléré des activités humaines. De telles innovations ont nécessité le recours à des méthodes scientifiques pluridisciplinaires pour les comprendre, telle que l'archéologie, les sciences humaines sociales et économiques afin de mieux analyser les héritages holocènes comme les sols, les différents dépôts, les trouvailles archéologiques et les restes osseux de la faune fossile. Cette approche qui peut nous aider à mieux appréhender la relation qui a pu exister entre l'Homme et son milieu, nous l'avons appliqué sur des coupes pertinentes selon les étapes suivantes:

a) description géomorphologique détaillée : ceci afin de préciser les types de sédimentation et leur localisation, leur proportion et par la suite choisir les échantillons qui seront soumis à des études sédimentologiques et chimiques au laboratoire. Cela pour but d'avoir d'après l'interprétation de leurs résultats des indications sur les paléo-environnements qui ont caractérisé les paléo-milieus holocènes déjà anthropisés.

b) Avoir recours à l'analyse archéologique, car les témoins matériels des activités humaines dans les sols ou dans d'autres dépôts peuvent fournir des indications sur la nature du peuplement humain, du milieu et les types d'exploitation des ressources de ce dernier.

c) Nous avons également eu recours aux datations radiométriques et essentiellement le  $^{14}\text{C}$  sur les charbons de bois et les coquilles terrestres, ce matériel est issu dans un premier lieu des profils de la Plage des Nations, de Fouarat, (Nafaa 2002) de l'embouchure de l'oued Cherrat (Tailassane 1999), et dans un second lieu ces méthodes ont également concerné les coupes de Harhoura et de Bir Jdid. (Watfeh et al. 2007), D'autres datations par OSL (Luminescence Stimulée Optiquement) ont essentiellement concerné la séquence de la grotte de Dar Es Soltane 1 (Rabat), d'El Mnasra (Témara) et des Contrebandiers (Témara) (Schwenninger et al., 2010 ; Bouzouggar et Barton, 2012).

L'ensemble des études s'accorde à attribuer un âge entre 6500 et 5500 ans BP pour dater l'optimum de la pulsation positive du mellahien. Les nouvelles recherches au niveau de la plage de harhoura au sud de la ville de Rabat réalisées par notre équipe depuis 2003 ont démontré que la transgression marine mellahienne correspond à deux pulsations marines :

- la première s'est produite vers  $6154 \pm 156$  ans BP correspondant au beach rock consolidé ;
- la seconde que nous avons identifiée récemment est représentée par un niveau marin plus haut que le précédent et qui l'a donc enfoui. Elle est datée de  $4888 \pm 139$  ans BP.

Les nouvelles recherches sur le littoral atlantique ont démontré que la transgression mellahienne s'est composée de deux phases principales et elles ont démontré que les traces de l'installation humaine sont devenues plus importantes au cours de l'Holocène.

# A24a Recolonisation or new landscapes: adaptations and change in the Early Holocene

Commission on Cultures, economy and ecology of Post Palaeolithic hunter gather  
(Organisers: P. Woodman)

Thursday 4th (14:30 to 19:30)  
Meeting Room: S3



2014 burgos  
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XVIIe Congrès Mondial de l'UISPP  
XVII Congreso Mundial de UISPP



ORAL CONTRIBUTIONS

ORAL

**1. THE MESOLITHIC HUT SITE OF CAMAS DARAICH, ISLE OF SKYE, SCOTLAND. SPATIAL ANALYSIS, RAW MATERIALS AND LITHICS: FIRST RESULTS**

*Juanola, Laura - (Universitat Autònoma de Barcelona) laura\_333333@hotmail.com*

*Ros, Eva - (Universitat Autònoma de Barcelona) Eva.RoS@e-campus.uab.cat*

*Estévez Escalera, Jordi - (Universitat Autònoma de Barcelona) jordiestevez@icloud.com*

*Pérez Rodríguez, Manuela - (Universitat Autònoma de Barcelona) manuela.perez70@gmail.com*

*Hardy, Karen - (ICREA at Universitat Autònoma de Barcelona) khardy@icrea.cat*

The Mesolithic of the west coast Scotland is well known, principally for its shell middens and evidence for coastal exploitation. Camas Daraich is an open air Mesolithic site, currently the earliest in the Isle of Skye, Scotland, where it is located at the southernmost point of the island, at the Point of Sleat. It lies around 500m from the current coastline, facing a paleolake. Little evidence survives for resource exploitation, though micromorphology shows that the occupation layer was formed in situ with a high organic component which indicates animal consumption at the site, while some charred plant remains have also been recovered.

Early excavations in 2000, were followed more recently, by a new excavation campaign. Currently raw material characterisation, lithics analysis and spatial analyses are ongoing.

The recent excavations have revealed a large lithic assemblage, a series of small stone alignments and the outline of a structure. Raw materials suggest connections to the island of Rum 12 miles away and also to the north east part of the island.

Here we present the first results of the lithics analysis and spatial analysis of the occupied area. We offer our early interpretations of the occupation of the site.

ORAL

**2. COLONISATION OF THE UPPER MIERA AND ASON VALLEYS (CANTABRIA, SPAIN) EN THE LATE GLACIAL PERIOD AND THE HOLOCENE**

*Pérez Bartolomé, Mercedes - (UNED Univ, Nac. Educ. a Dist.) mercedesper@hotmail.com*

The colonisation of the upper valleys in the centre of Cantabria, the Miera and the Asón, in the late glacial period and the Holocene will be studied. The upper part of these valleys was affected by glaciation (glaciers in the Upper Miera valley, Valdició and Bustalviente). The moraines reached altitudes of 500m in the Miera and 340m in the Asón, where the glacier ablation zones were located.

The chronological sequence of occupation in altitudes of 300-700m will be presented. Although these are not great heights, owing to the geomorphology in this area with very steep slopes and karst landforms, the valleys are characterised by very rugged relief.

The settlement patterns will be considered together with the variables of absolute and relative altitude, distance from the coast and local topography. The settlement type, its relation with the landscape and the resources available in the different biotopes will also be assessed.

ORAL

**3. AFTER THE ICE: COLONISING ISLANDS**

*Woodman, Peter - (UCC) p.woodman@ucc.ie*

For hunter gatherers the process of colonising an island is not always easy. For archaeologists the identification of this process can also be difficult. Ireland represents a good case study where factors such as its size easy/difficult access, environmental or climatic differences or even a convenient substantial population presence at the start off point have to be weighed against each other. In terms of researching how and when colonising new island landscapes, there are two issues. 1) One might presume that the resources of the sea would play a major role yet the role of changing sea levels can present a major obstacle to finding evidence of coastal settlement. 2) One major question is whether, after arrival, significant changes take place and how rapidly does this process begin.

ORAL

**4. FROM HUNTER GATHERERS TO HUNTER GATHERERS AGAIN: SOFT COMPUTING PERSPECTIVE FOR UNDERSTANDING THE ARCHAEOLOGICAL GAP AND ITS IMPLICATIONS (8.6-6.2K BP) IN TIERRA DEL FUEGO (ARGENTINA AND CHILE)**

*Maximiano Castillejo, Alfredo - (III PC. Universidad de Cantabria) maximianoam@unican.es*

Topics related with Pleistocene-Holocene Transition (e.g. wildlife restrictions, changes in vegetation cover, temperature oscillations, reversals glaciers surfaces, sea level rise...) took place in Tierra del Fuego, and one more significantly: in ca. 8.2k BP the connection with American continent was broken (emerging Strait of Magellan) (Coronato et al 1999; Borrromei et al 2009) and providing a peculiar insularity context where terrestrial faunal and humans were trapped and forced to interact with a changing environment in a delicate equilibrium between social groups -as terrestrial hunters role-, and wildlife -as limit food resource-. This complex situation is an ideal social laboratory in terms of how people responded to those vicissitudes.

Among the earliest human occupations at Peninsula Tierra del Fuego (ca. 10.5k BP) (Massone 2003; Miotti & Salemme 2004; Salemme & Mioti 2008; Morello et al 2011) and stable ecological conditions at Island Tierra del Fuego, around 5.7k BP, there are a significant archaeological Gap (low and discontinuity presence of archaeological sites and radiocarbon dates: n=4). About these archaeological evidences, there are two plausible hypothesis: i) Human extinction or, ii) Endurance, and development new social strategies for survival in this isolation and changing medium. The archaeological data and local history course show us that it's far away from correlate first terrestrial hunters (Tres Arroyos site, ca. 10.2k BP and Narazzi 1 site, ca. 9.6k BP) with social complexity and variety detected in Middle Holocene (5.8k BP), where the archaeological record indicates specialization and diversification in coastal and terrestrial resources. In this sense, we are interested in try to fill this archaeological Gap (8.6k-6.2k BP) and elucidate social process in terms of extinction and subsequent a new maritime colonization of the Island (+- 6.5k BP), or survival and diversification process in different social groups (i.e. Shelk'nam, Hauss and Yámanas).

This communication is a theoretical dissertation about how to deal with diverse evidences relate with a multifaceted social process (extinction or survival), and know how we could find empirical and flexible solution for interpreting the population of Tierra del Fuego. In this situation we'll apply a powerful and flexible perspective: Soft Computing (Zadeh 1994) like epistemological and technological mediation to generate new and useful knowledge for this issue. Soft Computing is an effective and efficient resolution way in determinate scientific problems where data and information about phenom-

enology are fractional, complex and fuzzy; and our case is an excellent example for this perspective because if we want to understand the transition process and fill the archaeological Gap, we must work with partial and incomplete dataset (i.e. archaeological contexts in function of lithic technology, anthropological and archaeofaunal remains...), and variety sources (e.g. climatology, ecology, landscape evolution, maritime transgression sequence...) with fuzzy information levels.

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# A24b Coastal adaptation: Assessing past resilient socio-ecological system

Commission on Cultures, economy and ecology of Post Palaeolithic hunter gather  
(Organisers: Ximena S. Villagran, André C. Colonese)

Tuesday 2nd (9:00 to 13:30)  
Meeting room S2



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ORAL

## 1. THE NATURE AND IMPORTANCE OF COASTAL ADAPTATIONS DURING THE MIDDLE STONE AGE OF SUB-SAHARAN AFRICA

*Will, Manuel - (Department of Early Prehistory and Quaternary Ecology & Senckenberg Center for Human Evolution and Quaternary Ecology, University of Tübingen, Schloss Hohentübingen, 72070 Tübingen, Germany) manuel.will@uni-tuebingen.de*

*Kandel, Andrew W - (Heidelberg Academy of Sciences and Humanities, ROCEEH - The Role of Culture in Early Expansions of Humans, Rümelinstr. 23, 72070 Tübingen, Germany) a.kandel@uni-tuebingen.de*

*Conard, Nicholas J - Department of Early Prehistory and Quaternary Ecology & Senckenberg Center for Human Evolution and Quaternary Ecology, University of Tübingen, Schloss Hohentübingen, 72070 Tübingen, Germany) nicholas.conard@uni-tuebingen.de*

The Middle Stone Age (MSA) of sub-Saharan Africa provides an exceptionally long record of marine resource exploitation and coastal settlements by modern humans. These adaptations to coastal landscapes feature prominently in current studies of the biological and behavioral evolution of *Homo sapiens*.

Here we present results on coastal settlement systems from our excavations at the site of Hoedjiespunt 1 (HDP1), Western Cape, South Africa. We also review recent advances in research on coastal adaptations of the MSA, with a focus on settlement patterns, lithic technology and economic behavior.

HDP1 dates to the last interglacial (MIS 5e) and demonstrates the simultaneous occurrence of flexible raw material use, anticipated long-distance transport of tool stones, systematic gathering of shellfish and use of ground ocher. The site's inhabitants executed scheduled movements to the coastline for exploiting shellfish during brief but repeated settlements. The three find horizons at HDP1 reflect a consistent pattern of technology and land-use that suggests stable adaptations of modern humans to coastal landscapes as early as MIS 5e. Recent other research has shown that coastal adaptations in sub-Saharan Africa date back as far as the late Middle Pleistocene (MIS 6). Studies from the western and southern coasts of South Africa, and from the Red Sea, demonstrate that coastlines provided important resources for occupations between MIS 6 and 4. These coastlines, however, represent diverse geographic, oceanographic and environmental settings.

Despite these dissimilarities, the available data suggest that early modern humans exploited marine resources in a comparable manner.

Mobile hunters and gatherers frequently integrated variable coastal landscapes and their resources into their settlement strategies during the MSA across more than 100 ka. The long-lasting and consistent nature of these behavioral innovations may have influenced human bio-cultural evolution during the MSA and the spread of our species along the African coast and beyond

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ORAL

## 2. THE CHANGING NATURE OF COASTAL RESOURCE USE IN WEST SCOTLAND

*Hardy, Karen - (ICREA at Universitat Autònoma de Barcelona) khardy@icrea.cat*

Evidence for coastal resource use, in the form of shell middens, can be found in many parts of the world. But the term 'shell midden' is used to define a wide range of different coastal sites, ranging from huge landscape-changing mounds, to small, barely visible, accumulations of shell or slow-accumulating deposits that can eventually fill up rockshelters.

Using a combination of radiocarbon-dated evidence and physical remains for different types of shell accumulations in Scotland, we explore how the nature of shell middens, and their patterns of accumulation, can contribute to an understanding of different ways coastal resources were used at different times in the past.

A closer look at the different types of shell middens from the Scottish west coast suggest that the way these have accumulated can help to distinguish different uses of the coastline and coastal resources in different periods. The fishing and collecting of coastal resources, as well as the accumulation of waste into shell middens occurred throughout the past in west coast Scotland. However, the evidence suggests that the way the coast, and the rockshelters where much of the evidence is located, were exploited, varied over time, with clear cut patterns of use at different times in the past. The archaeological evidence reflects this different use of the coastline and its resources.

ORAL

### 3. EXPLORING ISOTOPIC EVIDENCE OF ECONOMIC RESILIENCE IN PREHISTORIC FISHERIES OF ATLANTIC SOUTH AMERICA

Colonese, Andre - (University of York) [andre@palaeo.eu](mailto:andre@palaeo.eu)  
Collins, Matthew (University of York) [matthew.collins@york.ac.uk](mailto:matthew.collins@york.ac.uk)  
Lucquin, Alexandre (University of York) [alexandre.lucquin@york.ac.uk](mailto:alexandre.lucquin@york.ac.uk)  
Eustace, Michael (University of York) [me577@york.ac.uk](mailto:me577@york.ac.uk),  
Hancock, Y (University of York) [y.hancock@york.ac.uk](mailto:y.hancock@york.ac.uk)  
Ponzoni, Raquel (University of York) [rarp500@york.ac.uk](mailto:rarp500@york.ac.uk)  
Mora, Alice (La Trobe University) [amora@students.latrobe.edu.au](mailto:amora@students.latrobe.edu.au)  
Smith, Colin (La Trobe University) [colin.smith@latrobe.edu](mailto:colin.smith@latrobe.edu)  
DeBlasis, Paulo (Universidade de Sao Paulo) [deblasis@usp.br](mailto:deblasis@usp.br)  
Figuti, Levy (Universidade de Sao Paulo) [lfiguti@usp.br](mailto:lfiguti@usp.br)  
Wesolowski, Veronica (Universidade de Sao Paulo) [wesowski@woc.com.br](mailto:wesowski@woc.com.br)  
Claudia Regina Plens (Universidade Federal de Sao Paulo) [plens@unifesp.br](mailto:plens@unifesp.br)  
Eggers, Sabine (Universidade de Sao Paulo) [saegggers@usp.br](mailto:saegggers@usp.br)  
Farias, Deisi Scunderlick Eloy de (Universidade do Sul de Santa Catarina) [deisisf@unisul.br](mailto:deisisf@unisul.br) --[deisisf@yahoo.com.br](mailto:deisisf@yahoo.com.br)  
Gledhill, Andy (University of Bradford) [A.R.Gledhill@bradford.ac.uk](mailto:A.R.Gledhill@bradford.ac.uk)  
Craig, Oliver (University of York) [oliver.craig@york.ac.uk](mailto:oliver.craig@york.ac.uk)

Maritime adaptations sustained South American pre-Columbian populations since the late Pleistocene and stable isotope studies reveal the crucial role of aquatic resources to several Holocene coastal groups, even during the intensification of food production. However these direct lines of evidence are strongly biased towards archaeological records along the western and south-eastern coast of South America. Here we have extended the information to the subtropical Atlantic rainforest coast of Brazil.

We performed an inter-disciplinary study on human, faunal and artefact remains from mid to late Holocene Brazilian archaeological sites (~6,700 to ~1,000 cal BP): Jabuticabeira II' Moraes, Piacaguera, Galheta IV. Stable carbon and nitrogen isotope analysis of bone collagen were performed along with stable carbon isotope analysis of single amino acid. We also investigated molecular and isotopic compositions of organic residue preserved in pottery.

Combined results indicate that the subsistence strategy was influenced by local resources. We also combined

our results with data available for the Atlantic coast of southern South America. Comprehensively, results suggest a long-term and large-scale protein-rich diet, based on marine and C3 terrestrial resources.

Our interdisciplinary results emphasize how the archaeological record offers a unique and exceptional opportunity to illuminate the longstanding trajectory of New World maritime adaptations, which still today play a pivotal role to coastal populations in Latin America.

ORAL

### 4. ENDURING PATTERNS OF FUNERARY ARCHITECTURE IN THE SOUTHERN BRAZILIAN SHORES

DeBlasis, Paulo - (maeusp) [deblasis@usp.br](mailto:deblasis@usp.br)  
Farias, Deisi - (unisul) [deisisf@unisul.com.br](mailto:deisisf@unisul.com.br)  
Kneip, Andreas - (UFTO) [akneip@ufto.gov.br](mailto:akneip@ufto.gov.br)

Located in a context that, both from a geographical as a historical perspective, situates it in between the long-lived sambaqui (shellmound) and the latecoming Southern Je cultures from the southern Brazilian coast, Galheta IV is a funerary site bearing characteristics from both cultures, thus highlighting the fluidity of the contact between them. If, in one hand, it brings peculiar elements related to the Je, it also gets itself harmonically inserted in a landscape long dominated by the presence of the sambaquis.

ORAL

### 5. INTERACTION, RESILIENCE AND CHANGE IN PREHISTORIC HUNTING-GATHERING-FISHING COMMUNITIES IN THE COAST OF THE ATACAMA DESERT

Salazar, Diego - (Universidad de Chile) [dsalazar@uchile.cl](mailto:dsalazar@uchile.cl)  
Andrade, Pedro - (Universidad de Concepción) [pandradem@udec.cl](mailto:pandradem@udec.cl)  
Figueroa, Valentina - (Universidad Católica del Norte) [vfigueroa@ucn.cl](mailto:vfigueroa@ucn.cl)  
Flores, Carola - (University of California Santa Barbara) [carolaflowers@gmail.com](mailto:carolaflowers@gmail.com)  
Olguín, Laura - (Universidad de Tarapacá) [olguinlaura.o@gmail.com](mailto:olguinlaura.o@gmail.com)  
Borie, César - (Universidad de Tarapacá) [cesarborie@gmail.com](mailto:cesarborie@gmail.com)  
Escobar, Manuel - (Universidad de Chile) [mem1074@gmail.com](mailto:mem1074@gmail.com)

The coast of the Atacama Desert in northern Chile is one of the most extreme environments of the Andean area.

It is nearly 1000 km long and presents a very narrow littoral platform flanked by the Pacific Ocean to the west, and the Cordillera de la Costa (ca. 2000 masl) and the absolute Desert of Atacama to the east. Despite extreme environmental conditions, the high productivity of the Pacific Ocean in this area facilitated the peopling of this territory as early as 12.000 cal BP, as well as a continual occupation by hunting-gathering-fishing communities throughout the Holocene.

During the late Second Millennium BC, the northern part of this arid coast began important transformations as coastal populations increased their contact and interaction with agropastoral societies from the Andean Highlands. By the First Centuries of the Christian Era, in this area the traditional way of life of the coastal hunter-gatherer-fishers had virtually disappeared, giving way to agromaritime economies and dramatic shifts in the settlement system. However, in the southern part of the arid coast, where ecological conditions are most extreme due to lack of permanent sources of fresh water except for small and often salty "springs", the traditional economy was not transformed in spite of growing interaction of local communities with agropastoral societies of inland oases. In this paper we explore the different responses of coastal hunter-gatherer-fishers to interaction with agropastoral societies during the Late Holocene. We will consider social and environmental variables in order to explain the unique case of the "Costa Arreica" -the southern part of the arid coast- where local communities were resilient to transformations in their settlement systems and overall economic organization, but at the same time underwent significant social changes due to interaction with agropastoral societies.

# A25a Materials, Productions, Exchange networks and their impact on the societies of Neolithic Europe

Commission on Neolithic Civilizations of the Mediterranean and Europe

(Organisers: Marie Besse, Jean Guilaine)

Tuesday 2nd (9:00 to 13:30)

Meeting Room: B22



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XVII Congreso Mundial de UISPP

ORAL CONTRIBUTIONS

ORAL

**1. EXCHANGE AND INTERACTION: THE IBERIAN MEDITERRANEAN BETWEEN THE VI AND THE III MILLENNIUM CAL BC.**

*Orozco Köhler, Teresa - (Universitat de València)*

*Teresa.Orozco@uv.es*

*Bernabeu Aubán, Joan - (Universitat de València)*

*jbauban@uv.es*

In Mediterranean Spain the first agropastoral economy begun around mid VI millennium cal BC. From this time, the archaeological record allows us to observe a development of the processes of interaction between groups. These are processes that have chronological and regional variety, the reading of which can be made from different materials, technologies and ideas.

In recent years the work is focusing on evaluating both forms of movement or methodologies that enable their identification but also trying to identify and define the social networks behind these processes.

The distributions show circulation, not only of materials but also of information or ideas, expressing contacts and relationships that can occur between neighboring groups, but also on a larger scale, between groups remote in space, showing some dynamic relationships that are built and which may vary over time.

Ongoing work to approach social phenomena involved in these interactions go through to take the perspective of networks and complex systems, which allows a better understanding of how these systems evolve, grow or become fragmented.

In this paper we present some examples of the central mediterranean region, approaching the movement of elements of different nature - lithic bracelets, symbols as eye idols and other- in a temporal framework that covers from VI to IIIr millenium cal BC.

ORAL

**2. THE WESTERN NETWORK REVISITED: THE TRANSITION INTO AGRO-PASTORALISM IN THE ALTO RIBATEJO, PORTUGAL**

*Almeida, Nelson - (Universidade de Trás-os-Montes e Alto Douro "FCT PhD scholarship; Instituto Terra e Memória; Grupo*

*de Quaternário e Pré-História do Centro de Geociências) nelsonjalmeida@gmail.com*

*Ferreira, Cristiana (Universidade de Trás-os-Montes e Alto Douro - FCT PhD scholarship; Instituto Terra e Memória; Grupo de Quaternário e Pré-História do Centro de Geociências)*

*Garcês, Sara - (Universidade de Trás-os-Montes e Alto Douro " FCT PhD scholarship; Instituto Terra e Memória; Grupo de Quaternário e Pré-História do Centro de Geociências) sara-garces.rockart@gmail.com*

*Cruz, Ana (Centro de Pré-História - Instituto Politécnico de Tomar; Grupo de Quaternário e Pré-História do Centro de Geociências; Instituto Terra e Memória) anacruz@ipt.pt*

*Rosina, Pierluigi (Instituto Politécnico de Tomar; Grupo de Quaternário e Pré-História do Centro de Geociências; Instituto Terra e Memória) prosina@ipt.pt*

*Oosterbeek, Luiz - Instituto Politécnico de Tomar, Estrada da Serra 2300 Tomar; Instituto Terra e Memória (ITM, Mação); Grupo Quaternário e Pré-História do Centro de Geociências (u. ID73 " FCT)) loost@ipt.pt*

Twenty years ago, based on the study of artifacts assemblages, structures, settlement patterns and preliminary environmental data and datings, both diffusionist and indigenist models were put into question (Oosterbeek 1994) and a series of hypothetical historic and dialectic models were proposed.

The main proposal was to understand the transition as a long process in which different communities intervened, some paying tribute to coastal spread of novelties and people but others being related to an inland dispersal, linking the Iberian Southeast and South to the West through the Guadalquivir, Guadiana and Tagus basins. Further initial arguments were later discussed by A. Cruz (1996) and L. Oosterbeek (1999). Until 2010, monographic studies on ceramics (Peng Fuying), lithics (Ana Graça, André Freitas), human bones (Sílvia Lopes, Tiago Tomé), animal bones (Nelson Almeida), vegetation dynamics (Cristiana Ferreira), rock art (Sara Garcês, Luís Nobre, Gioconda Abreu, Maria Fernando Carvalho), megaliths (Alexandra Figueiredo), climate (Luana Campos), geomorphology (Pierluigi Rosina, Hugo Gomes) and datings (Guilherme Cardoso) were produced.

Ongoing studies on ecofacts together with the accumulated research suggests that a mosaic of small communities shared the territory of the middle Tagus basin, from the mid-6th to the 4th millennium, within a single socio-economic system of economic intensification (with different strategies being pursued by each group, but all sharing similar social organization and patterns of



interaction). These communities may be clustered into two main groups, as anticipated in the 1990's, but those groups do not necessarily stand for a demic segregation. It is also apparent that a degradation of the environmental resources, possibly a consequence of the cold and dry oscillations of the 7th and 6th millennium, preceded any evidence of deforestation or agricultural activity.

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ORAL

### 3. WHITE-PAINTED POTTERY IN THE NEOLITHIC BALKANS AS A PROXY FOR HOMOGENEITY, DIVERSITY AND EXCHANGE

*Networks* Stojanovski, Darko - (UTAD) [stjdrk@unife.it](mailto:stjdrk@unife.it)

Pottery decorated with white-painted motifs is often associated with the second wave of migration of pottery-producing groups of farmers, moving generally from Anatolia towards Northwest. This event is presented as a massive and rapid migration process, that occurred at the end of the 7th millennium calBC (Özdoğan, 2011). In fact, the wide geographical distribution of this type of decoration in the Balkan Peninsula at approximately the same time is considered as an argument in favor of the migration theory.

Another viewpoint considers the role of the indigenous population more significant than the one of the Anatolian immigrants. In this view, the migrating groups were smaller than assumed and they simply transferred the know-how of the technological aspects of pottery production and agriculture. This practical knowledge was then adapted by the locals in the local context, and quickly spread through the already existing exchange networks of the pre-Neolithic Balkans (Thissen, 2005, 2009). The local varieties of the white-painted decoration, from which different Early Neolithic cultures were coined, certainly are in favor of this view. Their exact dating and synchronization is another question, to which ongoing and future researches will give the final answer.

Early Neolithic cultures with white-painted pottery are present throughout the entire peninsula. The incredibly high frequency of state borders has not helped the archaeological science in the past, in terms of scientific method, approach, terminology and dissemination "across the borders". One of the goals of this communication is to synthesize the information gathered so far from the different regions, relying mainly on published materials, but including also some information from the latest research campaigns in Macedonia. The assemblages are presented through the following aspects: their geo-

graphical distribution and cultural affiliation; the stylistic variation of the decoration patterns, with relation to the typological and technological attributes; their relative and absolute chronological position; the relation of the assemblages with similar ones outside of the Balkan Peninsula, namely SW Asia.

The results from this presentation should give a high resolution view of the Balkan communities in the Early Neolithic, their internal development and the nature of the relations among them.

The general goal of this communication is to give some final conclusions, which would concern the discussions over the emergence of pottery and agriculture in the Balkan Peninsula and the mechanisms behind this process.

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ORAL

### 4. THE VOLCANIC CREATION OF LIPARI OBSIDIAN AND NEOLITHIC EXCHANGE NETWORKS IN THE WESTERN MEDITERRANEAN: IS THIS A COINCIDENCE?

*Tykot, Robert - (University of South Florida) [rtykot@usf.edu](mailto:rtykot@usf.edu)*

In the western Mediterranean, the long-distance movement of obsidian artifacts appears to coincide with early agriculture in the 6th millennium BC. The Aeolian island of Lipari, just north of Sicily, was a major geological source of high quality obsidian that was volcanically formed in the Late Mesolithic, while the obsidian sources on Melos, Palmarola, Pantelleria, and Sardinia were formed much earlier in time. Yet it appears that obsidian from all four Italian islands was not used during the Mesolithic, despite there being sites of that period on Corsica, Sardinia, Sicily, and elsewhere. Starting in the Early Neolithic, obsidian from Lipari was used to create stone tools found at archaeological sites as far away as southern France, northern Italy, Croatia, and Tunisia. But how and why does this seem to be coincidental with the introduction of the "neolithic package" of domesticated plants and animals and the use of pottery?

Since the introduction 50 years ago of chemical analysis for distinguishing obsidian sources and reconstructing trade and contact, I have conducted detailed geological research on the four Italian island obsidian sources, and analyzed more than 5000 obsidian artifacts from many prehistoric sites in the western Mediterranean. The ability to analyze such a large number has increased significantly in recent years with the use of a portable XRF, a

non-destructive method which allows analyses of large assemblages within museums and storage areas, providing statistically significant data sets for interpretation. I focus here on new analyses done with this instrument in 2008-2014 on obsidian from many neolithic archaeological sites in Sicily, southern Italy, Malta, and Croatia.

The data now available show that starting in the Early Neolithic multiple obsidian subsources were used on Lipari and the other islands. For Lipari, most obsidian has been assigned specifically to Gabelotto Gorge, but artifacts made from the Canneto Dentro subsurface have been found at multiple archaeological sites too. In southern/western Sicily, and on Malta, Pantelleria obsidian was also used, while in southern Italy some obsidian from Palmarola and even Sardinia have been found. These data are used to assess the regularity of long-distance mobility and the maritime transport involved; the selected use of certain geological subsources on Lipari and the other islands, based on quantity, quality, and accessibility; and regional and intra-site variation in source utilization.

The extensive obsidian information now available provides important perspectives on the socioeconomic nature of Neolithic societies, the initial use of obsidian in the western Mediterranean, and changes in source and subsurface usage over time. Obsidian use appears to be affected by such factors as the availability of other stone tool material, changes in territorial access to the sources, the development of local production centers for export, and the transport of other materials. Yet further research is needed in certain areas and especially for specific time periods. Integration of obsidian sourcing data with tool typology, usewear, other lithic materials, ceramics, and floral and faunal remains can produce a better understanding of the production and exchange networks for societies in Neolithic Europe.

ORAL

## 5. NEOLITHIC FLINT INDUSTRY FROM BULGARIA: RAW MATERIAL AND TECHNO-TYOLOGICAL PERSPECTIVE

*Gurova, Maria - (National Institute with Museum, Bulgarian Academy of Sciences) gurovam@yahoo.fr*

The paper focuses on the importance of raw material in the interpretation of flint assemblages. The general perspective and consideration of every prehistoric chipped stone industry should include an assessment of

the raw materials used, their availability, variability and the supply potential of the palaeoenvironment. Bulgarian prehistory is characterized by a remarkable abundance and diversity of flint raw materials. The main sources are located in the Lower and Upper Cretaceous limestones and cherts of the Moesian platform in northern Bulgaria. Some of them acquire a special prominence among the diagnostic characteristics of the flint assemblages. Typical is the case of 'Balkan Flint', which assumes considerable significance in the Neolithisation of the Balkans (and subsequently) in the context of the supra-regional Karanovo I-Star?evo-Cri?Körös cultural complex.

The paper aims to improve present day knowledge of the provenance and distribution of Balkan Flint, to highlight the decline of what for the Early Neolithic is an emblematic raw material during the subsequent stages of the Neolithic, and to examine the relation between raw material preferences and the typological repertoire of the flint industry through time.

The methods used to fulfill the research goals consist of techno-typological observation and analysis of a dozen flint assemblages from important Neolithic sites in Bulgaria studied by the author. The analytical approach to raw material investigations draws on interdisciplinary research done with geologists and petrographers using thin-section and LA-ICP-MS analyses.

A general shift in the flint industry from the Early to the Late Neolithic can be observed. The process includes a decline from the remarkable (Karanovo I, II) flint industry based on Balkan Flint and the diagnostic formal toolkit, consisting of approximately large blades with particular high and marginal to steep retouch, to a noticeable microlithization revealed by geometric microliths made of various raw materials (Karanovo III-IV and IV). The social dimensions and impacts of this phenomenon are still questionable and call for further research beyond the empirical patterns of the material culture.

ORAL

## 6. GALICIA AS A REGION OF EXCHANGE IN LATE PREHISTORY: POTTERY AS AN EXAMPLE

*Prieto-Martínez, M. Pilar - (University of Santiago de Compostela) mpilarprietom@hotmail.com*

*Lantes-Suárez, Óscar - (University of Santiago de Compostela) oscar.lantes@usc.es*

The north-west of the Iberian Peninsula has traditionally been considered as a key region for the connection of remote parts of the European continent. However, very little research has been carried out in detail on the available archaeological record, aimed at verifying this apparently obvious hypothesis. This idea was mainly supported by studying metals, especially from the later stages of the Bronze Age, in order to justify this importance.

We believe that if a detailed study is carried out of other elements of material culture, it could demonstrate the importance of the geographical location in a more specific manner. This is the case of this study, in which we present specific cases of pottery in which it is possible to document foreign influences in different scales of distance, thereby demonstrating the frequent mobility of people in the prehistory of this region.

Our aim is to attempt to verify this hypothesis based on a study of pottery using traditional archaeological research methods (the typology and operational sequence), and archaeometric methods (based on the physical and chemical analysis of clays).

Through the typological study, based on the manufacturing methods (the type of temper used) and the decorative techniques (such as the use of shells, the presence of stab-and-drag or "boquique" decoration, sgraffito or stamping), it is possible to document the influence of foreign traditions on prehistoric Galician pottery, as well as its possible points of origin. These influences can then be explored in greater detail through archaeometry. Studying the mineralogy of the pottery (using X-ray diffraction) in contrast with the mineralogical offer of the study areas has provided us with information on the most likely distances involved in providing the raw materials. Also, the geochemical study of the pottery and the geological samples in the surrounding area, using a multivariate statistical analysis, have allowed us to complement the calculation of these distances. Isotopic analyses were carried out of the Pb and Sr in these same samples, through which we hope to obtain an even more precise indication of the most likely sources.

Therefore, based on the typological studies and analytical results for the pottery, we will cover a period of some four thousand years, from the Early Neolithic through to the First Iron Age, although the best-documented stage is associated with Bell Beaker contexts.

ORAL

## 7. THE FIRST LONG-DISTANCE VARISCITE EXCHANGE NETWORKS IN THE NORTHEAST OF THE IBERIAN PENINSULA DURING THE EARLY NEOLITHIC AND THE EARLY MIDDLE NEOLITHIC

*Edo Benaiges, Manuel - (Cipag) medo@telefonica.net*

*Martínez Rodríguez, Pablo - (Cipag)*

*pablomartrod@gmail.com*

*Barrio Bonilla, María Jesús - (Cipag) chs\_bcn@yahoo.es*

*Fierro Milà, Elicinia (Cipag) - eli.f.mila@gmail.com*

The Postcardial Neolithic was known until recently as the Early Postcardial Neolithic Molinot type. The recent excavation of 4 episodes dated to the Postcardial Neolithic in Can Sadurní Cave has demonstrated that only the first of these episodes could be classified as Early Neolithic.

These same recent works in Can Sadurní demonstrated that during the Postcardial period (from the end of the first quarter to the last quarter of the 5th millennium BC), the community that dwelled in Can Sadurní cave acquired enough curve of experience and knowledge to start the exploitation of aluminium phosphates present in the Paleozoic basement of the Garraf Massif: variscite primarily, but also turquoise and chlorite minerals, of green colour and known as calaite. At the same time, the technology for the transformation of the raw material and the manufacture of ornaments was also developed. This took place in the 400 years before this community probably decided and specialized in the exploitation of these minerals in mines.

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All this about 400 years before the community, and this is the hypothesis that we are currently working, possibly conditioned by the need to control the operation,

probably decided to move to the area of extraction and established themselves in Can Tintorer (Gavà, Barcelona), to specialize exclusively in the intensive exploitation of these mineralizations. Cipag is implementing a comprehensive program of genetic research one of the aims of which is to monitor the genetic Middle Neolithic I postcardial Can Sadurní population and its comparison with the population postcardial Can Tintorer i also Middle Neolithic II population.

In this paper we will explain how the community of Can Sadurní provided calaite to other Prehistoric settlements of the Northeast of the Iberian Peninsula. This can be confirmed by the materials that prove connections with these areas where beads have been recovered in chronologies that predate the foundation of Can Tintorer site.

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ORAL

## 8. RAW MATERIALS AND KNOWLEDGES CIRCULATION IN MIDDLE NEOLITHIC COMMUNITIES OF WESTERN EMILIA (ITALY)

*Garbasi, Francesco - (Università degli studi di ferrara)*

*francesco.garbasi@student.unife.it*

*Mazzieri, Paola - (independent researcher)*

*paolamazzeri@gmail.com*

*Dal Santo, Nicola - (independent researcher) santo-@libero.it*

The following paper offers an overview regarding the circulation of raw materials, finished products and technologies in Western Emilia during the middle Neolithic, with special reference to the marketplace of Gaione and to Ponte Ghiara, Pontetaro, Benefizio and via Guidorossi settlements, in order to point out changes within intra and intercultural exchange networks in SMP culture (5000-4300 b.C.). Raw materials are also analyzed in the perspective of a specific production chain with the aim of identifying differences between ordinary materials and materials with peculiar function or meanings.

A macroscopic analysis of lithic finds allowed the individuation of raw materials from several origins, which show contacts both with the Peninsula and the Alpine world. A diachronic observation of the Middle Neolithic lithic industries, from the beginning until the disappearance of SMP culture, allowed also to observe the development of some trends that characterize the period, identifying two distinct phases in which the external cultural contributions undergo a gradual increase.

The study of methods and chipping technology allowed

the identification of specific techniques probably meaning the importation of finished objects or the result of specialized crafts acquisitions.

The analysis of SMP lithic assemblages has allowed to understand the development of an increasing ideological and economic complexity that brought, during the final phase, the growth of networks with southern Italy and transalpine cultures.

Cultural exchanges are evident in the spread of exotic raw materials, in growing dimensions of the artifacts, in importation of finished products and in the introduction of peculiar technological innovations.

The analysis permitted to identify the different value attributed to every single raw material, from the identitarian meaning of flints from Biancone outcrops and of alpine green stones, to the ostentation of objects that denounce extra-cultural contacts, sometimes subtended over a wide-range (obsidian, rock crystal, Gargano flint and silex blond).

Exotic raw materials (french silex- blond, flint from Gargano's geological units, obsidian) are, sometimes, used as grave goods to increase the deceased consideration, replacing the employment of the Biancone's flint. The introduction of exotic raw materials coincides with the importation of specific chipping techniques, unrelated to ergology assets of Square Mouthed Pottery culture. During SMP culture there's also a growing tension to a marked macrolithism, perhaps resulting from deep relationships with Serra d'Alto culture (Peninsular Italy) and, nevertheless, to frame in a process which characterizes most of the 5th millennium european neolithic cultures.

Finally, data concerning to several craft specialization individuated in western Emilia sites are here presented, with particular attention to the manufacture of steatite, a local available rock from which personal ornaments were produced, which seems to be characterized by specific cultural and identitarian values.

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ORAL

## 9. EXOTICA, SKEUOMORPHS, AND THE PROBLEM OF MATERIALITY IN THE SOUTH EAST EUROPE CHALCOLITHIC

*Dragos, Gheorghiu - (National University of Arts Bucharest)*  
*gheorghiu\_dragos@yahoo.com*

The establishment in South Eastern Europe of trade routes during the Neolithic and Chalcolithic allowed the

circulation of a series of exotic materials from the south to the north of that region, which acquired a special value (i.e. social status) due to their rarity. Exotica was characterised by the quality of its material that was uncommon compared to the materiality of local objects.

As a consequence of their scarcity the exotic objects were copied in local materials, more frequently found, creating skeuomorphs. This phenomenon could have had two reasons: a need for a "mass production" of the rare items, or a replacement of the exotica when the trade routes failed to function.

One stage to approach the axiology of the prehistoric materiality is to identify the originals and their skeuomorphs and to find the qualities of the materials that were copied, as well as the differences in the aspect of the skeuomorphs, and their relationship with local materials.

Another stage could be the identification of the trade routes of the exotica, based on their presence in settlements, and on their decrease in dimensions.

The findings indicate that the dimensions of the exotica objects diminish as the distance from their origin increases, which implies that it was not the object, but its materiality that was important. It seems that the symbolism of this materiality had a strong social impact, being associated with "prestige", as the funerary finds show. One of the results discussed would be the identification of a standardised package of local and exotica materials in the Gumelnita-Karanovo Kodjadermen Chalcolithic tradition.

The Chalcolithic was characterized by the emergence of hierarchized societies as one can see from the changes occurring in material culture. In this process materiality (i.e. exotica and its simulacra under the form of skeuomorphs) played a significant axiological role.

#### ORAL

### 10. TYPES AND GESTURES. THE JEWELLERY OF THE COPPER AGE IN THE ALPS IN A TECHNO-TYOLOGICAL STUDY

*Viola, Stefano - (Université de Genève)  
stefanoviola7@virgilio.it*

The contribute aims to compare jewellery objects coming from some northern Italy archaeological sites, datable to different periods of the Copper age. Through a techno-typological and functional study that takes into account several morphometric, morphological and spe-

cific trace parameters (indicators of workmanship activity and/or wear activity) the methods, techniques and tools are reconstructed and compared.

On one hand, with the typological analysis, jewellery has been looked at as a cultural marker, allowing to gather, from raw material, forms, and measures, information on different aspects of past life, such as style, territories, and traditions. On the other hand, with the technological analysis, interpretative hypotheses are proposed, based on the comparison between manufacture traces and experimental data, thus reconstructing, in part or completely, manufacture procedures and fabrication techniques.

Moreover, with a functional analysis allowed to distinguish wear traces from technological traces, and to recognize if the objects are used or not.

#### POSTERS

#### POSTER

### 11. "SETTLEMENTS-HEAD" AND "SETTLEMENTS-TAIL" IN THE OBSIDIAN EXCHANGE NETWORK IN THE NEOLITHIC WESTERN MEDITERRANEAN

*Quero, Tania - (University of Trieste) taniaquero82@gmail.com*

The study of the obsidian circulation in the Western Mediterranean sea, during the Neolithic period, is very interesting, because of the important social and economic role that this volcanic glass played, testifying a long-distance trading.

I would consider this subject, reanalysing the Neolithic sites in Italy, in terms of the different participation to the exchange networks, according to their distance from the sources and the competition with other raw materials.

At S. Martino Spadafora, a site on the Northern coast of Sicily (South Italy) that was excavated in 2008, two occupation phases are attested, during the Early and Late Neolithic periods. The obsidian (Lipari source) covers the 98% of the whole lithic assemblage. There are almost all phases of the chaîne opératoire.

At the Granarolo Middle Neolithic site, in the central Po valley (near Bologna, North Italy), that was excavated in 2012, the lithic assemblage is obtained from local flint and the obsidian (unknown source for now) accounts for the 0,08% of the whole industry (only 10 small blades).

The study of obsidian industries from S. Martino Spadafora site allowed to draw a diachronic change in the obsidian exploitation, from the Ancient to the Late Neolithic, in a place close to the main source of Lipari island.

Instead, grace to the little investigation at the Granarolo site, it was possible to confirm a frequentation of the central Po valley, in the district of Bologna, during the Middle Neolithic period. In this moment, the SMP communities have many contacts with the Central and South Italy so that they could easily obtain some exotic materials, including the obsidian.

The obsidian exchange is still one of the most important example of the long-distance trade, during the Neolithic period, in Europe. Evidently, a raw material gained prestige and symbolic value, when the distance from the source increased. The case of Granarolo is significant because exotic raw materials (as obsidian and 'alpine' flint) arrived in a place where local flint was preferred.

Otherwise, S. Martino Spadafora site possibly was part of the Lipari obsidian networks of exchange, during the Neolithic period, and had an active role in the distribution, because of its strategic location on the coast, as a bridge to the Calabria and the Sicilian hinterlands.

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POSTER

**12. THE IMPLICATIONS OF A EXTRA-REGIONAL TECHNICAL CHANGE IN THE AUTOCHTHONOUS GROUPS : THE EXAMPLE OF THE DIFFUSION OF COPPER METALLURGY FROM ITALY TO SOUTHERN FRANCE AT THE END OF THE NEOLITHIC PERIOD**

*Cauliez, Jessie - (CNRS) jessie.cauliez@gmail.com*

Au milieu du IV<sup>ème</sup> millénaire BC, la métallurgie du cuivre est en plein essor dans toute l'Europe où transitent dès lors les pratiques et les objets métallurgiques. Pour le sud de la France, archéologues et archéomètres s'accordent à dire qu'il faut rechercher l'origine de cette métallurgie en Italie, notamment en direction du Spilamberto de la plaine padane, du Remedello du nord de la Lombardie ou encore du Rinaldone de Toscane. Plus particulièrement, en Languedoc oriental, les données montrent que la métallurgie du cuivre aurait démarré modestement autour de 3100 BC, dans l'environnement culturel local du Ferrières, puis se serait déployée au moment du Fontbouisse aux environs de 2900-2800 BC. Pour autant, dans cette étape de plein développement technique, la Provence semble être restée en retrait (absence de site de transformation du minerai et rareté des

objets en cuivre), alors même qu'existeront au milieu du III<sup>ème</sup> millénaire BC des productions céramiques à fortes affinités Remedello et Rinaldone essaimées en Vaucluse, Drôme et Alpes-Maritimes, ainsi que des gravures d'armes comparables à celles données pour ces groupes en Hautes-Alpes.

Face à ce constat, trois questions se dégagent :

1. les groupes culturels de Provence ont-ils joué un rôle dans les filières d'échanges entre Italie et Languedoc ? Par l'analyse d'assemblages céramiques de différents faciès culturels provençaux de la séquence Néolithique final, est-il possible d'observer des influences italiennes au sein des identités culturelles régionales provençales qui traduiraient des voies potentielles de transit des produits et procédés métallurgiques, notamment via le nord des Alpes, ou a contrario des espaces frontières.

2. pour quelles raisons les groupes provençaux n'ont-ils pas adopté la métallurgie du cuivre, en dépit d'apports italiens connus (céramiques, mais aussi jadéites) et de l'existence avérée de gîtes cuprifères à l'est du Rhône ? Il s'agit ici de conduire une réflexion sur la mise en concurrence entre les grands centres producteurs de produits hautement valorisés au Néolithique final : la présence du centre de production des pièces de Forcalquier empêcherait-elle la diffusion des produits métalliques de la même manière qu'elle ne rend pas possible l'extension du réseau de diffusion des poignards pressigniens au cœur de la Provence ?

3. est-ce que la métallurgie entraîne des phénomènes de recomposition culturelle en Languedoc et en Provence au moment où elle se développe, suivant la réflexion de Roberts sur l'impact des changements techniques dans les structures de société ?

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POSTER

**13. PALEOECONOMIC RECONSTRUCTION OF A NEOLITHIC COMMUNITY IN SARDINIA DURING THE FOURTH-THIRD MILLENNIA BC**

*Ucchesu, Mariano - (Università di Cagliari)  
marianoucchesu@gmail.com*

This study is part of an interdisciplinary research (Cultura visuale preistorica: le domus de janas/ Prehistoric Visual Culture: the Domus de Janas) started in 2011 under the scientific supervision of Giuseppa Tanda and funded by the Regione Autonoma della Sardegna. The main goal is to reconstruct different aspects of Neolithic societies with particular emphases on the understanding of the

emergence and development of agriculture in Sardinia. Archaeobotanical research in Sardinia is still at an early stage. Despite intensive archaeological work carried out in the island, data is still scarce and most published reports focus on random findings of plant remains which document the cultivation of free threshing wheats, naked barley, fava bean, lentil and pea since at least the Middle and Late Neolithic periods (5th-3th millennium BC cal.). Over the past years, there has been a systematic recovery and study of plant remains from numerous archaeological sites. Five sites are currently under study covering a wide chronological span from the Early Neolithic to the Chalcolithic period.

The sediment has been systematically floated using a flotation machine. Meshes were of 1mm inside the tank and of 0.25mm outside. Plant remains were sorted under a stereomicroscope and subsequently identified and counted. A total of 17 samples has been analyzed for this study.

The few samples studied from the late Neolithic levels of the Domus de Janas Molia have yielded two categories of cereals. The taxa identified comprise *Hordeum vulgare* var. *nudum* and *Triticum aestivum/durum* which are common elements in both other Sardinian sites such as Grotta del Guano and Canelles and also in different Neolithic sites of northern and southern Italy (Rottoli and Castiglioni 2009; Castaldi 1987; Trump 1983; Ucchesu in press). Cereals appear as an important resource which was probably supplemented by other plant categories from which evidence is still rather scarce. The limits of the available archaeobotanical data make difficult to explore in detail the type of subsistence practiced by the communities living during the 4th and 3rd millennium BC in Sardinia. It is clear that much more research into subsistence patterns is still needed in Sardinia to better understand the subsistence system of prehistoric communities. In fact, new analyses of plant macro-remains have been carried out on samples from square « ag » located at the wall E of the anti-chamber below some ceramic from Ozieri. The latter consisted of plates decorated with dotted lines. It is likely that these remains are leftovers from the offerings contained in plates deposited in the anti-chamber. It is also likely that the offerings were contained in vases from the grave goods. There are no human bones as they have not survived the acidity of the terrain.

# A25b Current Approaches to Collective Burials in the Late European Prehistory

Commission Neolithic civilizations of the Mediterranean and Europe  
(Organiser: Tiago Tomé, Marta Díaz-Zorita Bonilla, Karl-Göran Sjögren,  
Ana Maria Silva, Rui Boaventura and Claudia Cunha).

Tuesday 2nd (09:00 to 13:30 and 14:30 to 19:30)  
B26 Meeting Room



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ORAL CONTRIBUTIONS

ORAL

**1. A GLIMPSE INTO SPATIAL SEX DISTRIBUTION AT THE MIDDLE NEOLITHIC COLLECTIVE NECROPOLIS OF THE BOM SANTO CAVE (PORTUGAL)**

*Gonçalves, David (Research Centre for Anthropology and Health) davidmiguelfgoncalves@gmail.com*  
*Granja, Raquel (University of Algarve) ragranja@ualg.pt*

*Alves Cardoso, Francisca (Centro em Rede de Investigação em Antropologia) francicard@fcsh.unl.pt*  
*de Carvalho, António Faustino (University of Algarve) afcarva@ualg.pt*

The assessment of the demographic profile of archaeological samples is critical to analyze and interpret funerary practices. In collective necropolises, composed of commingled secondary depositions, in which skeletons are rarely complete and many bones may present a poor state of preservation, the estimation of age at death and sex of the individuals is often impossible. Consequently, an accurate evaluation of funerary practices is often compromised. Therefore, aiming to resolve this problem and to assess spatial sex distribution, a sample-specific sex estimation method based on tooth measurement was used in the Bom Santo human remains.

Bom Santo is a burial cave located c. 30 km north of Lisbon. Systematic speleological surveys carried out in the 1990's allowed the identification of 11 different sectors within the cave. Presently, the estimated minimum number is of c. 121 skeletons. However, only one sector was partially excavated – Rooms A and B – so these are therefore preliminary results. All the data used here appertains to those rooms. The radiocarbon dates (3800-3400 cal BC), linked to a very homogeneous material culture points to a Middle Neolithic chronology, a period characterized by the “megalithic phenomenon” in which the Bom Santo population surely participated. Sex estimation was undertaken using the mean value of the buccolingual diameter of the lower canine, following the recommendations of Albanese et al. (2005) and Cardoso (2008). This method was used to sex discriminate 51 individuals, in a total of 73 canines. The sex estimations were then used to infer the sex distribution in those two rooms.

Although the sex ratio of the Bom Santo individuals was balanced (ranging from 1:1 to 1:1.7), spatial sex distribution suggests that the deposition of the remains in the cave may have been non-random. Estimated males were less represented in Room A ( $n = 4/N = 35$ ), when compared to Room B ( $n = 22/N = 36$ ), despite the fact that

the minimum number of individuals was similar in both rooms. As for estimated females, when compared to males their frequency was higher in Room A ( $n = 12/N = 35$ ), but sex inequalities were less pronounced in Room B ( $n = 13/N = 36$ ).

The use of a sample-specific odontometric method for sex estimation in contexts involving commingled remains may be a good alternative to more conventional methods in which human remains are poorly preserved and skeletons are incomplete. In the case of the Bom Santo Cave, this approach allowed us to detect a slight difference in sex distribution per Room. The spatial allocation of the individuals may have varied according to sex or to other unknown reason which resulted in different distributions of males and females in Rooms A and B. Similar research, in other Middle Neolithic sites, is necessary to infer if this was restricted to Bom Santo or if it was a common funerary practice amongst Middle Neolithic communities, and therefore culturally significant among the megalithic populations of central and southern Portugal.

ORAL

**2. CULTURAL EVOLUTION AND BURIAL DISCONTINUITIES IN THE COLLECTIVE GRAVES: BURY (NORTHERN FRANCE, 4TH-3RD MIL. CAL. BC)**

*Salanova, Laure (CNRS) laure.salanova@mae.u-paris10.fr*

The Paris Basin provides more than 400 collective graves from various architectures, but all used between the second half of the 4th and the end of the 3rd millennia cal. BC. Few of them were precisely excavated until the innovative method of spatial analysis developed by A. Leroi-Gourhan in the 1960's. Excavated between 2001 and 2007 under the supervision of L. Salanova, the Bury grave (Picardie) is archetypal of the large gallery graves, which were used during the whole sequence of the collective graves in this region (3500 and 2100 cal. BC). The well-preserved burial layer, which provided 300 individuals, was the opportunity to develop a chronological approach of the burial practices in this type of monument. The excavation was orientated towards the understanding of both architecture evolution and burials succession. An important team was mobilised to detect, from the field, each individuals. The bones study has allowed reconstructing most of the skeletons and the stratigraphic order of the deposits. A programme of radiocarbon dating, which was completed since the excavation in the framework of a European project led by A. Whittle and A. Bayliss, has allowed the application of Bayesian

statistics. The both approaches made it possible the most precise chronology of the gallery graves from this region. The chronological frame has guided a biological study (stature, discontinuous morphological variations, activities markers), for understanding the social meaning of the collective deposits (family, village scale or broader social group).

This research has provided several major results. The first one is a discontinuous use of the grave, confirming the cultural gap observed at the end of the 4th millennium in the region and showing the shortness of its first use. The second one refers to the closure process of the monument. Formerly considered as a unique event at the dawn of the 2nd millennium cal. BC, the data from Bury have demonstrated several stages in this process and spatial differences in the grave. Finally, the biological study allow to interpreting the discontinuities observed in cultural and social terms.

The same discontinuities and the shortness of the first use have already been observed in several monuments from Western Europe. A comparative analysis questions finally the reality of the collective graves, from their origins until their final use that seem to refer to different phenomena.

ORAL

### 3. THE COLLECTIVE BURIAL CAVE OF EL REBOLLOSILLO (TORRELAGUNA, MADRID) AND THE ROLE OF DEAD BODIES IN LATE COPPER AGE IBERIA

*Díaz-del-Río, Pedro (Instituto de Historia, CSIC)*

*pedro.diazdelrio@cchs.csic.es*

*Consuegra, Susana (Instituto de Historia, CSIC)*

*susana.consuegra@cchs.csic.es*

*Audije, Julia (Facultad de Ciencias, UAM)*

*Zapata, Susana (Facultad de Ciencias, UAM)*

*Cambra, Óscar (Facultad de Ciencias, UAM)*

*oscar.cambra@uam.es*

*González, Armando (Facultad de Ciencias, UAM)*

*Waterman, Anna (Mount Mercy University)*

*awaterman@mtmercy.edu*

*Thomas, Jonathan (University of Iowa)*

*Peate, David (University of Iowa)*

Peate, David (University of Iowa)

In this paper we present detailed information on the archaeological, bioanthropological, and isotopic data obtained from the 1989 excavation remains recovered from the cave of El Rebollosillo (Torrelaguna, Madrid). The site

is a small natural cave of approximately 23 square meters located in the Cretaceous carbonatic rocks of the karstic massifs south of the Spanish Central Range. A minimum number of 21 human individuals were buried here, consisting of 12 adults, 2 juvenile, 5 infants and two perinates. The remains of all individuals were disarticulated and mostly dispersed, although some remains suggest that long bones and crania may have been treated with special care. Only an minority of bone fragments were exposed to fire, while just one -a perinatal tibiae fragment- exhibits cutmarks, which may have served some sort of decorative purpose. Bayesian modeling of 7 <sup>14</sup>C determinations obtained from 7 different individuals (6 adults and 1 juvenile) suggest that the secondary disposal of disarticulated bodies spanned for no longer than 190 years (1  $\sigma$ ), although the majority (5 out of 7) most likely belonged to a single generation dating from 2550 to 2510 cal BC. Preliminary isotopic data suggests that these individuals were from local communities. These findings will be discussed in reference to their regional historical context.

ORAL

### 4. TEMPORARILY BURIED: 'MASS GRAVES' IN THE EARLY IRON AGE OF THE GREAT HUNGARIAN PLAIN

*Király, Ágnes (Institute of Archaeological Sciences of the Eötvös Loránd University, Budapest, Hungary)*

*koldoknezo@gmail.com*

*Sebok, Katalin (Institute of Archaeological Sciences of the Eötvös Loránd University, Budapest, Hungary)*

*ebokkata@gmail.com*

*Kovács, Gabriella (Matrica Museum, Százhalombatta, Hungary)*

*antropologus@yahoo.com*

*Zoffmann, Zsuzsanna (Budapest, Hungary)*

*zoffmann@freemail.hu*

*Hajdu, Tamás (Department of Biological Anthropology, Institute of Biology, Faculty of Science, Eötvös Loránd University, and Department of Anthropology, Hungarian Natural History Museum, Budapest, Hungary)*

*kishajdu@gmail.com*

Between 2009 and 2011 three Late Bronze/Early Iron Age settlement pits containing great amounts of human remains in different states of decomposition were unearthed at Pusztataskony - Ledence 1 (Eastern Hungary). Beside huge quantities of single bones and clear crania complete skeletons and body parts in approximate anatomical order were found. Associated finds were sporadic and mostly fragmented.

The presentation surveys stratigraphical observations

with a description of the deposits' structure, with a discussion of methods, problems and possibilities of micro- and macro-scale interpretation of the phenomena, completed with similar finds from the surrounding settlement, the results of the anthropological surveys, and the analysis of the soil micromorphological samples. The current results, especially placed in the context of contemporaneous mass deposits of human remains from South-East Europe, raise the possibility of an emerging multi-stage funerary practice in the Carpathian Basin. The application of diverse methods of 'classical' archaeology and other sciences allowed us to reconstruct the particulars of this unusual burial process.

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ORAL

## 5. RECENT ANALYSES OF SCANDINAVIAN MEGALITHIC TOMBS: AN OVERVIEW

*Sjögren, Karl-Göran (Göteborgs universitet)  
kg.sjogren@archaeology.gu.se*

During recent years, Scandinavian megalithic tombs have been in focus for a number of analyses on human bone, using various scientific methods, such as aDNA, isotope analyses, <sup>14</sup>C dating, histological analysis, etc. These have been used as ways of elucidating aspects such as diet, mobility, burial practices, burial frequencies, and neolithization processes. In this contribution I will summarize some of this work and what are the main results, and suggest what may be interesting ways to pursue in the future.

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ORAL

## 6. ON THE APPLICABILITY OF THE ASSESSMENT OF DENTAL TOOTH WEAR FOR THE STUDY OF COLLECTIVE PREHISTORIC BURIALS

*Marado, Luís Miguel (CIAS Centro de Investigação em Antropologia e Saúde, Universidade de Coimbra)  
luismarado@gmail.com*  
*Cunha, Claudia (CIAS Centro de Investigação em Antropologia e Saúde, Universidade de Coimbra)  
claudia.cunha.k@gmail.com*  
*Scott, G. Richard (II) Department of Anthropology, University of Nevada, Reno.) grscott@unr.edu*  
*Tomé, Tiago (CIAS Centro de Investigação em Antropologia e Saúde, Universidade de Coimbra) tiagotome@gmail.com*

*Machado, Hugo hugosousamachado@gmail.com*  
*Silva, Ana Maria (CIAS Centro de Investigação em Antropologia e Saúde, Universidade de Coimbra) amgsilva@antrop.uc.pt*

Collective burials found in Late Prehistoric sites in the Iberian Peninsula have increased significantly in numbers in the last decades. Recently developed approaches have applied new methodologies and techniques to recover as much data as possible on the anthropological information these burials provide. This communication proposes a new approach to regional osteological samples: the assessment of the functional use of teeth by individuals exhumed from collective burials and the inferences one might gather from their activities. The use of the mouth for working activities such as a plier, cutting tool, and for breaking or grasping objects, as well as for processing materials such as leather or fibers, is widely acknowledged in the ethnographic record. Studies of individual burials show these activities alter the morphology of teeth and bones of the oral cavity and can be traced in archaeological human remains. In collective burials, inferences from this material are more difficult to make due to the frequent disarticulation of the skeletonized elements. On the other hand, this kind of context provides solid MNIs, sometimes over hundreds, which can be submitted to statistical treatment enabling us to gather data on the probable functional use of the mouth.

Materials and methods employed include a laboratory protocol of data collection that can be submitted to statistical tests to (I) differentiate dietary masticatory function from the functional use of teeth as tools (tested with Kendall's tau to understand the correlations between types of wear and Pearson's chi-squared test to evaluate the significance of different frequencies); (II) identify the teeth and surfaces more commonly used (tested using analysis of variance); (III) differentiate the levels of morphological alteration, the kinds of damage left on dental and bone tissues, and their probable relation to specific activities through distribution statistics.

A comparison of these data to archaeological cases published for individual inhumations allows us to propose that although information at the individual level cannot be specific, it can provide data on the population level on the most common functional uses of teeth for members of a given sample.

ORAL

**7. ASSESSING SPATIAL DISPERSION OF HUMAN SKELETAL SAMPLES FROM COLLECTIVE BURIALS: A GIS APPROACH TO THE BURIAL-CAVES OF THE NABÃO VALLEY (CENTRAL PORTUGAL)**

*Tomé, Tiago (CIAS Centro de Investigação em Antropologia e Saúde, Universidade de Coimbra) tiagotome@gmail.com*

*Cunha, Claudia (CIAS Centro de Investigação em Antropologia e Saúde, Universidade de Coimbra)*

*claudia.cunha.k@gmail.com*

*Silva, Ana Maria (CIAS Centro de Investigação em Antropologia e Saúde, Universidade de Coimbra)*

*amgsilva@antrop.uc.pt*

*Oosterbeek, Luiz (Instituto Politécnico de Tomar, Instituto Terra e Memória (Mação) e Centro de Geociências da Universidade de Coimbra) loost@ipt.pt*

Geographic Information Systems (GIS) applications in Archaeology represent a dynamic field. They may be used for managing excavation data, Cultural Resource Management and landscape assessment. One can also regard GIS as “a place to think”, environments in which to test hypothesis of a spatial nature.

Late Prehistory collective burials are a context where GIS may prove an invaluable analytical tool. Such contexts often present taphonomical challenges to interpretation, due to the disarticulation and fragmentation processes human skeletal remains usually undergo. In Portugal, many of these burials were excavated throughout the XIXth and XXth centuries. Many older excavations displayed little care for a detailed recording of human remains, with many bones being discarded, their study deemed useless. Nevertheless, recent assessments of Portuguese prehistoric collective burial samples have been able to shed some light on funerary aspects of these societies.

Two burial-caves were considered for GIS assessment, Gruta do Cadaval (CDV) and Gruta dos Ossos (GRO), both belonging to the Canteirões Late Prehistoric burial-caves complex (North Ribatejo – Portugal). Sample choice was determined by several factors: both caves share a similar morphology; they were excavated in the 1980's, with care being taken regarding tridimensional coordination of the remains; the samples have a partially overlapping chronology.

A database combining data resulting from the osteological assessment and the original field records was assembled. The point data files created from this database were used to perform an analysis of spatial dispersion of the remains, attempting to correlate biological parameters determined in the osteological assessment. Kernel

Density Estimation was performed on these data point files, generating heatmaps that represent the spatial dispersion patterns of human remains inside each cave. The analysis was performed with Open Source software (QGIS 2.2).

Results suggest both similarities and discrepancies among CDV and GRO regarding spatial dispersion of human remains. Both caves exhibit a main depositional cluster in the central part of the room closer to the entrance. In both cases there is also a secondary cluster, located in smaller, deeper rooms. Adults and non adults spatial patterns differ – on CDV adult remains are found mostly on the main cluster, non adult remains mostly on the secondary cluster; on GRO, there is a clearer concentration on the main cluster of both adults and non adults, non adults being absent from the secondary cluster.

Regarding specific skeletal regions, on CDV cranial and axial remains concentrate mostly on the main cluster, while appendicular remains are present on both clusters. As for GRO, the spatial patterning is not so clear-cut but, still, there is a differential distribution of the long bones – upper limbs were located mostly on the centre of the main cluster, lower limbs being more peripheral, closer to the cave walls.

GIS can be a powerful tool for the study of collective burials. Furthermore, the use of Open Source software allows for an inexpensive approach. This study demonstrates that, in the vast realm of analytical techniques allowed by GIS, heatmap generation analysis is a viable path in the study of Prehistoric collective burials.

ORAL

**8. MORA CAVORSO CAVE: A COLLECTIVE UNDERGROUND BURIAL IN NEOLITHIC CENTRAL ITALY**

*Rolfo, Mario Federico (Università degli Studi di Roma Tor Vergata) rolfo@uniroma2.it*

*Achino, Katia Francesca (Universitat Autònoma de Barcelona) katiаfrancesca@libero.it*

*Fusco, Ivana (Università degli Studi di Roma Tor Vergata) ivanafusco@yahoo.it*

*Silvestri, Letizia (Durham University)*

*letizia.silvestri@durham.ac.uk*

**An exceptional underground discovery**

Since the year 2006, the excavations at Mora Cavorso Cave have started to cast new light on the later prehistory of central Italy. Systematic investigations, following a fortuitous speleological discovery, revealed the presence of at least 21 incomplete individuals, dated to the Early Neolithic. This site appears

to be the best preserved and most numerous collective burial of the region. Therefore, archaeological sciences have joined forces to obtain the most complete interpretation of the context.

### Physical and molecular anthropology

The human remains have been examined morphologically to identify gender, age, minimum number of individuals and markers of pathologies and behavioural stress. This osteological approach has been integrated by the analysis of DNA, in order to investigate the aspects of geographical provenience and genetic affinity. The study of the stable isotopes, moreover, allowed to reconstruct the palaeodiet.

### Geology

Geologists have sampled stalactites and karst formations, in order to understand the natural formation processes of the cave, the impact of possible sources of light or air, the growing speed and intensity of the limestone in the burial area and the surroundings.

### Archaeology

Bioarchaeology and geology have added more details to the already data-rich archaeological context. Further ongoing studies involve taphonomy and chrono-spatial distribution of the human remains, along with radiocarbon, ecofact and artefact analyses. One remarkable challenge will be that of correlating the uses of the various chambers of the cave, which seem to have been frequented also for non-funerary reasons. The combination of isotope, zooarchaeological and botanical analyses shows that sheep husbandry was already practiced and the diet was rich in meat and poor in plants. Local provenience of the individuals has been ascertained as well. From the funerary point of view, the inhumated are not selected by age or gender, the grave equipment is poor, whereas the effort put in carrying the dead inside the chambers seems to have been extraordinary.

Although the interpretation of the Neolithic frequentation of Mora Cavorso Cave is still in progress, some aspects of the human occupation of the site can be still highlighted. The demographical studies and analyses of the grave goods, predictably, indicate that social complexity had not yet emerged. From a cultural point of view, the choice of such a symbolically powerful site is notable. Despite the quantitative and qualitative poverty of artefacts, the effort put in carrying the dead can be considered a great energy investment. Rather than just indicate the social relevance of the buried, this might testify to the importance of such a ritual process in strengthening the social relations of the living. The integration and combination of all the aforementioned studies will allow an overarching interpretation, which by taking into account several biasing factors, will show the potential of a multidisciplinary approach and lead to a contextualization of the discovery its wider archaeo-anthropological framework.

## ORAL

### 9. RESTING IN PEACE OR IN PIECES: TOMB I AND DEATH MANAGEMENT IN THE 3RD MILLENNIUM BC AT THE PERDIGÕES ENCLOSURE (REGUENGOS DE MONSARAZ, PORTUGAL)

*Evangelista, Lucy - (CIAS - Departamento Ciências da Vida, Universidade de Coimbra, Portugal)*

*lucyshawevangelista@gmail.com*

*Silva, Ana Maria (CIAS - Departamento Ciências da Vida, Universidade de Coimbra, UNIARQ, CENCIFOR)*

*amgsilva@antrop.uc.pt*

The Perdigões 16 ha ditched enclosure has been continuously investigated since 1997 and widely published. Several funerary structures have been unearthed, showing a variety of mortuary practices (inhumations and cremations found in different architectural solutions like tombs, pits or ditches). Among them is Tomb 1, a tholos type structure discovered in the eastern side of this site. Preliminary data available from the Perdigões Tombs seems to indicate the collective secondary depositions of bones. If this is confirmed by the anthropological study underway, several important questions are raised regarding the process of body manipulation at the time.

This study seeks to, through anthropological analysis of the human remains recovered from the several archaeological phases in Tomb I, contribute to the better understanding of the Late Neolithic/Chalcolithic individuals that used the Perdigões enclosure as a burial site and their death management strategies, in light of a changing mental framework that can be perceived in several spheres of the archaeological evidence.

In this conference the first results of our study will be presented.

Excavation of Tombs I in the Perdigões archaeological complex was undertaken using state-of-the-art methods and care. The great investment in terms of field work that continues in the laboratory may provide valuable clues for a better understanding of the site's complex and varied burial practices. Laboratorial methods include the cleaning and inventory of the great number of skeletal remains recovered, their taphonomic analysis, assessment of their relative representativeness, estimation of NMI, estimation of age at death and determination of sex (when possible) and morphological analysis. The various bones will also be studied to look for indications of pathologies. A funerary analysis of space is essential for a better understanding of the way death was managed during the period in which the Tomb 1 was in use.

The laboratorial work is underway and follows the different archaeological phases defined for this structure. In this way we will try to understand if there are differences in the way the monument was used through time. It seems to have a long and complex history of utilization that continued even after it

began to fall into disrepair. A preliminary analysis of the human remains recovered from Tomb I indicates, in general terms:

- An overall poor bone preservation level and high level of fragmentation.
- The presence of adults (both sexes) and non-adults.
- All skeletal parts seem to be present although with very different levels of preservation.
- Bone and artifact dispersion seem to point to a differentiated utilization of the Tomb along its several phases.

The anthropological study of Tomb I will provide important additional biological information on the people buried at Perdigões. It will also provide results, that compared with the already obtained for the rest of the site and for other similar structures, will help shed light on the cultural and mental framework behind these communities idea of death and choices regarding death management strategies.

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ORAL

## 10. NEW BIOARCHAEOLOGICAL INVESTIGATIONS AT TOMB 3, LA PIJOTILLA (SOLANA DE LOS BARROS, BADAJOZ, SPAIN)

*Díaz-Zorita Bonilla, Marta (Tübingen Universität)  
marta.diaz-zorita-bonilla@uni-tuebingen.de*

This research is based on the bioarchaeological analysis done at Tomb 3 at La Pijotilla applying standard methods in osteology, biochemistry and paleopathological analysis in combination with the funerary context. La Pijotilla represents one of the most extensive Copper Age settlements in the Iberian peninsula including a funerary complex with one of the largest human bone deposits such as Tomb 3. The aim of this work was to reconstruct the mortality, morbidity, dietary and mobility patterns of this skeletal population from the Copper Age (c. 3300-2100 cal BC) and placing into context within the Late European prehistory.

The human bone collection from Tomb 3 at La Pijotilla was given a MNI of 178 individuals based on the analysis of 283,329 human bone and teeth fragments. Results showed an equal distribution of adults by sex and non metric traits suggested close biological relationships between the population and compared to other southwestern Spanish population. The evaluation of the health status identified mainly joint diseases and for dental paleopathology calculus and linear enamel hypoplasia among the most frequent recorded. Analysis of the stable isotope of carbon and nitrogen, when compared to other 3rd millenium BC sites in southern Spain, do not showed any differences between inland and coastal sites. However,

analysis of strontium isotope revealed a significant number of non local humans. This higher degree of mobility was also found in other larger settlements and results showed interaction among these sites.

The analysis of bioarchaeological remains is essential to any archaeological site due to the extensive information they could offer to interpret past populations. In addition, the application of new biochemical techniques brings extra information about subsistence and mobility patterns and will complement our understanding of the past with new biochemical techniques brings extra information about subsistence and mobility patterns and will complement our understanding of the past with new perspectives.

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ORAL

## 11. CONTEXTS, CIRCULATION, CHRONOLOGY AND USE OF CINNABAR IN FUNERARY ENVIRONMENTS IN THE SOUTHWEST IBERIAN PENINSULA

*Inácio, Nuno (Universidad de Huelva)  
nuno.inacio@dhis1.uhu.es  
Nocete, Francisco (Universidad de Huelva)  
nocete@dhis1.uhu.es  
Bayona, Moisés R. (Universidad de Huelva)  
moises.rodriquez@dhis1.uhu.es  
Nieto, José Miguel (Universidad de Huelva)  
jmnieto@dgeo.uhu.es  
Sáez, Reinaldo (Universidad de Huelva) saez@dgeo.uhu.es*

The use of pigments was a frequent ritual practice in funerary contexts (megalithic tombs, dolmens, caves, hypogea or tholoi) with occupations ascribed to IV and III Millennium BCE. From the data provided by research in the megalithic tomb of Santa Rita (Vila Real de Santa Rita, Portugal), we reflect on contexts, circulation, chronology and use of cinnabar in funerary environments in the Southwest Iberian Peninsula.

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ORAL

## 12. THE COLLECTIVE BURIAL OF SAN JUAN ANTE PORTAM LATINAM (ÁLAVA), IN THE CURRENT DEBATE.

*Etxeberria, Francisco (Universidad País Vasco)  
paco.etxeberria@ehu.es  
Herrasti, Lourdes (Sociedad de Ciencias Aranzadi) antropologia@aranzadi-zientziak.org  
Armendariz, Ángel (Universidad Cantabria) angel.armendariz@unican.es  
Vegas, José Ignacio (Instituto Alavés Arqueología)*

The study of the collective burial of San Juan ante Portam Latinam was published in 2007. Nevertheless, the discussion of the results of the analysis still remains valid.

In this burial, which is dated around 3000 cal BC, there were found more than 330 individuals. The skeletons were arranged in a clogged space, that is why the anatomical connections have persisted, so it could be inferred that the bodies had been buried in a short period of time.

Only 40% of the buried individuals had reached adulthood, so there is a clear predominance of subadult population. The registration of 13 cases of arrowheads of flint embed in bone, with signs of survival in some cases, and a direct cause of death in most, it could show the existence of repeated violent clashes. The atypical nature of the burial site, the presence of such a large group of individuals where all age-groups are represented, as well as the previously mentioned arrows wounds and other traumatic injuries also suggest an episode of catastrophic death, of the violent type. This conflict could be related to a intergroup struggle in the aim of the control of natural resources and the domain of the territory.

space between the alluvial fan which accumulated inside the cave and its northern wall. The individuals are longitudinally aligned, oriented to the entrance of the cave and following the conical shape of the sediment deposits. The forced folded position shown by the lower extremities of the individuals indicates that the corpses must have been deposited in the cave inside a strongly-tied shroud.

These are therefore successive primary burials within a hypogeum (in this case, a natural cavity), conceived as a great pantheon or cemetery. Unlike in most cave deposits, a taphonomic process consisting in the collapse of the ceiling of the cave covered the inhumations and protected their integrity, preserving them in connexion. The individuals were not buried but deposited in a space which had probably been flattened before the final deposition.

It is calculated that this funerary episode lasted for two hundred years. Sedimentation processes continued after it and new corpses were deposited. A new rock fall occurred and human remains were displaced (layer 10b). In this presentation a detailed approach to these events will be presented, as well as a description of the apparel found in relation to the individuals singled.

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ORAL

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### 13. CAN SADURNÍ CAVE (BEGUES, BARCELONA). A NEW FUNERARY MODEL DURING THE MIDDLE NEOLITHIC I IN THE NORTHEAST OF THE IBERIAN PENINSULA

*Edo Benaiges, Manuel (Cipag) medo@telefonica.net*  
*Martínez Rodríguez, Pablo (Cipag) pablomartrod@gmail.com*  
*Antolín Tutusaus, Ferran (Cipag. Ipas (Basel Univ.) ferranantolin@hotmail.com*  
*Castellana Perelló, Concepció (Cipag) ccastellana@ya.com*  
*Bardera Soler de Morell, Remei (Cipag) meibardera@yahoo.es*  
*Saña Seguí, Maria (Lab.Arqueozologia UAB) Maria.Sana@uab.cat*  
*Bergadà Zapata, Maria Mercè (SERP. UB) bergada@ub.edu*  
*Barrio Bonilla, María Jesús (Cipag) chs\_bcn@yahoo.es*  
*Fierro Milà, Elicinia (Cipag) eli.f.mila@gmail.com*  
*Fullola Pericot, Josep Maria (SERP. UB) fullola@ub.edu*

During the excavations of 2013, a series of burials dated to the Middle Neolithic I or Early Middle Neolithic (5460±40BP and 5540±40BP) were discovered. These constitute a new funerary model of collective burial practices, which is unknown to date in the northeast of the Iberian Peninsula. In previous excavations a very mixed layer of collective burials had appeared, but a small number of skeletal parts were found in connection. Four inhumations have been excavated this last campaign. The bodies were in foetal position, on their right side, in the

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### 14. THE ROCK CUT TOMB OF BAÚTAS AND SURROUNDING NECROPOLISES (CARENQUE/BELAS, PORTUGAL)

*Boaventura, Rui (UNIARQ: Archaeology Center of the University of Lisbon; CIAS: Research Center for Anthropology and Health; Municipality of Odivelas; Portanta, Association for Iberian Archaeology) rui.boaventura@campus.ul.pt*  
*Ferreira, Maria Teresa (CENCIFOR Centro de Ciências Forenses; CIAS: Research Center for Anthropology and Health) mtsferreira@yahoo.com*  
*Silva, Ana Maria (Departamento de Ciências da Vida da FCTUC; CIAS: Research Center for Anthropology and Health; CENCIFOR Centro de Ciências Forenses; UNIARQ: Archaeology Center of the University of Lisbon) amgsilva@antrop.uc.pt*

The remains of a rock-cut tomb were detected in the south-east limit of a quarry at Baútas in 1932. The then curator of the National Museum of Archaeology, Manuel Heleno, proceeded with the recovery of the objects and human remains, which were never properly presented. Immediately after, three more rock-cut tombs were discovered just 1 km to the Northeast of Baútas, and three years later another tomb nearby.

Given that a cluster of three dolmens was known since the middle of the 19 century, located about 1,3 km toward WNW,

this region of Belas and Carenque presents an interesting case study for populations of the 4th-3rd millennia BCE. The archaeological and anthropological remains of these rock-cut tombs are being systematically studied, making it possible to present in firsthand the results for the rock cut tomb of Baútas. Despite some recording limitations regarding context, it is possible to ascertain who was deposited in that tomb as well as what socio-economic relationships there might have existed with neighboring groups.

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### 15. THE ARTIFICIAL CAVES OF VALENCINA DE LA CONCEPCIÓN DE (SEVILLA)

*López Aldana, Pedro Manuel (Universidad de Sevilla) aldana-astrogodo@gmail.com*

*Pajuelo Pando, Ana (Universidad de Sevilla) anapajuelo@gmail.com*

Collective burials are one of the most common funerary practices during Later Prehistory and show a diversity of structural solutions. Nearly all contemporaneous morphological types are known to exist at the 3rd millennium BC archaeological site Valencina de la Concepción (Sevilla). The site extends over a wide area of some 400 ha and includes a necropolis with tholos tombs featuring different sizes, morphologies, construction methods, demographic attributes, etc. On the other hand, several funerary structures have been identified in recent years on the site's outskirts and even out of the referred tholoi area. In typological terms, these structures fit well into the types known as "artificial caves". They were found in 3 different zones, located at C / Dinamarca, El Algarrobillo and La Huera, the latter in the locality of Castilleja de Guzmán.

From a morphological point of view, there is significant variability concerning not only architectural aspects but grave goods and anthropological elements as well. This is particularly evident in all the C / Dinamarca tombs, ranging from structures where a large number of individuals were buried to structures featuring a very limited number of burials only.

Concerning the treatment of the bodies, the most widespread ritual is the hyperflexion of upper and lower extremities, probably indicating the use of shrouds or bandages. In structures where larger numbers of individuals were buried, human remains were often rearranged in piles to make room for new inhumations. Some individuals seem to share morphological features that might link them to certain family groups; DNA studies were carried out to test this observation.

Grave goods are rather scarce or even absent, as in the case of smaller structures. The distribution of grave goods in relation to the burials doesn't enable linking grave goods to any par-

ticular burial.

This type of funerary structures are definitely a novelty in the Copper Age site Valencina de la Concepción. Their presence and location must be assessed in chronological, social and cultural terms.

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### 16. BIOARCHAEOLOGICAL APPROACH TO THE LATE NEOLITHIC AND CHALCOLITHIC POPULATION OF CAMEROS MEGALITHIC GROUP (LA RIOJA, SPAIN)

*Fernández-Crespo, Teresa (Universidad del País Vasco) teresa.fernandezzc@ehu.es*

The main aim of this article is to go deeply into the nature of people buried and to broaden the knowledge of the funerary practices performed in the monuments of Cameros (La Rioja, Spain) during the Late Neolithic and Chalcolithic (5 500 - 3 500 BP).

Four anthropological collections are selected for the approach (Peña Guerra II, Collado del Mallo, Fuente Morena and Collado Palomero I), which correspond to the main sites used as graves in that period. The sample comprises 92 individuals. Conventional anthropological methods (NMI, age and sex estimation, morphometry and macroscopic observation) together with a palaeodemographic analysis of the collections and a reassessment of the main archaeological data recovered in the excavation of the sites, are used in the study.

Concerning the anthropological characterization, some aspects must be noted: the identification of various demographic anomalies clearly incompatible with the normal structure of human populations; the morphometrical description of individuals as people with a slender constitution, a balanced proportion of skeletal structure and an average stature; and, finally, the finding of a high incidence of arthrosic, degenerative and, to a lesser extent, oral diseases, in contrast to the scarcity of infectious, neoplastic and traumatic signs.

With regard to the funerary practices, the aforementioned demographic anomalies result on a bias in the age and sex distribution of buried people that could be related to funerary selection. The analysis of bone representation and manipulation shows, despite the frequent alteration and disorganization of burial contexts, the preeminence of primary deposits but, at the same time, a probable introduction of secondary assemblages in certain megalithic graves. The presence of the ochre colorations in some bones is related to the application of different iron oxides, a result of whether depositional or post-depositional practices.

Bioarchaeological analysis of Cameros megalithic human remains reveals a population with the typical morphological



and pathological features of pre-industrial societies. However, the presence of biases in the distribution of deaths could be suggesting the existence of a cultural selection that further research should try to assess. Despite the frequent alteration of the assemblages, the main primary nature of graves can be determined and some specific funerary practices are identified. The paper finally stresses the relevance of current bioarchaeological approaches to obtain irreplaceable data on Prehistoric collective burials.

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POSTER

**17. ANTHROPOLOGICAL AND TAPHONOMICAL STUDY OF HUMAN REMAINS FROM THE BURIAL CAVE OF EL ESPINOSO (RIBADEDEVA, ASTURIAS, SPAIN).**

*González Rabanal, Borja (Instituto Internacional de Investigaciones Prehistóricas de Cantabria) borjagrabanal@gmail.com*

*Marín-Arroyo, Ana B. (Instituto Internacional de Investigaciones Prehistóricas de Cantabria) anabelen.marin@unican.es*

*González Morales, Manuel Ramón (Instituto Internacional de Investigaciones Prehistóricas de Cantabria) manuelramon.gonzalez@unican.es*

During the Chalcolithic and Bronze Age in the Cantabrian Region, Spain, human groups buried their dead depositing them in narrow caves coexisting this tradition with the megalithic structures at times. This work is based on the anthropological, archaeological and taphonomical study of the human remains found in 1993 at El Espinoso Cave, located in Ribadedeva (Asturias, Spain). Up to now, it constitutes the only collective burial known from this cultural period in the western Cantabrian Region.

These human bones were deposited on the surface in a small room at the end of the cavity. Bones were found in surface, scattered throughout the room, without any apparent anatomical connection. Remains are very fragmented due to post-depositional processes showing diagenetic modifications such as concretions and water activities. Although during the excavation was not recovered any type of grave goods, the presence of two metal bracelets recovered during a furtive action is known. Also, the presence of faunal remains was documented.

First, an anatomical and taxonomic identification of the human remains was achieved. Later, age of the individuals was determined from the dental eruption and epiphyseal fusion of long bones. Sex and stature was estimated based on the measurements taken from talus, calcaneus and patella bones. This osteometrical study is interesting in sites where long bones are

highly fragmented or absent. Finally, a taphonomic analyses based on the different biostratigraphic and diagenetic modifications that altered the skeletal remains within the deposit was carried out. Thereafter, relevant quantitative and statistical analyses were made.

The human remains represented belong to a minimum of eleven individuals with different ages and both sex. While any peri-mortem fracture was identified, the taphonomical results report a significant post-depositional activity within the cave, both natural and anthropic. Regarding burial treatment is difficult to say something although the presence of carbons remains has been documented in different locations of the burial area. About the animal species represented, cow, red deer, pig, and ovicaprids were identified. Whether if they could have been part of grave goods or not is discussed here. However, faunal bones showed butchering activities.

This study presents novel methodological aspects applied to the only collective burial known from Chalcolithic and Bronze Age in Asturias.

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POSTER

**18. DIET AND RITUAL IN THE WESTERN MEDITERRANEAN COPPER AGE: HUMAN AND ANIMAL STABLE ISOTOPES FROM THE COLLECTIVE BURIAL AT S. CATERINA DI PITTINURI (SARDINIA, ITALY)**

*Lai, Luca (Dept. of Anthropology, University of South Florida (Tampa, USA); Dip. di Storia, BB Culturali, Territorio, Università di Cagliari (Cagliari, Italy) melisenda74@yahoo.it*

*Fonzo, Ornella (Laboratorio di Osteologia, Museo Genna Maria, Villanovaforru (VS, Italy) ornellafonzo@virgilio.it*

*Usai, Elena (Dip. di Scienze della Vita e dell'Ambiente, Università di Cagliari (Cagliari, Italy) elena.usai1965@tiscali.it*

*Medda, Luca (Dip. Scienze Chimiche e Geologiche, Università di Cagliari (Cagliari, Italy) lmedda@unica.it*

*Tykot, Robert (Dept. of Anthropology, University of South Florida (Tampa, USA) rtykot@usf.edu*

*Goddard, Ethan (College of Marine Science, University of South Florida (Tampa, USA) egoddard@mail.usf.edu*

*Hollander, David (College of Marine Science, University of South Florida (Tampa, USA) davidh@marine.usf.edu*

*Tanda, Giuseppa (Inter-departmental Centre for Mediterranean Prehistory and Protohistory (CIPPM), University of Cagliari (Cagliari, Italy) gtanda@unica.it*

From the first reactions to the most simplistic processualist views, it is clear that what is represented in burial contexts does not linearly reflect traits of the living community. We can have a mediated glimpse of the ecological ties between humans and other species in the very rare cases when faunal and

human remains are found together, but single situations need to be carefully decoded. In the Western Mediterranean Copper Age, such relationships may provide indications on the theorized intensification of animal products exploitation, and its aspects in specific environments and fields of practices.

The bone remains from Santa Caterina di Pittinuri, coming from a 4th-3rd millennium BC undisturbed context on the west coast of Sardinia, provide an ideal case study. Ten humans and 11 animals were sampled for C, N and O isotopes, which reflect to some degree the food consumed over several years before an organism's death. While collagen yield was scarce and uneven, good preservation of both collagen and the mineral signal is suggested by C:N ratios and the physiology-dependent species-specific distribution of apatite O and C. Taphonomy was also investigated through FT-IR spectroscopy, which confirmed different diagenetic pathways for the human and animal remains, possibly also connected to pre-burial treatment. Interpretation of diet was cautiously carried out considering the different species represented, and must be tentative due to the modest numbers involved. The human diet, despite the coastal location, did not include any detectable amount of marine resources. As inferred based on the  $\delta^{15}\text{N}$  interval between humans and ovicaprines, it probably included terrestrial animal proteins, but in a relatively low proportion compared to other prehistoric Mediterranean groups, possibly indicating heavier reliance on agriculture rather than animal meat and secondary products. In line with starchy foods could be the high prevalence of caries observed.

The small spacing between collagen  $\delta^{13}\text{C}$  and apatite  $\delta^{13}\text{C}$ , appearing possibly contradictory, could be the effect of mostly ruminant products, coherently with the scarcity of animal offerings representing daily, 'normal' foods. The diet of pigs overlaps with that of herbivores, supporting their identification as wild boars based on bone morphology; as hunting was likely a key practice in structuring gender identities rather than barely a subsistence activity, this also implies that ritual offerings of defleshed body parts, mostly mandibles, involved special animals and not daily food remains.

The methodological implications – and complications – of assessing human diets based on all animal species represented as if they were a coherent whole are discussed, and at a broader scale the need to complement traditional tools with different analytical techniques is underlined.

The potential wider significance of the data discussed above is that there is no isotopic trace of marine foods, nor a radical difference reflecting increased reliance on milk products, whereas there might be clues of strong reliance on vegetal foodstuffs alongside the symbolic relevance of wild boar hunting.

ORAL

## 19. FUNERARY PRACTICES OF THE CHALCOLITHIC PERIOD: THE COLLECTIVE SECONDARY CREMATIONS AT PERDIGÕES ENCLOSURE

*Valera, António Carlos (NIA Núcleo de Investigação Arqueológica, ERA Arqueologia, S.A.) antoniovalera@era-arqueologia.pt*

*Leandro, Inês (CIAS, University of Coimbra) inesleandro@hotmail.com*

*Pereira, Daniela (CIAS, University of Coimbra, Portugal) niela.pereira@gmail.com*

*Silva, Ana Maria (CIAS, Department of Life Sciences, University of Coimbra, Portugal; UNIAO; CENCIFOR) amgsilva@antrop.uc.pt*

Perdigões is a large set of ditched enclosures located in Reguengos de Monsaraz, South of Portugal, and dates from Late Neolithic/Chalcolithic. In the middle 3rd millennium the central area of Perdigões ditched enclosures was reused for funerary purposes. There, two pits were used for secondary depositions of cremated human remains and associated votive materials also submitted to fire. In pit 16 a conical deposit with these remains showed that they were dumped inside, probably in one single action. In pit 40, still under excavation, thick layers of cremated human remains and archaeological material filled the top of this structure. Then, a semi-circular stone cairn containing a small cist was constructed overlapping part of the pit. This stone structure was later covered by deposits also with cremated human remains and archaeological material in a depositional activity that seems to have been done in open area. Contrary to pit 16, this sequence shows a continuous activity of depositions for some time, starting in the middle of the millennium and developing through the 3rd quarter.

The aim of this work is to document the evidences of collective secondary cremation contexts in the Perdigões Enclosure. The human remains were cleaned and catalogued prior to data collection. For that, the human bone fragments were sorted into skeleton division's categories. Non-adults bones were separated from adult bones.

Information recorded for the human bones included data related to modifications due to thermal changes caused by fire as colour changes, types of fractures, level of distortion, degree of shrinkage and fracture pattern. Paleobiological data, as demographic characteristics – ageing (adult versus non-adults), sexing – and other skeletal data as discrete variants and pathology were recovered.

Pit 16 contained burnt human remains, highly fragmented and predominantly calcined bones. The paleoanthropological study of the sample recovered from pit 16 reveals a minimum number of 9 individuals: 6 adults and 3 non-adults. Evidence

of several pathologies was detected and several alterations due to the exposure of heat were observed. The obtained data confirms that the majority of the bones were submitted to high temperature and, at least some of them, were submitted as fresh bones to the fire. On the other hand, the human remains recovered from Ambiente 1 correspond to a minimum number of 90 individuals: 72 adults and 18 non-adults. The burnt human remains exhumed from cist correspond to a minimum number of 8 individuals: 5 adults and 3 non-adults. The secondary collective cremation burials from Perdigões Enclosure are a unique funerary context in Portuguese Chalcolithic burial practices. These contexts give a new perspective of the importance cremation might have had in the middle 3rd millennium amongst the funerary practices and rituals in South Portugal.

niences within the site including Pit 11, 16, Tomb 1 and Tomb 2 with radiocarbon dates that span the known chronology of the site. The samples produced a high variation in mercury content, ranging from 0.057 to 115.62 ppm; samples from Tomb 2 had the highest levels. The most likely explanation for high mercury levels is from diet with individuals feeding at higher trophic levels being more exposed via biomagnification. However, stable isotope analysis ( $\delta^{13}\text{C}$  and  $\delta^{15}\text{N}$ ) of the same 21 bone samples revealed a weak negative relationship with  $\delta^{15}\text{N}$ . Mercury was lowest in individuals with the highest  $\delta^{15}\text{N}$  values indicating no relationship between a high trophic diet and exposure to this contaminant. Instead, these results imply a possible age and/or sex bias in exposure to mercury, possibly through the use of cinnabar as a pigment in funerary rituals, body paintings, pottery or other cultural uses.

ORAL

**20. MERCURY AND STABLE ISOTOPE ANALYSIS OF HUMAN BONE FROM A LATE NEOLITHIC/CHALCOLITHIC DITCHED ENCLOSURE AT PERDIGÕES, PORTUGAL**

*Emslie, Steven (University of North Carolina, Department of Biology and Marine Biology, 601 S. College Rd., Wilmington, NC 28403, USA) emslies@uncw.edu*

*Brasso, Rebecka (University of North Carolina, Department of Biology and Marine Biology, 601 S. College Rd., Wilmington, NC 28403, USA)*

*Patterson, William (University of Saskatchewan, Saskatchewan Isotope Laboratory, 114 Science Place, Saskatoon SK Canada S7N5E2)*

*Silva, Ana Maria (CIAS, Department of Life Sciences, University of Coimbra, Portugal; UNIARQ; CENCIFOR) amgsilva@antrop.uc.pt*

*Gomes, Hugo (Instituto Politécnico de Tomar, Portugal)*

*Valera, António Carlos - antoniovalera@era-arqueologia.pt (Nia Era Arqueologia, S.A.)*

Numerous ditched enclosures of late Neolithic and Chalcolithic ages have been documented throughout Europe including the Iberian Peninsula. The large enclosure at Perdigões, south-central Portugal, has been excavated since 1997 and includes at least eight funerary features (pits, ditches and tholoi tombs). This site does not show clear evidence for habitation and most likely was a meeting place for local communities and a stage for social practices. Depositions of human remains (including cremations), animal remains, and a diversity of archaeological materials were deposited in pits, ditches or tombs at the site. Here, 21 samples of human bone were analyzed for total mercury concentration using a Direct Mercury Analyzer (DMA-80). The samples were from a variety of pro-

ORAL

**21. MULTIPLE BURIALS ON PIT GRAVES FROM RECENT PREHISTORY AT SOUTHWEST OF IBERIA: THE CASES OF MONTE DO VALE DO OURO 2 (FERREIRA DO ALENTEJO), RIBEIRA DE S. DOMINGOS 1 AND ALTO DE BRINCHES 3 (SERPA)**

*Pereira, Tania (Department of Life Sciences, University of Coimbra, Portugal) taniafepereira@gmail.com*

*Silva, Ana Maria (CIAS- Research Center for Anthropology and Health, Department of Life Science, University of Coimbra, Portugal; UNIARQ; CENCIFOR) amgsilva@antrop.uc.pt*

*Porfírio, Eduardo (Palimpsesto - Estudo e Preservação do Património Cultural Lda., Coimbra, Portugal) eporfrio@gmail.com*

*Valera, António Carlos (Nia Era Arqueologia, S.A., Portugal) antoniovalera@era-arqueologia.pt*

The recent work of rescue archaeology in Portugal has permitted the detection of an increasing number of pit graves from different time periods, dated from Late Neolithic until Final Bronze Age.

Based on three sites from the Southwest Iberia, the aim of the present work is to show some preliminary results about funerary contexts of Alto de Brinches 3 (Serpa), Ribeira de S. Domingos 1 (Serpa) and Monte do Vale do Ouro 2 (Ferreira do Alentejo), where evidences of burials on this kind of structure were identified.

Fieldwork information was articulated with laboratory results to achieve a better understanding of the funerary practices. These pits were used as multiple burials, ranging the minimum number of individuals between 3 and 5: Pit 691 of Alto de Brinches 3 includes a Minimum Number of Individuals (MNI) of 3; Pit 1 of Ribeira de S. Domingos 1 has a MNI of 5; and, Pits 97 and 102 of Monte do Vale do Ouro 2, have each one a

MNI of 4. In general, all osteological remains were affected by several taphonomic agents leading to a high fragmentation of the skeletons. These were deposited in several positions (supine, lateral and ventral decubitus) and orientations. At pit 97 of Monte do Vale do Ouro, 2 individuals showed evidences of fire action. Individuals of both sexes, adults and non-adults are represented: Alto de Brinches includes 4 adult individuals; pit 97 of Monte do Vale do Ouro, 1 adult and 3 non-adults; pit 102 of Monte do Vale do Ouro, 3 adults and 1 non-adult; at Ribeira de S. Domingos 1, 3 non-adults and 2 adults were represented. Among the more relevant data was the evidence of non-masticatory use of teeth in the sample of Monte do Vale do Ouro.

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ORAL

## **22. COLLECTIVE BURIALS AND UNEQUAL ACCESS TO DEATH. THE BIOARCHAEOLOGY OF VALENCINA DE LA CONCEPCIÓN (SEVILLE, SPAIN)**

*Díaz-Zorita Bonilla, Marta (Tübingen Universität)*

*marta.diaz-zorita-bonilla@uni-tuebingen.de*

*García Sanjuán, Leonardo (Universidad de Sevilla)*

*lgarcia@us.es*

Valencina de la Concepción (Sevilla, Spain) is one of the most important 3rd millennium BC sites of the Iberian peninsula. The large number of archaeological excavations carried out since the 1860s make it one of the most extensively excavated prehistoric sites of Iberia. A wide range of archaeological features have been identified throughout the site, including several burial structures that have yielded a substantial collection of human remains, most of which remains unstudied. The purpose of this paper is to present a review of the funerary practices and the human anthropological record currently known for Valencina de la Concepción, looking into the variability of burial structures and the results of the bioarchaeological analyses carried out to date.

The resulting discussion, which also make use of recently obtained radiocarbon and stable isotope analyses for some specific sectors of the site, will deal with issues pertaining the demographics as well as spatial and social organisation of the people who occupied this site throughout the Copper Age.

# A25c Standing stones and megalithic monuments in context

Comisión Civilizaciones neolíticas del Mediterráneo y de Europa  
Organiser: Terence Meaden

Thursday 4th (09:00 to 13:30)  
B04 Meeting Room



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ORAL CONTRIBUTIONS

ORAL

**1. STONEHENGE, DROMBEG AND AVEBURY: THE RATIONALITY OF THEIR STONE-CIRCLE DESIGN PLANS WHEN INTERPRETED BY HIROS GAMOS AND VALIDATED BY PHOTOGRAPHIC SUNRISE EVIDENCE FOR THE EIGHT TRADITIONAL AGRICULTURAL FESTIVAL DATES**

*Meaden, G. Terence (Oxford University) terencemeaden01@gmail.com*

Little is known about the intentions of the builders of the stone circles of Neolithic and Bronze Age Britain and Ireland, and the use to which the stones were put. Yet there are sites where constructive clues can be deduced by analysing stone settings relative to specific sunrises or sunsets. Because the stone circle at Drombeg is accurately explained this way—with photographs that powerfully demonstrate it—the solution strongly supports similar explanations for sites like Stonehenge where the action can be watched by any visitor and verified under clear-sky conditions.

The research has taken many years. The key lay in studies conducted at sunrise for particular dates of the year. Drombeg Stone Circle excels in this reconstructive analysis because the crucial stones are still present, and accurate survey authenticates it. The truths are convincingly demonstrated by photography.

At Drombeg particular standing stones play critical roles at sunrise for the eight festival dates of traditional agricultural communities. Crucial is the positioning of a male-type perimeter stone (bearing an anthropomorphic image) such that its phallic shadow at midsummer sunrise envelops a vulvar engraving on the recumbent stone diametrically opposite. Gradually the shadow moves aside allowing sunshine to reach the female symbol. It is the same for sunrises at Beltane, Lughnasadh and mid-year points (equinoxes) when shadows from other perimeter stones couple similarly, before being immediately followed by penetrating sunlight. For the winter half of the year (including Samhain, the solstice and Imbolc), the target stone for shadow reception is a huge lozenge-shaped megalith. At the equinoxes the drama is enacted between an arguably-male pillar stone and the seemingly-female lozenge stone.

Consequently, all eight sunshine-and-shadow events have been photographed at sunrise at Drombeg.

Stonehenge behaves similarly at midsummer sunrise where sunshine initially illuminates the Altar Stone, before the phallic shadow of the Heel Stone intervenes and

penetrates the monument to reach the Altar Stone. The enigma of the short round-topped anomalous Stone 11 at Stonehenge is solved too. The surviving stones of Avebury's southern stone circle act similarly at midsummer, midwinter and Beltane. Avebury's Cove works likewise with respect to midsummer sunrise.

An explanation in terms of the ancient, widely-loved worldview of the Marriage of the Gods between Sky and Earth seems warranted. This mythology was known classically as the hieros gamos (Sacred Marriage)—a concept known for classical historical times and encountered latterly by anthropologists interviewing tribal communities. The sun-and-shadow display is a dramatic, highly visual effect that still occurs and can be witnessed on the intended days by any visitor to Drombeg and Stonehenge. In the Neolithic and Early Bronze Age numerous spectators standing outside these monuments could witness the spectacle. This is the paramount fundamental meaning for the basic design plan of Stonehenge, and explains much about the meanings underlying the intrinsic design plans of many other monuments—including Avebury, Drombeg, Newgrange and Knowth.

This report also includes a reconstructed 365 day-by-day calendar for early Britain resulting from a study involving sunrise directions that accord with the axial orientations of over 60 Wessex long barrows.

ORAL

**2. KNOWTH PASSAGE-GRAVE IN IRELAND ? AN INSTRUMENT OF PRECISION ASTRONOMY?**

*Prendergast, Kate (University of Oxford) kate@brodgar.fsnet.co.uk*

There are three large Neolithic passage-graves at the monumental complex on the banks of the river Boyne in County Meath, Ireland: Newgrange, Knowth and Dowth. It is becoming increasingly clear that astronomical alignments comprise a central function of these monuments, but while astronomy at Newgrange has been extensively researched and interpreted, less is known and understood about the way astronomy functions at Knowth and Dowth. This paper focuses on the evidence for astronomical alignments at Knowth, and on interpretations of this evidence.

While at Newgrange there is one passage - facing south-east – at Knowth here are two passages - one facing east and one facing west. It has been believed for many years that these are equinoctial solar alignments and hence directly complement the winter solstice alignment at Newgrange. This paper will draw on new surveys, as well as interpretations of the evidence at Knowth. A synopsis

of this evidence will be presented and reviewed in the context of the rock art at Knowth - prominent examples of which can also be interpreted as depictions of astronomical cycles. These will be illustrated by photos taken at the site.

This paper will hope to successfully argue that, while the passages do function in relation to the equinoxes, they are not direct equinoctial alignments. Rather, they may have been constructed and used to facilitate the harmonisation of the solar and lunar cycles—much in the same way as does the equinoctial Judeo-Christian festival of Easter.

The paper concludes by suggesting that like Newgrange, Knowth may be an instrument of precision astronomy, which enabled its builders and users to construct highly sophisticated calendars and counting systems, which in turn facilitated calculated planning, and was a fundamental structuring principle for their ritual lives and cosmological beliefs.

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ORAL

### 3. REPORTING THE MAJOR DISCOVERY OF AN EXTRAORDINARY CULT SITE WITH ROCK ART ENGRAVED IN CALCITE, UNIQUE TO SARDINIA

*Gradoli, Maria Giuseppina (Geologist and Archaeologist, PhD researcher, University of Leicester (UK) ggradoli@yahoo.it, Anardu, Giuseppe (Freelance Geologist, PhD) anardu.geol@yahoo.it, Kovacs, Keith (University of Central Florida, School of Visual Arts & Design, Orlando (USA)*

This abstract announces the recent identification in East-Central Sardinia of an extraordinary cult cave displaying specific and unique use of natural surfaces on which complex patterns of rock art, always linked to past or present running water, were engraved. The small cave, now partly filled with sediments and rocks and disturbed by human action, shows intentional use of the physical and contextual properties of the natural resources by means of three different symbolic levels. The site is located on the upper part of a limestone plateau, in a marginal position not easily reached. In the central part of the main room of the cave, the remains of some speleothems arranged in a sort of oval open space (the deep first level) demarcate a flow of white calcite incised with signs and swirling lines of difficult interpretation. Nearby, several pieces of calcite-coated pottery were found scattered among the stones. The cave environment is linked to an external rock shelter by a 1.5 metres high step and a steeply sloping surface. Several now extinct waterfalls are recognisable in this second level that again is charac-

terized by a white calcite pavement where a great number of little cup marks were pecked, together with other incised and artificially modified features.

The third and highest level is an open-air surface with carvings, including cup marks and channels departing from a shallow broad central pool cut into a very thick layer of pure and well-formed calcite crystals. The latter with their special crystalline consistency and colour (white, translucent and, in the upper part, pinky-brownish) must have been 'visually appealing' for the prehistoric people using the site. Moreover, due to the presence of a great quantity of water flowing and passing through the different physical levels in which the site is articulated, and coming from both the walls and inner part of the cave and from the sky as rain on the open-air exterior engraved surface, the site must have been perceived as a powerful place for sacred rites.

Such a complex cult site—the first of the kind reported for Sardinia—and its uniqueness due to the curving action of a complex pattern of cup marks and different signs including female anthropomorphism cut into a thick crystalline surface, deserves much research, careful excavation, and urgent protection by the local authorities.

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ORAL

### 4. THE PEDRA DA ENCAVALADA AND ITS RELATIONSHIP WITH THE MEGALITHIC WORLD (ABRANTES, PORTUGAL)

*Cruz, Ana (Instituto Politécnico de Tomar) anacruz@ipt.pt, Graça, Ana (Instituto Politécnico de Tomar) anagrace@ipt.pt*

In Central Portugal, with a tripartite geomorphological diversity formed by the confluence of three rivers (the Nabão, the Zêzere and the Tagus), the Alto Ribatejo is home to some megalithic funerary monuments but to only one menhir structure.

Within the area affected by the Nabão river (a subsidiary of the Zêzere) are the sites of Alvaiázere and Quinta do Paço. In the river Zêzere area (a subsidiary of the Tagus) are the sites of Alverangel and Pederneira on the right bank and Martinchel site and Medroa menhir on the left bank. It is also on the left bank of the river Zêzere that lays Pedra da Encavalada, which is the subject of this paper. Finally, within the area affected by the Tagus River, is the monumental set of Mação. In none of them Rock Art has been detected.

The Pedra da Encavalada stands out as an atypical megalithic monument. In architectural terms it is a partial set

of monoliths adjoined to a large outcrop standing out in the landscape. His mound consists of burial pits (probably single) with circular plan, filling the entire perimeter of the "megalithic" structure. It is a unique monument of its kind in Alto Ribatejo, and based on the datings obtained by TL, it must have been a landmark in the consolidation of the megalithic architectural process in the region.

The megalithic monuments organised, in part, the cultural landscape of agro-pastoral communities during the Holocene. They are thought to have had a symbolic character that is widely discussed in the academic literature and, according to some authors, megalithic architects have built these monuments for "astronomic" purposes, thus giving them several uses at the same time. The significance of the devotion of agro-pastoral communities to these mega-constructions can be found within the spatial, cultural/collective and cognitive contexts as an epistemological rupture with the sphere of the Early Neolithic.

The relationship that can be established between Pedra da Encavalada and all its surrounding megalithic structures can only be explained by the emergence of a new attitude towards death.

ORAL

### 5. A CONSTRUCTIVE RELATIONSHIP? FORAGER-FARMER CONTACTS AND MEGALITH CREATION IN KURNOOL DISTRICT, SOUTH INDIA

*Blinkhorn, James (Université de Bordeaux) jblinkhorn@outlook.com*

The creation of megalithic monuments marks a significant change in community relationships with geological landscapes. Although regularly incorporated within meaningful landscapes by hunter-gatherer populations, by engaging with geological resources more conspicuously, farming populations have been able to symbolically enrich their landscapes in new ways. This presentation, focusing on southern India, will discuss the different ways in which foragers and farmers have engaged with geological resources, and how contact between these groups may have led to new means for symbolically enriching a shared landscape. The Erramali range form part of the Cuddapah Supergroup, comprising a suite of limestone and shale deposits, capped by quartzites. Huge quartzite boulders litter the sides of the plateau as they roll gently toward the valley floors below, forming innumerate rockshelters inhabited by forager populations and providing a canvas for rock art production. On

low rises in the valley floor, megalithic burial grounds are found, produced primarily from limestones and yielding late Neolithic and early Iron Age material culture. The presence of human burials and both quartzite and limestone stone structures within and around the huge boulders beneath the plateau presents a unique manifestation of Megalithic trends in southern India. This is interpreted within the context of forager-farmer contacts in prehistory, and such contacts have also extended into the ethnographic present.

ORAL

### 6. INDIAN MEGALITHIC CULTURE SINCE ITS DAWN IN PREHISTORIC TIMES AND ASPECTS OF CONTINUING MEGALITH USES AND BELIEF SYSTEMS

*Das, Subhashis (www.megalithindia.in) subdas.hzb@gmail.com*

The paper considers the fact that much of India's landscape is interspersed with megaliths. India is one of few countries in the world where megalith making, as a tradition by many tribes, has continued uninterrupted till today—dating arguably from the Neolithic/Chalcolithic/Iron ages. In addition to the above, the paper examines the diverse megalithic architectures that are spread across the country, and studies graves and their associated deposits. The paper also delves into the realm of the cupmarks—an enigmatic symbolic art form associated with megaliths.

The presence of innumerable and diverse forms of megaliths ranging in time from the Neolithic/Chalcolithic/Iron Ages to the contemporary period suggests that these monuments should be one good source of India's ancient history, yet they are not acknowledged as such. The populace remains oblivious of the worth of these primitive monuments. As a result megaliths are fast being destroyed by villagers who tow them away for mundane domestic purposes. However a few megalithic-using tribes still raise megaliths to the dead in many parts of our country—thus making these monuments one of the rarest of the heritages that continues to be made unabatedly since antiquity.

Such a circumstance of megalith-making even in the present era is unknown for most parts of the globe, so this means that knowledge of Indian customs and practices may help to explain megalithic uses and practices worldwide including Neolithic and Bronze Age Britain, Ireland, Continental Europe and the Mediterranean.

Cupules (cup marks) and related forms of symbolism and traditions bind megaliths and these symbolical art forms to the archaic fertility cult that surprisingly link an-



cient India with Europe. This study deeply investigates megalithism in India finding that megaliths, contrary to conventional thinking, are not solely funerary monuments or commemorative stones to the dead but serve other purposes as well.

The paper shows that quite a number of megalithic monuments across the Indian landscapes, being of diversified architecture, are non-sepulchral in nature. Some stones further reveal mathematical and astronomical positioning that seems to suggest they were erected for their fertility rites in which astronomy was necessary. Among traditional customs of the tribals the Sarhul being a fertility festival in which the Sky Father is believed to marry the Earth Mother with the result that the fertility of farming lands and livestock is again renewed. In North-East India where megalith erection after death among several tribes still continues uninterrupted, many of these monuments are dedicated to the Mother Earth—and this may have been true of Neolithic Europe too.

These findings, along with grave goods, could also help in understanding more about the megalithic monuments and culture not only of early India but even of Neolithic Europe, and even get to be accepted as the long-overlooked source of India's ancient history. In the process these will obtain the status of venerated relics of India.

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ORAL

## **7. SIMILARITIES OF INDIAN MEGALITHS WITH NEOLITHIC EUROPEAN AND BRITISH MEGALITHS AND MONUMENTS: A CONSIDERATION OF POSSIBLE INFLUENCES IN ANTIQUITY**

*Das, Subhashis (www.megalithindia.in) subdas.hzb@gmail.com*

The paper investigates various lines of evidence for a connection between the lands of Britain and India including especially the Age of the Neolithic. The similarities in architecture of many megalithic settings and monuments between these distant lands are a mystery. Why are so many megalithic monuments in these lands identical or nearly so? Can they be the result of mobile contacts between the peoples of these countries in unknown antiquity or were the ideas spread by broadly the same set of people?

Unexpectedly but crucially one finds scores of Mundari/Kol words present in some European languages, and even in English, that could have been loaned from the different Mundari languages to the European vernacu-

lars or vice versa, and suggestive of the existence of various megalithic Mundari tribes in Europe at some remote past.

Since very ancient times India is a heterogeneous land of numerous cultures and faiths. The overwhelming presence of innumerable prehistoric megaliths across India's sacred landscape confirms the supposition that it was due to the various tribes who were the predominant population of this country among which many were megalith builders. Many Indian megalithic monuments, seemingly of later date than those of Britain, disclose European and British influences.

The paper looks into such megaliths that are identical both in India and Britain. It is all the more astonishing when one discovers similar names prevailing for the same object in Britain, Europe and also among some Mundari tribes in India. One astounding find is the name sarsen or sasan which is used widely for megaliths and large stones in Britain, Europe and even in the Jharkhand state of Eastern India by the Kolarian Mundaric tribes. The presence of identical megalithic structures and designating the same object or thing with the same name in lands so far apart is unlikely to be the outcome of random coincidences but, rather, a consequence of a likely interaction between them. Nevertheless, some archaeologists and scholars tend to shirk at the utterance of such a communication between ancient India and Britain.

Several proto-austroloid Kolarian tribes of India have rich folklores that propose their origin to be in lands outside India. One oral tradition of the significant Kolarian Santali tribe recounts sagas of their traversing many far-off locales for centuries which many tribal gurus presume to be ancient Europe. No wonder the parallels of many ancient megaliths in India could be traced to Britain.

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ORAL

## **8. THE AVEBURY HILLS, SOUTHERN ENGLAND: A PREHISTORIC LANDSCAPE WITH POSITIONED MEGALITHS AND SETTINGS SUPPORTED BY NEOLITHIC AND EARLY BRONZE AGE PORTABLE LITHIC FINDS**

*Meaden, G. Terence (Oxford University) terencemeaden01@gmail.com*

Thousands of sarsen stones lie near Avebury across the heights of the Marlborough Downs in Southern England. Many are in shallow combs, the result of geological processes that began in the Eocene. Others, dotted about the higher slopes of Overton Down, were arguably intentionally positioned in the Neolithic Age. Unfortunately hundreds were split and removed by

a commercial stone-breaking industry in the nineteenth and early twentieth centuries. Even today sarsen stones continue to be sold or stolen. As a consequence, the author launched a project 18 years ago to compile a survey and photographic inventory of all noteworthy surviving stones. Major discoveries resulted.

The highest zone of Upper Overton Down—two square kilometres in area—is hugely significant. Most of its numerous megaliths, whether standing or recumbent, were specially selected, carefully positioned and in some cases subtly sculpted or inscribed. A megalith database with photograph albums together with detailed lists and photographs of diagnostic struck flints and carved portable-size sarsens have been prepared.

Far-reaching is the recognition of a pillar stone weighing 7-8 tonnes positioned to suggest calendrical functions—similar to the Obelisk in the South Circle of Late Neolithic Avebury on the plain below. Because of its remote location and lesser sophistication compared with Avebury, this highland obelisk seems to predate the Avebury megalith arrangements.

Another major result is the locating of an array of human and animal carvings. Human representations on placed stones include one with a well-proportioned carved head. Another is a splendid female torso with breasts. Animal likenesses include masterful full-body and head-alone exemplars. Groupings that incorporate aligned megaliths further suggest that in this highland region stones were ordered as open-air temples, sometimes having sunrise and sunset alignments.

Numerous portable-size sarsen stones—slightly worked and weighing up to 48 kg—have been examined. Refinements by tooling and polishing help explain their purpose. Several depict human heads, another is a female bust, and two are isosceles triangular in shape deliberately pierced or hollowed at the apex.

Of many flints found at a megalithic shrine, one resembles the top of a human skull with the brain partly exposed—a stone that a medical or spiritual practitioner might meaningfully use. It had been stored in a rock cavity along with struck flints, tools, and sarsen artefacts. At another site a third triangular sarsen stone has a true cup mark hollowed at the apex. Its reverse side is shaped for human buttocks. This implies it was made to be sat upon, as if it was a sacred seat bearing fertility hopes. The nature of the finds and postulated sarsen shrines and temples indicate that the origins of the Overton Down megalithic complex belong to the fourth millennium BC. Together, the artefacts and stones, with their social and religio-ancestral implications, and Early Neolithic long barrows suggest that this upland region east of Late Neolithic Avebury was occupied for centuries by a zealous agricultural community.

ORAL

## 9. ARCHAEOZOOICONOLOGY: A CORPUS OF ROCK ART ANIMAL SCULPTURES ON MEGALITHS IN THE AVEBURY HILLS OF SOUTHERN ENGLAND

*Meaden, G Terence (Oxford University) The best examples represent the mammals Bear, Sheep, Hare, and a Birthing Calf or Deer. Another is a raptor, probably Buzzard or Eagle. There is a good reproduction of Frog, and another may be Toad. The subtle artwork dates from the Neoli) terence-meaden01@gmail.com*

The paper about Neolithic archaeozooiconology announces the recognition of lifelike animal depictions deliberately carved into megaliths on the hills east and south of prehistoric Avebury in Wessex in Central Southern England.

The relevant localities are small—only a few hectares in area. No carved megaliths of similar character have been sighted elsewhere on the vast expanse of the sarsen-dotted landscape known as the Marlborough Downs with their tens of thousands of hard sarsen sandstones. Within the said localised regions special attention has been paid to photographing and studying pertinent megaliths on sunless days and at different times of day with the sun shining at different angles. In some cases the images are at their best in the light of the rising sun. Many stones in this landscape were carefully positioned. The stones of Avebury and West Kennet Long Barrow were studied too, and as a consequence an outstanding example of a fine animal sculpture is reported from each.

The best examples represent the mammals Bear, Sheep, Hare, and a Birthing Calf or Deer. Another is a raptor, probably Buzzard or Eagle. There is a good reproduction of Frog, and another may be Toad. The subtle artwork dates from the Neolithic and Early Bronze Age.

The Calf or Deer is on the lintel of the Early Neolithic chambered long barrow on a hill above the hamlet of West Kennet, a part of the Avebury complex. This monument is known to date from 3700 BC. Galleried and chambered long barrows, besides being places for depositing ancestral bones, may have been treated as cultic sites bearing hopes for rebirth after death. This can explain the lintel's artwork with its full-body image of a bovine calf or a deer at, it would seem, the moment of birth.

At Late Neolithic Avebury (2900 BC and later) on the great Cove stone the outline of a Hare was carved, rearing upright in typical springtime 'boxing' mode. As sculptural artistry this is an extraordinary and magnificent example of interactive imagery—of a type unknown elsewhere in world prehistory and possibly unique in the history of art. For, as the spectator's angle of view changes while walking through an arc of 90 degrees, the animal's outline transforms from a hare into a perfect left-profile human head facing the midwinter sunset.

The several other animal images discussed in this paper are high on Overton Down, which is above and immediately east of Avebury Down. There are human head images too. The sheep's head is best admired when illuminated by the light of the rising sun, especially at midsummer sunrise to which direction the megalith was set squarely perpendicular some 5000 years ago.

This archaeological survey of thousands of sarsen stones took many years.

It is suggested that iconography was the intention of the art form. On Overton Down the stones were positioned within zones of what appear to be open-air temples where, additionally, numerous portable size, meaningful, carved sarsen stones weighing from 1 to 48 kg have been found.

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ORAL

**10. AN ANALYSIS OF RECENTLY-DISCOVERED CARVINGS AND STONEMASONRY AT WEST KENNET LONG BARROW, AVEBURY, SOUTHERN ENGLAND: WAS THE CELEBRATION OF THE SKILLS AND ARTISTRY OF STONECRAFT AS IMPORTANT IN THE DESIGN AND CONSTRUCTION OF THIS BUILDING AS THE HONOURING OF THE ANCESTORS ENTOMBED WITHIN?**

*Pattison, Di (Independent) di@dipattison-artwork.co.uk*

The focus of this paper is the examination of a major feature of the design of one of Britain's finest early buildings - the newly-published presence of worked stones in the form of surprisingly large quantities of masonry and sculpture. These are considered in relation to the architecture and to finds of stone artefacts, tools and pottery.

Documentary studies, observational fieldwork and photography are used to record and assess the possible meaning of the large number of worked stones discovered by the author at this and other megalithic monuments within the Avebury World Heritage Site. The diversity of stoneworking methods, sculptural motifs and styles is noted together with the variety of tools and levels of handling expertise from the abundant toolmarks on the exposed surfaces. The placement of the worked portions on the stones and within the architecture are plotted on ground-plans and related to the two phases of construction dating to c3800 and c2200BCE. The faithfulness of the reconstruction is first established from archival and published sources.

The findings are related to known locations where stone artefacts, tools and pottery were found. An assessment was made of the number of persons involved in the architectural stonework at each period and how the work activities were organised, using an analysis of toolmarks. The supporting stone shapes and sizes and the dimensions of the carvings were re-

corded noting similarities and differences between the work of the two phases. The iconography of the imagery was analysed and considered in relation to the pottery, and artefacts. The stonework was planned and undertaken before the megaliths were upraised in most cases. The results indicate however that some Phase One stones were modified in Phase Two using new tools and processes and more sophisticated work organisation. The majority of Phase Two worked stones appear to deliberately partner stones and images of Phase One and this spirit appears in some ways to extend to the general architecture and earthworks too. Therefore the second phase of stonework seems in these ways to very deliberately pay homage to that of Phase One. The Phase One works by their diversity appear to celebrate the skills and achievements of stoneworkers/stoneworking for the two purposes of masonry and sculpture in particular, and also for toolmaking and other artefactual/craft purposes. However the excellence and complexity of the Phase Two works suggests a more professionally organised workforce. The quality of the best sculpture from the outset is superb, without comparison in the European megalithic monuments of either the Neolithic or Bronze Ages, including highly innovative three-dimensional large-scale carvings of animal and human subjects, indicating both a unique local style and the influence of people and cultures from far afield. These esoteric eclectic and also highly creative elements suggest strongly that this tiny building was designed from the outset as a most magnificent and singular structure.

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ORAL

**11. THE WEST KENNET STONE AVENUE AT AVEBURY, SOUTHERN ENGLAND: AN ANALYSIS OF THE FAITHFULNESS OF ITS RESTORATION AND OF THE ICONOGRAPHY OF A BODY OF RECENTLY-RECOGNISED SCULPTURES OF HUMAN HEADS AND ARTIFICIALLY-SHAPED STONES.**

*Pattison, Di (Independent) di@dipattison-artwork.co.uk*

The paper examines the possible usefulness and meaning to the Neolithic community of the megalithic art and stonemasonry at West Kennet Avenue in Wiltshire, England. From unpublished and recently-published archives an assessment is made of the faithfulness of Alexander Keiller's restoration of the 1930s for the first time. Do surviving stones now stand as in c2200BCE? Was Keiller correct in suspecting stones were deliberately shaped and carved?

Documentary studies, observational fieldwork, annotated site plans and photography are used to establish the faithfulness of the restoration. The presence of toolmarks on every stone surface has been recorded and discussed in recently-published work by this author. New research adds to the detailed understanding of the carvings. Their sizes, orientation, loca-

tion and iconographic detail are recorded including the views 'seen' by the sculpted faces; the play of sunlight and shadow over the three-dimensional artworks; the alertness or otherwise of their gaze; their age; expression; clothing; pose; scale and imaginative elements. Gendered imagery was the subject of an earlier paper by the author. Keiller recorded many observations of marks and debated their artefactual nature with colleagues - these were checked individually. The fertility symbolism of certain stone shapes was understood in his period. How do viewers interact with the stones and their imagery? The impression that this, the longest stone avenue in the UK, was a consistently-paired row of upraised natural stones is corrected. Almost every one has been worked, many very intensively. The majority carry carvings and large-scale images of the human head are the dominant motif. The size, direction of view, placement on the stone and details all appear to be the result of deliberate decision-making. The lozenge-like stones are all carefully worked as are the pillars, but other worked and unworked shapes are also present.

Earlier writers have understood the meandering avenue as a processional walkway with views over a monumental and sacred landscape, suggesting it prompted discussion, story-telling and cultural discourse. The number, scale and detail of the images supports this but suggests the stonework was intended to add greatly to the magnificence of this monument. Perhaps the carved faces helped define and protect the boundaries/features of the sacred landscape, commemorated people and events of the past and fulfilled an educational role while the stonemasonry also served very practical purposes. This monument reflects the culmination of centuries of stonemasonry at the Avebury World Heritage Site, presenting unique artwork of high quality and importance.

ORAL

## 12. STAR-BEINGS AND STONES: ORIGINS AND LEGENDS

*Bender, Herman (Hanwakan Center for Prehistoric Astronomy, Cosmology and Cultural Landscape Studies, Inc.) ash-co@charter.net*

Native American myths, legends and oral traditions are rich with stories of giant beings existing in ancient times. They all talk of giant Thunderers or Thunder-beings, giant snakes and great Thunderbirds. Even the first humans were said to be giants, some half man, half animal. The Tsistsistas (Cheyenne) have a name for the giant beings their ancestors encountered during the early migration to the grasslands of the Great Plains. They called them *haztova hotoxceo* or "two-faced star people". Other tribes such as the Black Feet, Gros Ventres and Lakota have similar stories.

These old stories may have real world counterparts. After de-

veloping a field model based on landscape parameters including prominence, springs, prehistoric trails and habitation sites, areas of prime interest were identified and visited in the spring of the year after the snow had melted and before the trees leafed out for the season. One site was in an effigy mound group overlooking a marsh to the west, another on a low prominence overlooking a marsh to the east.

Both sites had a number of large rocks and boulders deeply embedded in the land surface. After intensive field clearing, mapping of every rock exposed on the surface and aerial photographs, two human-like petroform effigies emerged. One has a serpentine body and wing-like arms now known as the "Star-being", discovered in a prehistoric effigy-mound group in southeastern Wisconsin (USA). Configured in stone, it is approximately 20 meters in length with a red colored, bison-shaped headstone aligned to face the summer solstice sunrise. There is another called the Starman which also has a red-colored, bison-shaped headstone aligned to face the summer solstice sunrise. Like the Star-Being, the Starman petroform is also approximately 20 meters in length.

Each giant effigy appears to be a reflection of certain constellations and stars, the "Star-being" a mirror-image of the (western) constellations of Scorpius and Libra (with Sagittarius); the Starman an almost exact representation of Taurus and the Pleiades. Both giant effigies are estimated to be 3500-6000 years old, embodiments of ancient legends and traditions writ large in stone and connected to "The People" through ceremony and acts of cosmic renewal.

ORAL

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ORAL

**13. MANITOU OR SPIRIT STONES AND THEIR MEANINGS FOR NATIVE INDIANS OF NORTH AMERICA**

*Bender, Herman (Hanwakan Center for Prehistoric Astronomy, Cosmology and Cultural Landscape Studies, Inc.) ash-co@charter.net*

Since ancient times the Native or Indian people of North America have believed in the existence of a supernatural, omnipresent and omniscient 'force' or 'presence'. All encompassing, it is universal in scale. For many of the Native people living here, manifestations of the supernatural could be expressed by one word: Manitou.

Manitou itself was seen to rest in rocks and boulders, sometimes referred to as 'spirit' or 'image' stones. They were once a common feature of the landscape. Hilltops and other significant places considered important were favored locations for the manifestation of Manitou. On the cultural landscape, the stones together with their physical setting were considered sacred. Physically, both the hills and Manitou stones were (and are) generally associated with water, i.e. springs, rapids and water falls, creeks, straits, river bends and drainage divides. Association with springs seems to have been most common. There is also a definite trail (i.e. prehistoric footpath) association, and the places venerated by the presence of Manitou(s) may have functioned as part of a broad 'trail-shrine' network,

identifying 'place' itself in both a spiritual and geographic context.

Using a variety of historic sources and place names, many Manitou stones were located. They appear to be from an ancient tradition. Some Manitous can be dated back many millennia. Historically, early French explorers, Jesuit priests and the later missionaries frequently mentioned them as did Henry Rowe Schoolcraft during his travels in the upper Midwest and Northern Great Lakes States in the early 19th century. Once the target of destruction by many missionaries, a surprisingly high number have survived, discovered where they were originally erected. Recently discovered lithic Bison effigies and other distinctive shapes, including rock outcrop resembling human and animal profile styles, can be considered as part of the phenomena.

This paper, the product of 15 years of continuing research, features some of the approximately 140 images of Manitou stones in many forms found spread across North America

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POSTER

**14. DOLMENIC TOMBS AND LANDSCAPE IN CENTRAL-WESTERN SARDINIA (ITALY): A CASE OF STUDY**

*Cabras, Marco (Universidad de Granada) marcocabras@correo.ugr.es, Cicilloni, Riccardo (Università degli studi di Cagliari) r.cicilloni@unica.it*

The Sardinian dolmenic phenomenon attracted the interest of scholars since the beginning of the twentieth century. However, it is during this century that essential features of the phenomenon have been examined and the consequent field studies have led to the knowledge of over two hundred specimens of various types, which make, in number and characteristics, one of the most important megalithic groups in western Europe. It now seems confirmed the rise of the phenomenon during the culture of San Michele of Ozieri (recent Neolithic, 4000 – 3300 B.C.) and this is probable because to this culture precisely are attributed the first examples of megalithism, such as aniconic and proto-anthropomorphic menhirs, some megalithic circles and various monumental tombs. The Sardinian dolmenic graves, however, had the maximum spread during the Chalcolithic, as evidenced most of the finds from the excavations. The phenomenon also shows a close relationship to extra-wide island and especially with the monuments of Catalonia, Pyrenees, non-coastal departments of French-Midi, Corse and Puglia.

Here it is under investigation about 90 dolmenic graves of various types (simple type, "corridor" type, "allée couverte" type, and others of uncertain attribution) located in central-western Sardinia, and particularly in a significant area of about 3500 sq

km coinciding with the historical regions of marghine-planargia, guilcer and montiferru, today belonging to the provinces of oristano, nuoro and sassari. This area is covered by about 40% of the whole sardinian dolmens known in bibliography. Locational trends and relationships with landscape elements have been investigated with the aid of gis methodologies such as viewshed and cost surface analysis that have been used to evaluate the role visual dominance on the surroundings in relation to waterways, natural access routes, and eventually to other types of settlement and burials of the final neolithic and eneolithic.

The analysis shows that the analyzed dolmens enjoy an isolated locational character, more frequently they are found in plateaus, but also at low plateaus and hills. Although different concentrations are found in dolmenic emergencies, these don't seem to have direct relationship between them, but their influence is apparently directed towards the ways of traveling and sensitive elements of the landscape that have capabilities of a territorial demarcation.

The particular location emphasizes the significance of these monuments as territorial markers for segmentary societies. It seems that the dolmen was built according to the territory immediately surrounding it. This fact reinforces the hypothesis of the secondary task, as well as to the burial, to symbolizing a message or a landmark for those who moved towards "other" territory: a sign of belonging. The peculiarity of the dolmens as territorial markers is then reaffirmed by these analysis. The casuistry of articulation in the necropolis also suggests a stratification of a burial area, sometimes in the form of connections and integration between dolmenic and hypogean aspects occurring during the chalcolithic, which demonstrate changes in territorial strategies and perhaps social.

# Monumentality and territory: relationship between enclosures and necropolis in the European Neolithic

Comisión Civilizaciones neolíticas del Mediterráneo y de Europa  
Organiser: Vincent Ard and Lucile Pillot

Thursday 4th (14:30 to 19:30)  
B01 Meeting Room



2014 burgos  
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ORAL CONTRIBUTIONS

ORAL

**1. SYMBOLIC TERRITORY OR LIVING SPACE? A CASE STUDY IN WEST-CENTRAL FRANCE**

*Ard, Vincent (Université Toulouse 2 - UMR 5608 TRACES) vincent.ard@univ-tlse2.fr*

In many European areas, the Neolithic period corresponds to the development of architectural monumentality which left important marks in the landscape, as well as the land clearing and the cultivation by the first agro-pastoral societies. This monumentality can be observed in the domestic sphere, particularly by the edification of enclosures with various functions and surfaces, and in the funeral and ritual sphere, by the development of many megalithic or pre-megalithic cemeteries. It is noteworthy that the concomitant development of these monumental sites reveals the complexity of cultural, symbolic and socio-economic practices of Neolithic societies. These monumental sites probably reflect socio-cultural dynamic systems in which the notion of territory seems to be a fundamental concept. Obviously, in many areas of Europe, Neolithic people have appropriated their surrounding landscape, exploited or not, by the edification of these monumental sites. In this way, they probably sustain their control over a defined territory. That's why burial, domestic or even defensive monumental sites, must be jointly analyzed in order to understand the organization of these Neolithic spaces, in which enclosures and cemeteries can structure a territorial network.

We conducted a spatial study of the distribution of the neolithic monumental sites in the Nord-Charente (France), which is placed in the continuity of the recent spatial analysis of megaliths of this area conducted by Elias Lopez Romero and Luc Laporte (in press). In this area, many space was used for the installation of many sites (necropolis, enclosures) which, according to recent studies (PCR "The Nord-Charente during Middle and Late Neolithic : causewayed enclosures, megalithic tombs and territories", coord: V. Ard), are dated of the Middle and Late Neolithic periods. Through the application of varied spatial analysis (distribution, dispersion, visibility, etc.), we attempt to know if

- Is-it possible to determinate an organization of the occupied space?
- What characterizes this territorial organization?
- Can we suppose that these monumental sites reveal a new way of appropriating space?
- What are the patterns of territorial organization, in

which enclosures and cemeteries have a fundamental role?

This paper will be an opportunity to present the first results of this study and to discuss the concept of landscape appropriation, combining domestic, symbolic, economic or natural spaces.

ORAL

**2. BURIALS OR ENCLOSURES: A PHENOMENON OF SUBSTITUTION IN THE LATE NÉOLITHIQUE IN THE EASTERN LANGUEDOC (FRANCE)?**

*Jallot, Luc (Paul Valéry- Montpellier 3 University) ljallot@9business.fr*

In south east France a long experience in building techniques gave the little communities of the Fontbousse culture (2600-2200 cal. B. C.) the means to increase the expansion of their architectural realizations. This expertise no longer applied to the tombs, which only rarely require the edification of an ostentatious monument, but to the dwelling place and systems of delimiting, stone enclosures and earthworks. The question then arises of the identification of new funerary sites and their relationship with these works.

As attested by carbon dating and the analysis of archaeological material, the construction of enclosures increased during the second half of the third millennium. In the hinterland some stone enclosures were built in concurrence with numerous open villages. The coastal plains and valleys became covered with extensive settlements showing ditch networks. These works belong to a general construction technique consisting of the aggregation of modules or segments. The delimitation systems surround the inhabited areas and the animal pens. The megalithic monuments of the Ferrières group (3200-2800 cal BC) are reutilised. They are succeeded by small dispersed tombs and underground cavities are also use. In the plains ossuaries and individual graves replace earlier collectives tombs.

This oscillating process is general in the eastern part of Languedoc. The settling of the land is firstly established by small mobile agro-pastoral communities which leave hardly visible traces of their habitation and build monumental megalithic tombs or not, sometimes grouped in necropoles. It can be suggested that the anchorage of these communities and the probable affirmation of lineages are expressed essentially by emblematic funerary monuments. In a second phase, the habitat is grouped.



The enclosures only appear during a third phase, probably in the last third of the third millennium. These realizations, which depend on a segmented conception of architecture, express in their turn the territorial anchorage of the new communities. The tombs are grouped in the living spaces, succeed to them or move away from them by reutilizing earlier funerary sites. At the end of the Bell Beaker period and at the beginning of the early Bronze Age (2250-2150 cal BC) a change in economic activities again provokes a spreading of settlements and the preference for hilltop sites. The diversification of sepulchral practices continues in a general context of diminishing population and concentration of the settlement. This simplified representation can hardly be surpassed in the current state of field data.

The oscillating movement between necropoles and enclosures expresses all the more the growing importance of land and the extension of settlement limits in view of the socialization of the landscape. Formal connections exist between Languedocian stone enclosures and the enclosures of southern Spain and Portugal, within a general context of diffusion of symbolic productions, harnessing food-producing resources and social tension. Moreover, the development of enclosures is generally interpreted in terms of social "complexification". This academic view does not seem to be applicable to the situation described in eastern Languedoc.

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ORAL

### 3. CONTINGENT CORPSES? ON THE VARIABILITY IN THE DEPOSITION OF HUMAN REMAINS AT NEOLITHIC AND CHALCOLITHIC IBERIAN ENCLOSURES

*Jimenez-Jaimez, Victor (University of Southampton) V.J.Jimenez-Jaimez@soton.ac.uk, Marquez-Romero, Jose E. (Universidad de Málaga) jemarquez@uma.es*

The multiple ways of seeing the variability in the location, distribution, position and character of human bones at Neolithic and Chalcolithic Iberian enclosures ultimately depend on how we define what 'funerary' means. Often, two contrasting types of funerary practices are perceived in those contexts: a) normalised funerary practices, in which human remains are deposited in conventional or recurrent ways and positions, usually with clearly identifiable grave goods and within distinguishable, somewhat standard funerary containers; b) non-normalised funerary practices, as a result of which human bodies or body parts are deposited within pits and ditches, or between the stones forming the enclosure walls, in a myriad of different states and positions,

seldom repeated.

In order to challenge these views, we will assume that not every human bone recorded in an archaeological survey or excavation necessarily entered the context in which it was found in the context of funerary practices. For us, the heterogeneous presence of human bones in ditched or walled enclosures need not be the materialisation of either non-normalised funerary practices in ditches/pits/walls or standard burials in regular graves. Quite the contrary, this heterogeneity may be an effect of two very different kinds of conventional practice: a) one funerary, in graves and focused on the body of a dead person; b) and one non-funerary, reflected in the fillings of pits and ditches, that involves the ritualised deposition of a much wider range of material elements, and in which human bones are contingent.

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ORAL

### 4. THE ROLE OF ENCLOSURES IN TERRITORIAL STRUCTURATION IN THE PARIS BASIN BETWEEN 4500 AND 3800 BC

*Lietar, Claira cliraa@hotmail.fr*

From the fifth millennium BC, widespread and progressive complexification of enclosures is observed in the entire Paris Basin. Analyzed more precisely, this phenomenon shows variability across regions in this area. Through the study of this variability, we can identify different forms of territorial structures. This paper presents a method for analyzing the function of enclosures and synthesis of territorial organization patterns for the Paris Basin during the Middle Neolithic.

Here, we propose a classification of these sites based on multiple criteria, integrating morphology of enclosures structures (dimensions of enclosed areas, complex structures) but also deposition patterns and internal structures. This classification provides a basis for reflection on the function of these sites and lets discuss the complexity of some of them.

Location analysis of the enclosures in different environmental contexts provides further insight into the function of these sites and their organization within the territory. It relies on the modeling of environmental contexts across micro-regional analysis windows, defined from a combination of environmental variables (topography, drainage network, soil quality for agriculture).

Different patterns of territorial organization can be highlighted according to contemporary cultural groups. Some territories, such as the Aisne valley and the Bassée offer similar models of territorial structure with a con-

centration and a wide variety of enclosures. Their hierarchical structure reveals different levels of social organization, local, regional or supra-local. In the Aisne valley, the presence of monumental tombs is another sign of social hierarchy and division of territory between social groups. Same time territories of northern Chassean have, in comparison, less structured areas. The enclosures are fewer and more dispersed. Some territories, in the lower Seine valley, do not show any enclosure.

Observed over the long term, the development of territorial structures corresponding to regionalized processes and can be related to procurement flint systems.

ORAL

### **5. ENCLOSURES AND NECROPOLISES IN THE TERRITORIAL PATTERNING DURING THE MIDDLE OF THE FIFTH MILLENNIUM B.C. IN THE SEINE-YONNE AREA (FRANCE)**

*Pillot, Lucile (UMR 6298 ARTeHIS - Université de Bourgogne (Dijon, France) lucile.pillot@u-bourgogne.fr*

In France, in the Paris Basin, at the beginning of the fifth millennium BC, during the Middle Neolithic period, we observe a monumentalisation of some sites. These sites, which are enclosures and monumental necropolises (Passy-type necropolises), are attributed of the Cerny Culture, which is considered as a significant period of social, economic or even political and religious changes in complete break compared to the early Neolithic. Indeed, these sites can illustrate the emergence of a new way of the territorial appropriation.

Spatial analysis of the distribution of these monumental sites (Ripley's K function, density analysis, etc.) allow to try out these assumptions of territorial strategies.

By this way, it's noteworthy that enclosures and monumental necropolises are included in the territorial patterning. Indeed, the association of the both types of sites is often systematic. These are generally located nearly than another (the necropolises are located in the 2km radius around enclosures). Moreover, these sites seem to be complementary by their functions (habitat/funeral). Our study highlights that these monumental sites can be integrated inside specific occupation "poles" which aggregate a lot of sites. Monumental necropolises are globally distant of being 6/7km than another. It allows us to suppose large influence areas around each monumental complex which gathered necropolises and enclosures. The others types of sites (habitat, funeral, temporary occupations, etc.) are located inside these largest influence areas.

These both monumental sites seem to have significant role(s) in territorial patterning and organization. This communication it's a way to present these spatial studies.

ORAL

### **6. THE MONUMENTALIZATION OF THE TERRITORY: THE CONSTRUCTION OF PASSY-TYPE NECROPOLISES AS AN APPROPRIATION OF SPACE**

*Pillot, Lucile (UMR 6298 ARTeHIS - Université de Bourgogne (Dijon, France) lucile.pillot@u-bourgogne.fr, Fusani, Nicolas*

The installation of a monumental site often seems to mean a significant territorial appropriation of one community. Examining Passy-type cemeteries (Yonne, France), we question the motivations, mentalités and the socio-cultural context that contribute to this monumentalization? Passy-type cemeteries consist of huge earthen monuments (Paris Basin, mid-5th mill. BC).

Our studies highlight the principle of repetitive organisational patterns that structure the cemeteries. These result from well-codified building project. A same architectural module seems repeated several times over time, explaining the huge aspects of some structures (>300m). We can illustrate this model by the comparison between two sites: the excavated site of Passy and the surveyed site of Vinneuf. A geophysical survey was conducted on the Vinneuf cemetery (Yonne, France. Almost thirty neolithic long ditched monuments (until 320 m) were identified. By shape, layout and size, Vinneuf monuments are very similar to Passy excavated funeral monuments. By looking at the organisation of Vinneuf monuments, we can ask ourselves if the spatial distribution is the result of a deliberate process, as is the case in Passy. Despite of the important length of some monuments, a recurrent building module is identified ( $\pm 30$  m). This process can be a result of one persistent cultural norm up a very long time. By the installation of one more monument or module, the community show her anchorage in the occupied space.

This construction model reveal the appropriation of one part of space by Neolithic communities during a long time. There is a wish to maintain and perpetuate a symbolic signification of this place. Indeed, these cemeteries are persistent monumental places that are reused from the Neolithic to the Protohistory, during Bronze Age

POSTER

**7. TOWARDS A DEFINITION OF THE PREHISTORIC LANDSCAPE IN THE PLATEAU OF SIGARRA: VISIBILITY AND TERRITORIALITY BETWEEN THE MIDDLE NEOLITHIC AND BRONZE AGE**

*Salazar, Natalia natalia.salazar@historia.udl.cat*

As part of the Territory and Landscape Archaeology, spatial analysis related to visibility are showing that the comparison between the preponderance between establishments, monuments and places with a strong religious symbolism has been used by humankind since immemorial time and throughout all periods to delimit territories from political, social and economic terms.

This study presents the practical application of GIS method of Cumulative Viewshed Analysis, in order to infer intervisibility relationships between archaeological sites of the Middle Neolithic, Chalcolithic and Bronze Age. We may find these sites chronologically and typologically connected in a particular historical territory structured around the ancient Iberian settlement and afterwards Roman town of Sigarra (current population of Els Prats de Rei, Barcelona).

Based on the Digital Elevation Model (DEM) of this territory, Cumulative Viewshed Analysis has been applied looking for a possible answer to a specific research approach: try to find the visibility spatial relationships between habitat and megalithic necropolis related, as a tool for elucidate the structure of possible territories and, by comparing the results for chronologies and typologies, establish its diachrony. The analysis has provided generally positive and interesting results allowing new hypotheses for understanding the spatial distribution parameters of necropolis and habitats based on a territorial and landscape conception.

The diachronic perspective of maps that we have developed allows aiming a number of general assessments. We note that the visibility is very important in prehistoric burial sites, as their visual impact is revealed as remarkable. However, the Neolithic visibility patterns show a lack of political and territorial hierarchy; while in the Bronze Age, in direct relation to the social complexity detected by archaeology, visibility patterns reflect a spatial hierarchy. In both periods the choice of the highest locations in the territory studied is a constant, which leads us to conclude that the visibility of these burial monuments was sought and calculated, becoming territorial and landscape landmarks difficult to ignore.

In light of the specific interest of these results we conclude that the archaeological application of Cumulative Viewshed Analysis reveals itself as a useful tool for the in-

vestigation of potential prehistoric territorial structures.

POSTER

**8. ARE SOME DITCHED ENCLOSURES FUNERARY CEREMONIAL CENTRES? QUESTIONING THE CURRENT DATA FROM 3RD MILLENNIUM SOUTH PORTUGAL**

*Valera, António Carlos (NIA-ERA Arqueologia) acvalera25@gmail.com*

Valera, António Carlos (NIA-ERA Arqueologia) acvalera25@gmail.com

In the last 15 years the archaeology of South Portugal Recent Prehistory has been in permanent empirical "revolution", namely in what concerns funerary practices.

The traditional image of the megalithic monuments as the main funerary architectures of Neolithic and Chalcolithic communities no longer stands and pit graves, hypogea and other enclosures have been shown equally important funerary solutions in the region.

In this context of more diversified funerary architectures and spaces, some ditched enclosures have emerged as places that maintain specific special connections with areas of necropolis and revealing themselves as places where funerary practices and body manipulations appear as significant social practices, inclusive to the very meaning of those enclosures. Some examples will be presented and discussed.

This communication pretends to do a revision of the available data in South Portugal regarding the relation between ditched enclosures and funerary practices and underline that the funerary world is part of a cosmogony embedded and expressed by some of those enclosures.

# A25e Dynamics of human and cultural dispersals during the Neolithic transition in Europe: Complex Systems and Prehis-

Comisión Civilizaciones neolíticas del Mediterráneo y de Europa

Organiser: Joan Bernabeu Aubán, Oreto García Puchol and Salvador Pardo Gordó

Friday 5th (09:00 to 13:30)  
B22 Meeting Room



2014 burgos  
1-7 sept.

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XVII World UISPP Congress  
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ORAL CONTRIBUTIONS

ORAL

### 1. POPULATION AND SUBSISTENCE: PATTERNS IN EUROPE'S EARLY FARMING POPULATIONS

*Shennan, Stephen (University College London) s.shennan@ucl.ac.uk*

The ERC-funded EUROEVOL project has gathered a large database to create proxy measures of human demography and subsistence patterns for the period 8000-4000 cal BP in western and central Europe north of the Mediterranean, during which farming arrived in this region. The demographic proxies have revealed a widespread regional pattern of boom and bust. In most regions population increased rapidly with the arrival of farming but then declined sharply; in some cases there is more than one boom and bust. The talk will present the main outlines of the demographic, archaeobotanical and archaeofaunal evidence and explore the feedback relationships between population and subsistence that the patterns suggest.

ORAL

### 2. DEMIC VERSUS CULTURAL DIFFUSION IN THE NEOLITHIC TRANSITION IN EUROPE AND SOUTHERN AFRICA

*Fort, Joaquim (Universitat de Girona) joaquim.fort@udg.edu, Jerardino, Antonieta (ICREA/CSIC) amsjerardino@gmail.com, Isern, Neus (UAB) nisern83@gmail.com*

The speed of the Neolithic transition in Europe, as determined from archaeological data, was about 1 km/yr. Such a spread rate has been recently shown to imply that this transition was about 60% demic and 40% cultural (Fort, PNAS 2012). This conclusion was reached by using a recent model that unifies demic diffusion and cultural transmission theory. Here we review that model and case study, and apply the same approach to estimate the percentages of cultural and demic diffusion in the Neolithic transition in southern Africa.

We used databases for the Neolithic transitions in Europe (12,000-6,000 cal yr BP) and southern Africa (2,000-1,000 cal yr BP). We first applied GIS interpolation techniques to map both transitions. We then computed linear regressions to estimate the speed in both cases. We also estimated independently the parameters necessary to apply the model, namely initial growth rate (reproduction rate) of farmers/herders, their generation time and

dispersal kernels, and the intensity of cultural transmission from hunter-gathering into farming and into herding.

The Neolithic transition in Europe had a speed range substantially different from that in Southern Africa. According to the demic-cultural model (Fort, PNAS 2012), this implies that the relevance of demic and cultural diffusion was rather different in both case studies. We suggest that these differences could be due to the fact that the final state of the transition was herding (without farming) in the southern African case, whereas it was farming and stockbreeding in the European case.

A recent demic-cultural model makes it possible to compute the importance of demic versus cultural diffusion in Neolithic transitions. Here we have discussed the only two cases for which we have enough high-quality data to obtain statistically sound results. In the future, the same approach could be applied to Neolithic transition in other continents, as well as to other human spread phenomena in which both demic and cultural diffusion could have played a role.

ORAL

### 3. EARLY NEOLITHIC IN IBERIA. TESTING THE HYPOTHESIS OF AN AFRICAN ENTRANCE

*Isern, Neus (Universitat Autònoma de Barcelona) neus.isern@uab.es, Fort, Joaquim (Universitat de Girona) joaquim.fort@udg.edu, Faustino Carvalho, António (Universidade do Algarve) a.faustino.carvalho@gmail.com, Gibaja, Juan F. (CSIC-IMF) jfgibaja@gmail.com, Ibañez, Juan José (CSIC-IMF) ibanezjj@imf.csic.es*

Here we analyze an Early Neolithic database for Iberia to study the spatial dynamics of the Neolithic transition in the peninsula. Particularly we study how the Neolithic was introduced in order to test the hypothesis of an African entrance nearly simultaneously with the European arrival.

We use an Early Neolithic database with 93 dates in Iberia, selected so that only dates on short-lived species are included in order to obtain a reliable representation of the Neolithic expansion. We analyze this database to test the possibility of an African entrance by applying GIS techniques (creating interpolation maps) as well as by studying space-time trends. We also apply a very simple reaction-diffusion computational model with different scenarios —namely, with and without spread along the African coast— in an attempt to reproduce the patterns from the interpolation maps.

The interpolation maps show the presence of very early

dates surrounded by later dates both at the northeastern and the southwestern coasts, which is consistent with a double-origin expansion of the Neolithic. The analysis of space-time trends for different origins also suggests a Neolithic expansion from the south at the western part of the peninsula. In addition, our numerical simulations provide better predictions when allowing a Neolithic expansion from the Near East, along the African coast and with an entrance from northern Africa.

Our results show that the hypothesis of a dual Neolithic expansion in Iberia, with an African origin besides the European entrance, is a reasonable possibility. This is further supported by the presence of early dates at the African coast consistent with those near the strait in Iberia, as well as the similarity in several archeological elements, which in turn differ from those at northern Iberia. However, due to the scarcity of dates in the African shore, we cannot yet exclude the possibility of a very fast Neolithic expansion along the Mediterranean coast until further data is gathered.

ORAL

#### 4. THE PURSUIT OF CULTURAL DYNAMICS IN THE SPREAD OF NEOLITHIC

*Pardo Gordó, Salvador (Departament de Prehistoria i Arqueologia. Universitat de Valencia) salvador.pardo@uv.es, Bernabeu Auban, Joan (Departament de Prehistoria i Arqueologia. Universitat de Valencia) juan.bernabeu@uv.es*

The archaeological literature focused on the spread of the Neolithic in Europe combines its efforts in understanding the influence of demic diffusion (diffusion of population) versus cultural diffusion (cultural influence) to establishing that a 40% dispersal of the Neolithic could be associated with second process. In this perspective, the only variables that had taken in consideration are space (where = archaeological sites) and time (when = radiocarbon dates).

Several of the hypotheses proposed to explain the dispersion need to use others variables than simple spatio-temporal dynamics; they need in particular involving the dynamics of cultural change associated with the above. Consequently the spread model needs to implement this variable.

In this paper we propose to approach the expansion of cultural traits in the western Mediterranean, using for this purpose the ceramic decorations like cultural variable.

To make this approach we have developed an Agent-Based Models, its traits bottom-up, across-level and capacity to simulate multiple hypotheses can become a

very useful tool for our purpose. In this methodological context, evolutionary archeology has a major role, as it will give our agents computational model of behavior and interaction rules.

ORAL

#### 5. CONNECTIONS AND DISCONNECTIONS IN LITHIC PRODUCTION BETWEEN NORTHERN AND SOUTHERN LEVANT DURING THE PRE-POTTERY TO POTTERY NEOLITHIC TRANSITION: A VIEW FROM BEISAMOUN, CENTRAL LEVANT

*Lozano, Sergio (IPHES) slozano@iphes.cat, Bernabeu Auban, Joan (Universitat de Valencia) jbauban@uv.es, Pardo Gordo, Salvador (Universitat de Valencia) salvador.pardo@uv.es, Orozco Köhler, Teresa (Universitat de Valencia) teresa.orozco@uv.es, Garcia Puchol, Oreto (Universitat de Valencia) oreto.garcia@uv.es*

Interactions among individuals and groups in human societies can be represented as networks, in which the nodes are social agents and the connections between the nodes (edges or links in network terminology) represent their interactions (Wasserman & Faust, 1994). This allows for the application of a wide range of mathematical tools, with which to understand their evolutionary dynamics. During the last decade the analysis of complex networks has raised significant interest, especially since its ubiquity across scientific fields was uncovered (Newman, 2010).

The impact of these theoretical and methodological tools on issues concerning exchange and social interaction is evident and their utility has been perceived by archaeologists (e.g., Knapett, 2010; Mills et al., 2013). However, the application of network analysis' tools to archaeological data requires addressing a number of issues concerning, for instance, objective clarification and the appropriateness of the available data (Brughmans, 2012).

Our goal in this work is to apply network analysis to a particularly challenging scenario, namely Iberian first farming societies. Specifically, we aim at studying the dynamics of cultural evolution and change of the earliest agricultural groups in Iberia.

Concerning network construction, we will use the analysis of ceramics' style, applying methods developed recently (Bernabeu et al, 2011), to obtain proximities or distances as a measure of relationship. Once the network is obtained, we will evaluate the macro effect (in terms of network connectivity) of micro changes such as the

removal of a node (focusing specially on “hubs”, which are responsible of the transmission of information to the entire network).

microtine species (voles) has been detected in the Chalcolithic and Bronze Age levels in all of the studied sites, coinciding with the overture of the landscape.

ORAL

POSTER

## 6. HUMAN INFLUENCE ON THE SMALL MAMMALS DIVERSITY IN NORTH OF IBERIA FROM EARLY TO MIDDLE HOLOCENE

*Bañuls Cardona, Sandra (Universita di Ferrara) sandra.banulscardona@unife.it, López-García, Juan Manuel - (Universita di Ferrara) lpzjmn@unife.it*

The Holocene period in the Iberian Peninsula is characterized by important changes in the vegetation and rapid climatic fluctuations. We are analysed from early to middle Holocene levels of three sites: El Mirador cave (Atapuerca, Burgos), Colomera cave (Sant Esteve de la Sarga, Lleida) and Valdavara-1 cave (Becerreá, Lugo). The studied samples are part of late Boreal, Atlantic, Sub-Boreal and Subatlantic periods. During these periods the human influence in the environment is more important than in the latest Pleistocene. The human are, since the agriculture appearance, the principal modified agent of the landscape, and therefore also in the richness and diversity of species, and this activity is more important since the Chalcolithic and Bronze Age.

Eight small mammal taxa adapted to conditions created or modified by human activity (synanthropic species) have been identified in our studied sites: *Microtus (Terricola) duodecimcostatus* (the Mediterranean pine vole), *Microtus (Terricola) lusitanicus* (the Lusitanian pine vole), *Myodes glareolus* (the Bank vole), *Microtus arvalis* (the Common vole), *Microtus agrestis* (the Field vole), *Micromys minutus* (the Eurasian harvest mouse), *Eliomys quercinus* (the Garden dormouse) and *Crocidura russula* (the Greater white-toothed shrew).

In general, we observed that the percentage of the synanthropic species is elevated (55.8%) in all of studied sites. However, this percentage in the Chalcolithic and Bronze Age (61.6%) is higher than in the Neolithic levels (46.1%).

The human influence on the small mammal species is produced by rearing of livestock and agricultural activities, and these activities caused the forest deterioration and destroyed the high grasslands. The climatic and the environmental records performed with the small mammals, as well as, other disciplines shows that the forest deterioration is not so evident. From the small mammal point of view, *Apodemus sylvaticus* (the Wood mouse) is the best represented species, but an increased of the

## 7. STRUCTURED-POPULATION MODELS OF THE NEOLITHIC TRANSITION

*Pérez-Losada, Joaquim (Universitat de Girona) joaquim.perez@udg.edu*

Reaction–dispersal front propagation models have been applied to investigate many systems, such as human invasions. A variety of models have been developed in recent years for analyzing the speeds of human invasion fronts. In the called the non-overlapping generation model, all traits in the life history of the individuals are ignored, i.e. only the age-independent parameters are used. Therefore, this model cannot analyze any effect on the front speed of the fact that the fecundity, mortality and dispersal kernel depend on the age of individuals. We present a model that makes it possible to analyze the effect of the age dependences of mortality, fertility and dispersal persistence on the speed of propagating fronts in two spatial dimensions. We apply the model to the Neolithic transition in Europe.

In order to take into account the dependences of fecundity, mortality and dispersal on age, we regard the population as subdivided into several age groups. At each time interval, we compute the new subpopulation number densities at all nodes of a two dimensional grid in a two-step process: dispersal and growth (the latter includes reproduction and deaths). In the dispersal step, a fraction of the population in age group stays at the original node, and the remaining fraction is distributed equally among the nearest neighbors. In the second step, the effects of reproduction and mortality are computed. The two-step dispersal–growth cycle is then repeated many times, until a constant speed for the propagation of the population profiles is reached.

We apply our model to the Neolithic transition in Europe. Simulations of the front speed were plotted as a function of the adult dispersion persistence. The numerical results for the model with several age groups agree well with the analytical results for the same model. We see that the infant mortality has a very important effect on the front speed. The sensitivity of the results has been analyzed, with reference to a baseline case for the parameter values obtained from the ethnographic literature. Infant mortality and total fecundity ratio have the most important effects, speed, whereas the adult mortality rates and

dispersal persistences are less important. We have found that there is a relatively narrow range for the value of the infant mortality consistent with the observed range of the Neolithic front speed.

We have analyzed the effect of age-dependent mortality, fecundity and persistence on the invasion speed for populations that spread across a two-dimensional space. Our simulated and analytical front speeds are consistent with each other and, for realistic parameter ranges, with the observed speed of the Neolithic transition in Europe. Predicted speeds fall within the experimental range for realistic values of the infant mortality, and this conclusion is independent of the adult dispersal persistence. The model can also be used to constrain demographic traits from measured front propagation rates.

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POSTER

**8. CARDIAL WARE, SICKLE BLADES AND 14C C. 5600 - 5000 CAL BC: CULTURAL, CHRONOLOGICAL, TERRITORIAL MARKER DURING THE EARLY NEOLITHIC OF THE NW MEDITERRANEAN**

*Oms Arias, F. Xavier (SERP (Universitat de Barcelona) xavier-oms@gmail.com, Gibaja Bao, Juan F. (CSIC-IMF) jfgibaja@imf.csic.es, Mazzucco, Niccolò (CSIC-IMF) niccomazzucco@imf.csic.es, Ibáñez, Juan José (CSIC-IMF) ibanezzj@imf.csic.es*

There are two fundamental variables that we need to control when we speak of the Neolithisation processes: a chronological and a geographical variable. In this work we are going to analyze both aspects, trying to identify some key-elements that can help us to establish a correlation between space and time.

We built a database collecting three different variables from sites of the NE of the Iberian Peninsula. We collected: (a) a total of 35 radiocarbon dates from 16 different archaeological sites; (b) the information about ceramic assemblage of 32 archaeological sites, with special emphasis on the decorative motifs represented in each assemblage; (c) the information about the presence/absence of the sickle blades in each site and their typology. With this three variables we will be able to establish whether exists or not an homogeneous model for the distribution of two fundamental elements of the Neolithisation process (ceramic and agricultural production) over space and time.

The calibration of the radiocarbon dates has permitted to establish a totally of three chronological phases for a period comprised between 5600-5000 cal BC. During this interval we can appreciate moments of major and minor occupation in the area of study. At the same time,

the decoration motifs observed in pottery assemblages and the specific type of sickle blades represented in each area, allow to establish geographical and cultural boundaries.

During the first phase (5600-5450 cal BC) we only have two dated sites. The information we have is quite scarce. Both of them are located in the littoral and pre-littoral area of the Catalan southern coast. Even if ceramic data is not abundant, sickles appear composed of little inserts (mainly blade/bladelets but also flakes) hafted in series, forming a serrated edges.

During a second phase (5500-5350 cal BC), human occupation is increasing in the area, expanding toward the Llobregat valley and the surrounding plains. Ceramic record suggest the existence of slight territorial differences on small-scale, even if decorative motifs are generally simple. Sickles suffer a change, being composed of larger blades hafted parallel or diagonal to the haft, isolated or in pair.

During a third phase (5300-5000 cal BC) human occupation is fundamentally consolidating in the littoral and pre-littoral area, extending also to the north, south and west of Catalonia. A major decorative differentiation between near territories is now detected.

The analysis of the chronological, ceramic and sickles data had allow to identify new insight into the Neolithisation of the NW of Mediterranean. Our results suggest a very rapid process of diffusion, however not homogeneous or linear.

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POSTER

**9. ALTERNATIVE HISTORIES OF AGRICULTURAL ORIGINS: TESTING MODELS FOR THE SPREAD OF FOOD PRODUCING ECONOMIES IN THE IBERIAN PENINSULA**

*Bergin, Sean (Arizona State University) Sean.Bergin@asu.edu, Barton, C. Michael (Arizona State University) Michael.Barton@asu.edu, Pardo Gordó, Salvador (Universitat de València) salvador.pardo@uv.es, Bernabeu Auban, Joan (Universitat de València) joan.bernabeu@uv.es*

The combination of a growing database of high-precision radiocarbon dates and experimental computational modeling protocols permit systematic testing of alternative scenarios for the spread of farming across the Iberian Peninsula. We create a set of different algorithms for the dispersal of agropastoral economies, ranging from simple diffusion to ones based in Human Behavior Ecology and statistically compare their ability to replicate the spatial/temporal distribution of the earliest, securely



dated Neolithic sites in Iberia. The results of these digital experiments offer insights into the social and ecological processes that drove the spread of agriculture, as well as suggestions as to the most likely points of origins for the arrival of these novel socio-economic systems in the Iberian Peninsula.

# A25f North-South connections and disconnections in the prehistory and proto-history of the Levant

Comisión Civilizaciones neolíticas del Mediterráneo y de Europa  
Organiser: Ianir Milevski, Fanny Bocquentin and Miquel Molist

Thursday 4th (09:00 to 13:30 and 14:30 to 19:30)  
SALON DE ACTOS ECONOMICAS Meeting Room



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ORAL CONTRIBUTIONS

ORAL

**1. ACTING DEATH AND BURIAL IN VARIABLES. A NORTH-SOUTH COMPARATIVE THANATOGRAPHY OF THE LEVANT DURING THE MIDDLE BRONZE AGE.**

*Andreou, Panayiotis (IANES, Eberhard Karls Universität Tübingen, Germany) Panayiotis.Andreou@gmx.de*

The first impression of comparative mortuary behaviour between North and South during the Middle Bronze Age in the Levant is much affected by the blinding display of affluence in its northern regions (such as Ebla, Qatna or Byblos) contrasted by an ostensible uniformity in the South, which recent scholarship has referred to as a "funeral kit". Admittedly when set against the seemingly undifferentiated burials of the South, the "glamour" of northern "elite" mortuary behaviour does a lot to obscure an otherwise pluralistic means of cultural expression and highlights discontinuity in the way of a self-fulfilling prophecy.

This paper discusses continuity and discontinuity in mortuary behaviour and activity, on the terms of it being a funerary process, by addressing a wide spectrum of individual variables derived from the archaeological mortuary remains of the first half of the second Millennium Levant. It is less concerned with deducing either social structure, or ideology, or patterns of eschatological beliefs per se, since burials are merely one of many constituent parts of these systems and their holistic understanding depends on a synthesis of all of the aforementioned. At its core lies a sincere effort to normalize mortuary data in a way that facilitates interregional comparability. As a second step it endeavours to disentangle and conceptualize individual elements of the burials themselves and map potential ritual activities, as these can be inferred from interrelationships of objects, tomb architecture and/or the deceased.

Past agents of burials, both active or inactive, have shared "values" and have "valued" materials expended during funerary ceremonies. By breaking down ritual action in overlying layers of information over space and time, it is envisaged to augment the potential of mortuary data in revealing tentative conceptual boundaries or patterns of their interregional interdependence, resulting in a more conspicuous detection of continuity and discontinuity in mortuary behaviour in MBA Levant.

ORAL

**2. NILE VALLEY-LEVANT INTERACTIONS DURING THE UPPER, EPI-PALEOLITHIC AND NEOLITHIC**

*Bar-Yosef, Ofer (Harvard University) ofer.baryosef@gmail.com*

The connections between Egypt and the Levant are a constant subject for inquiry but more often the archaeological highlights focus on the 4th millennium BC and later times. Earlier relationships are more poorly known. It is assumed that modern humans migrated from this general area of Northeast Africa into western Asia some 47/45 Ka cal BP, but sound evidence for presence of Upper Paleolithic blade making foragers in both regions dates to ca. 35/30 Ka cal BP.

Sound documentation for migrating foragers in the same south to north direction is the makers of the microlithic industries of the Mushabian (including the Ramonian) who played an important role in the emergence of the early Natufian culture.

The establishment of semi-sedentary and sedentary hamlets across the Levant and the onset of intentional cultivation that marked the Neolithic Revolution in the northern area of the Fertile Crescent, changed the history of the Eastern Mediterranean basin.

The spread of Neolithic farmers and their products (plants and herded animals), along the Levant and Mesopotamia, carrying elements of the new cosmology, had an impact of the cultural history of the Nile Valley. Selected cases from this intricate series of contacts and interactions will be presented.

ORAL

**3. CULTURAL INTERACTIONS DURING THE EARLY UPPER PALAEOOLITHIC PERIOD IN THE LEVANT AND BEYOND: THE CONTRIBUTION OF MANOT CAVE**

*Barzilai, Omry (Israel Antiquities Authority) omryster@gmail.com, Hershkovitz, Israel (Tel Aviv University), Marder, Ofer (Ben-Gurion University in the Negev)*

The Early Upper Palaeolithic of the Levant consists of two cultural entities, "Early Ahmarian" and "Levantine Aurignacian", which are assumed to have coexisted at ca. 36/34,000 -28/27,000 Cal BP. The Early Ahmarian, distributed throughout the Levant, is conceived as local tradition whereas the Aurignacian, restricted to few cave sites in the Mediterranean woodland region, is considered an interference of European population/s.

A recent excavation project at Manot cave in the western Galilee, Israel exposed at least five archaeological layers corresponding with the Early Upper Palaeolithic stage.

Four excavation seasons resulted with rich archaeological finds attributed to the Early Ahmarian and Aurignacian traditions that are currently dated to 40,000-31,000 cal. BP.

This paper presents the chrono-cultural sequence at Manot cave with an emphasis on the two traditions. These are further compared to other parallels from the Levant region and beyond, which reflect (or not) the cultural interactions during the Early Upper Palaeolithic.

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ORAL

#### **4. NORTH-SOUTH CONNECTIONS DURING THE PRE-POTTERY NEOLITHIC: A POINT OF VIEW FROM THE DEAD**

*Bocquentin, Fanny (CNRS) fanny.bocquentin@cnrs.fr, Ortiz, Anabel (Universitat Autònoma de Barcelona) inhija@hotmail.com*

The processes of Neolithisation developed in the area of the Near East between 12,000 and 7,000 cal. BC were related to important economic, social and cultural changes in the people lifestyle. One of these notable changes is observed in the funerary practices, not just in the pattern of location of the graves but in the treatment of the bodies. The Pre-Pottery Neolithic (PPN) burials which have been found in great quantity over decades of archaeological works carried out in the north and south areas give, for the first time of the Levantine history, the opportunity to compare the funerary treatment developed in this period throughout the area. The way of handling corpses is an important part of group identities which must be thorough considered. If the PPN burials are known to be quite diverse over time and place, we expect to give an overview of burial customs in the Levant and debate in details some uncommon funerary gestures as secondary burials, seated primary burials or cremation, in order to discuss the connections and disconnections between north and south highlighted by the dead community.

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ORAL

#### **5. CONNECTIONS AND DISCONNECTIONS IN LITHIC PRODUCTION BETWEEN NORTHERN AND SOUTHERN LEVANT DURING THE PRE-POTTERY TO POTTERY NEOLITHIC TRANSITION: A VIEW FROM BEISAMOUN, CENTRAL LEVANT**

*Borrell, Ferran (Centre de Recherche Française à Jérusalem)*

*silmarils1000@hotmail.com*

*Khalaily, Hamoudi (Israel Antiquities Authority) hamudi@israntique.org.il*

During the Pre-Pottery (PPN) to Pottery Neolithic (PN) transition (ca. 7,000 cal. BC in the northern Levant, slightly later in the southern Levant) broad changes in cultural and economic patterns occurred in the Levant. These ran parallel to significant changes in lithic technology such as the transition from blade to flake production. The causes and consequences of the major socio-economic changes are still debated (agricultural intensification, abandonment of hunting, decline of different degrees of specialized artisans, etc.) and have become one of the most urgent issues facing present Neolithic research in the Levant. The full characterization and reconstruction of human behavior related to chipped stone tool production at Beisamoun in the Hula Basin, central Levant, provides an excellent opportunity to understand the mechanisms through which the PPN to PN transition occurred in the central Levant. Moreover, the central Levant is the key to identifying connections and disconnections between northern and southern Levant during this unstable period, and increasing the general understanding of the Neolithisation process in the Levant.

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ORAL

#### **6. EXPLORING CONNECTIONS AND DISCONNECTIONS BETWEEN NORTHERN AND SOUTHERN LEVANT IN THE EARLY BRONZE AGE THROUGH THE ANALYSIS OF FUNERARY DATA**

*Bouso, Monica (UdL/GRAMPO) monicabouso@gmail.com*

The aim of this presentation is to understand and define the diverse burial customs of northern and southern Levant cultures during the 3rd millennium BC, as well as to assess the level of communication and interaction among them.

Funerary data offer an essential means of learning about the lives of past peoples. This type of archaeological inquiry contributes to a broader understanding of social organization and political and ritual structure by studying aspects such as the type and location of funerary structures, the type of disposition of the anthropological remains, and the disposition, assemblage and origin of the grave goods. It will be the analysis of the interrelation among all of these aspects that should allow us to define the burial customs practiced in these regions and to explore their possible connections and disconnections. Additionally, the different chronological sequences used

in these regions and their place within a single chronology will be discussed.

ORAL

## 7. THE IMPACT OF THE NEOLITHISATION PROCESS ON THE FUNERARY PRACTICES AND HEALTH STATUS OF THE LEVANT POPULATIONS: FROM NORTH TO SOUTH

*Chamel, Bérénice (CNRS Archéorient) berenicechamel@gmail.com*

*Le Mort, Françoise (CNRS Archéorient) francoise.le-mort@mom.fr*

Numerous archaeological excavations were conducted in the Levant that have produced large quantities of human skeletal remains recovered from Pre-Pottery Neolithic sites. In the last few decades, research in biological anthropology gradually intensified in the region and recently developed approaches have led to new results. Analysis of the documentation provided evidence of the increased diversity of funerary practices and of the prevalence of both infectious diseases and stress indicators related to new lifeways, from the hunter-gatherers to the first farmers. Thanks to the new set of available data, it is now possible to analyse the impact of the Neolithisation process on the funerary practices as well as on the health status of the populations, in the Northern Levant as in the Southern Levant and to perform comparisons between the two regions.

ORAL

## 8. NORTHERN CULTURAL INFLUENCES IN SOUTHERN LEVANT BURIAL TRADITIONS AND IMAGERY IN THE CHALCOLITHIC PERIOD

*Dina, Shalem (Kinneret Institute for Galilean Archaeology) shalemdina@gmail.com*

One of the widely known burial traditions in protohistoric periods is the secondary burial in ossuaries and jars from the Late Chalcolithic period (4500-3700 cal. BCE), known only from sites in Israel.

In 1995 an excavation conducted in a Late Chalcolithic burial cave at Peqin, Upper Galilee, Israel, revealed an unusually large number of finds which shed new light on the anthropomorphic imagery of the period. The ossuaries and jars bear anthropomorphic features, which include a large prominent nose and a pair of large eyes,

sometimes other human features such as hair, mouths, hands, female breasts and beards, as well as zoomorphic, geometric and floral symbols. Although the phenomenon of this burial tradition of richly decorated ossuaries and jars seems to be unique to this period and to a very limited area in the Near East it is here suggested that its origin may partially be in the symbolism of the Neolithic period.

An example of such tradition is the special treatment of the head of chosen individuals in secondary burials.

Moreover, a careful examination of the motifs on the ossuaries suggests that many of them origin in the northern Levant. If so, these symbols partially survived and were culturally transmitted and transformed into Late Chalcolithic social contexts.

ORAL

## 9. THE CHRONOLOGY AND DISPERSAL OF THE PRE-POTTERY NEOLITHIC B CULTURAL COMPLEX

*Edwards, Phillip (La Trobe University (Melbourne) p.edwards@latrobe.edu.au*

The Pre-Pottery Neolithic B (PPNB) period saw the establishment of village farming in South-west Asia and it is one of the earliest cultural complexes for which we can follow complex patterns of interaction across the Mediterranean Levant. This paper reviews the current status of a prior model of PPNB chronology published in 2004 by the author and colleagues.

The study reviews stratigraphy, radiocarbon dates and associated material culture sets from Pre-Pottery Neolithic A (PPNA) and Pre-Pottery Neolithic B (PPNB) sites from the northern and southern Levant and Cyprus.

This review argues that, over the past decade, excavations of new Early Neolithic sites across the Levant and on Cyprus have lent additional support to the model that the Early PPNB (EPPNB) emerged in the northern Levant around 9,600 BP/ ~ 9,200 cal BC and the PPNB entity or many of its derived traits appeared significantly later in the southern Levant later around 9,200 BP/ ~ 8,300 cal BC.

ORAL

## 10. CONTACTS BETWEEN THE SOUTHERN AND NORTHERN LEVANT IN THE FIRST HALF OF THE 5TH MILLENNIUM BC: A VIEW FROM JORDAN

*Gabrieli, Eva evagabrieli@hotmail.com*

In the first half of the 5th millennium BC, the territories

which roughly correspond to present-day Jordan, unlike the vast majority of the Near East, do not seem to be significantly involved in long-distance trade networks. However, even if evidence relating to exchanged items is rather meagre, the similarities apparent in the material culture point to the existence of an 'interaction sphere' which implies some sort of connexion with the Northern Levant.

Contacts between the Chalcolithic Levantine populations, although their meaning and modes are still scarcely understood, took place both within and between communities, but almost certainly did not usually exceed short or middle-range distances, apparently perpetuating older, well-established practices. Such long-standing interactions, apart from the more easily recognisable stylistic or formal similarities displayed by the artefacts, can account for the emergence and adoption of important innovations, like the tournette or, later, metallurgy, and the sharing of social/ritual customs, like the segregation of the dead. In fact, the comparison of the sequences provided by selected archaeological sites from all over the Levant, despite differences occurring at a local level, allows us to recognise some broad parallel lines of development or commonalities, highlighting the greatest importance of these contacts in entangling and structuring Levantine communities over the time, even in the case of areas which seems to be scarcely connected like the Transjordanian territories.

ORAL

## 11. SHARING SPHERES IN 6TH MILLENNIUM BC CAL. HALAF COMMUNITIES AND BEYOND

*Gómez Bach, Anna (Universidad Autónoma de Barcelona) annagomezbach@gmail.com*

*Cruells Banzo, Walter (Universidad Autónoma de Barcelona) cruellsw@gmail.com*

*Molist Montaña, Miquel (Universidad Autónoma de Barcelona) miquel.molist@uab.cat*

Sixth millennium BC cal. is a large period where several sustainability strategies and technological processes took place by farmers and herders groups. The recent field works in northern Mesopotamia, mainly in Syria, but also in Levant, Jordan and Israel, provide an important database suitable for a reflexion about the social and economic strategies attributed to the Halaf and other "cultural groups identified (Wadi Rabah, Gassulian, etc.). Archaeological remains and material objects shows a more complex interaction between communities and regions and only their attribution in well stratigraphic

contexts becomes essential for a review perspective both in Levant and upper Mesopotamia. Analyzing sequences, materials, networks and circulation of manufactured items and raw materials this work wants to put in order the results obtained. Also, absolute C14 data available will enrich to establish a more consolidated chronological framework for these 6th millennium BC cal groups.

Through the regional sequences this paper tries to identify the presence or absence of connections between regions that, in fact, are not very distant from each other.

ORAL

## 12. POSIBLE CONTACTS OF HALAF AND UBAID WITH THE SOUTH LEVANT

*Gil Fuensanta, Jesus (Seminario de Estudios Orientales ) jesus.gil@uam.es*

Much has been debated on the possible influences or connections of northern Syria and eastern Anatolia in the southern Levant during the 5th and 4th millennia BC. The presence of possible materials in connection with the Halaf and Ubaid cultures in parts of the southern Levant (i.e. Israel) offers a new starting point for this debate. So far, although the 5th millennium (Halaf and Ubaid cultures) offers relations between the two regions with a relative diffuse character, the connections seem clearer during the 4th millennium BC.

ORAL

## 13. THE PPN IN SOUTH LEVANT AND THE RELATIONS WITH OTHER REGIONS. A CLIMATOLOGICAL QUESTION?

*Gil Fuensanta, Jesus (UAM (Spain) jesus.gil@uam.es, Boynikolu, Ediz (Trakya Üniversitesi (Turkey) boynik@gmail.com*

After the research, the Pre-Pottery Neolithic (PPN) period of the South Levant have been compared to the cultural development in neighbouring regions during the same period, ca. X to VIII Millennia BC.

The PPN sites taken into account for this comparative study include, among others, North Mesopotamian places such as Abu Hureyra, Mureybet, Jerf el Ahmar, Sheikh Hassan, Tell Halula, or Tell el Abr, plus other Turkish sites such as Gobekli Tepe, Nevali Cori, Teleilat, or Cayonu. The Southern Levantine PPN sites include places from different regions, such as Ain Ghazal, Beisamoun,

Gesher, Hayonim Terrace, Jericho, Nahal Oren or Yiftahel, among others.

The comparison of PPN lithic sequences and cultural contexts of Southern Levant to the Northern Mesopotamian bulk offers certain similarities but some local variations. As example, the blade technology was very sparsely through all the areas into study. The lithic industry shows conservatism for a long period (naviform and bipolar cores, burins) but also homogenous changes in most of the affected regions when certain innovations happened from time to time. The fact of a dispersal of those industries could be not a reflection of climatological change but the possibility of long exchanges and mobility through this extensive period.

This PPN long sequences lived deep changes in the ecosystems and lifestyles through the whole extension of the period. The transformation of hunter-gatherer societies into agrarian societies could have been not simultaneous in all the regions. In several of the researched areas, the hunting or foraging remained a basic diet for most of the societies during the PPNA and most of the PPNB in the Middle and Upper Euphrates region. Agriculture took a long time to be adopted as the main source for the diet. The extinction of some wild species in regional areas could have been an important trigger that forced a change of strategy.

For certain climatological and ecosystem changes happened in the transition of the PPNA to the PPNB and the end of the same PPNB of the Near Eastern regions with the result of the abandonment of sites and ex-novo habitation of places, if no changes into the ritual and lifestyles of the sites.

The climatological conditions of certain areas could be explained in cases as a trigger, and not perhaps as the main cause, for the cultural developments of the PPN.

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ORAL

#### **14. TESTING THE EASTERN TRAJECTORY: IS THERE ANY GENEALOGIC RELATIONSHIP BETWEEN THE AHMARIEN AND EUROPEAN EARLY AURIGNACIAN?**

*Hauck, Thomas (Institute for Prehistory, University of Cologne) Thomas.Hauck@uni-koeln.de*

Searching for the origin of the European Upper Palaeolithic (UP) remains a major scientific challenge. Questions concern the place and time of UP innovations as well as their subsequent diffusion trajectory. Moreover, it is commonly believed that the colonisation of Europe by Anatomically Modern Humans is closely related to the marked change in the archaeological landscape be-

tween 45.000 and 35.000 years ago. Some models are based upon the assumption the spread of the UP cultural package followed a rather uniform and linear trajectory from the place of its origin, the Middle East, over SE Europe to the Atlantic. In this respect, the Early Aurignacian of Europe is seen as a derivative of the Ahmarian. Alternative models propose a multi-local origin of UP technology.

Notwithstanding which scenario is favoured, the Early UP landscape of Europe was more complex than previously thought. In this paper, we critically examine the proposed genealogic relationship between the Ahmarian and the Early Aurignacian of Europe. It will be shown that both cultural units witness a high degree of variability sincerely affecting the validity of cross-continental linkages.

It is only by identifying contextual areas within both cultural units that meaningful comparisons can be made.

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ORAL

#### **15. CONNECTING NORTH AND SOUTH LEVANT THROUGH COMPLEX NETWORKS OF OBSIDIAN EXCHANGE DURING THE PPN: A MATHEMATICAL SIMULATION**

*Ibáñez Estévez, Juan José (IMF-CSIC) ibanezzj@imf.csic.es*  
*Ortega, David (IMF-CSIC) ortega@imf.csic.es*  
*Campos, Daniel (Dpt Física-UAB) Daniel.Campos@uab.cat*  
*Méndez, Vicenç (Dpt Física-UAB)*  
*Khalidi, Lamya (Archéorient-CNRS) lamya.khalidi@mom.fr*  
*Teira, Luis (III PC-UC) luis.teira@unican.es*

Most models used to explain the mechanisms of obsidian exchange during the Neolithic in the Near East continue to be based on the down-the-line model proposed by C. Renfrew in the 1960s. However, Renfrew's model, which results in a very regular and clustered network of exchange, does not permit the circulation of obsidian to distant regions of the Near East as it is observed in the archaeological record.

In order to better replicate the archaeological data and to better understand the parameters that may have been involved in the modalities of obsidian exchange, we explore multi-agent modeling which can treat the topic of obsidian exchange as a complex system composed of interacting agents (Neolithic communities).

We propose a small-world exchange network, in which some Neolithic communities were able to move long distances to attain new exchange partners, as an alternative to the down-the line model. Multi-agent simulation allows us to test the small-world hypothesis and to ex-

plore the characteristics of obsidian exchange networks during the PPN. Later, the results of the mathematical modelling are compared with the archaeological data of obsidian presence in the Levant

The existence of a small-world type network of exchange and interaction during the PPNA explains the co-evolution of the North and South Levant at the dawn of the Neolithic. Even more complex and efficient networks of interaction during the PPNB gave rise to a kind of cultural similarity along the Levant, which has been defined as a PPNB interaction sphere or a PPNB civilization.

ORAL

### 16. SOME ICONOGRAPHIC MOTIFS FROM THE 6TH-5TH MILLENNIA BC IN MESOPOTAMIA AND THE LEVANT: CLUES FOR CULTURAL CONNECTIONS

*Milevski, Ianir (Israel Antiquities Authority) [ianirmilevski@gmail.com](mailto:ianirmilevski@gmail.com)*

*Getzov, Nimrod (Israel Antiquities Authority)*

*Galili, Ehud (Israel Antiquities Authority)*

*Horwitz, Liora K. (The Hebrew University of Jerusalem)*

Several artefacts bearing iconographic motifs have been recovered in recent salvage excavations and surveys in southern Levantine sites, dating to the 6th – 5th millennia BC. The artefacts were manufactured on a variety of raw materials (bone objects and stone palettes) and depict anthropomorphic motifs - often a female figure, occasionally accompanied by horned animals and trees (usually identified as palms). In the southern Levantine sites (Hagosherim, Ein Zippori and the submerged site of Neve Yam) these motifs are associated with the Wadi Rabah culture, identified with the Late Neolithic/Early Chalcolithic periods.

These artefacts have attracted attention since they resemble objects from the northern Levant and Mesopotamia. For example, some of these motifs appear in stelae from Ashur and Mari and depict an association between anthropomorphic symbols and horned animals and occasionally with trees.

Other 6th and 5th millennia BC iconographic items, found in both the northern and southern Levant, show a schematic representation of rams heads, probably representing personal amulets. These objects are associated in the north with the Halafian culture (Domuztepe), and in the south (Kabri, Hagosherim and perhaps Gilat) with the same Late Neolithic/Early Chalcolithic entities as the anthropomorphic motifs noted above.

These finds reinforce the suggestion, put forward decades ago by Jacob Kaplan, on the relations between the

southern Wadi Rabah culture and the northern Halafian. The following paper will describe and analyse the motifs and distribution of these iconographic bearing artefacts in the two Levantine regions

ORAL

### 17. THE PROTOURBAN MODEL OF URUK: A COMPLEX PROCESS OF TERRITORIAL EXPANSION DURING THE 4TH MILLENNIUM BCE

*Montero Fenollós, Juan Luis (Universidad de A Coruña) [fenollos@udc.es](mailto:fenollos@udc.es)*

*Sanjurjo Sánchez, Jorge (Universidad de A Coruña) [fenollos@udc.es](mailto:fenollos@udc.es)*

Archaeological activity in the Near East allowed to verify that the Middle and Late Uruk period (Late Chalcolithic 4-5) represented a geographic expansion process from southern Mesopotamia to northern (Syria and eastern Turkey) and esaterns territories (western Iran) during the middle of 4th millennium BC.

The study of the material culture defined as "southern Mesopotamia-style Uruk" in the Syrian Euphrates valley (from north to south) has helped to define that there were different types of protourban settlements in Syria within a hierarchical process characterized by mass production.

This is the case of the bevelled rim bowls, a diagnostic Uruk-type pottery of unknown function, the location of which archaeologists have intended to draw the connections and disconnections of the Uruk geography. Our working hypothesis is that these bowls are material evidence of a new and common food culture of leavened bread.

ORAL

### 18. THE "NATUFIAN" IN NORTHERN LEVANT: THE LATE EPIPALAEOLITHIC OF DEDERIYEH CAVE, AFFRIN VALLEY, NORTHWEST SYRIA

*Nishiaki, Yoshihiro (The University of Tokyo) [nishiaki@um.u-tokyo.ac.jp](mailto:nishiaki@um.u-tokyo.ac.jp)*

*Kanjo, Yosef (Aleppo Museum) [kanjou00@yahoo.com](mailto:kanjou00@yahoo.com)*

*Takeru Akazawa (Kochi University of Technology) [akazawa.takenu@kochi-tech.ac.jp](mailto:akazawa.takenu@kochi-tech.ac.jp)*

The geographic distribution of the Natufian remains unclear. Its northern extension is particularly ambiguous. Archaeological assemblages showing some cultural sim-



ilarity with the Natufian did exist in the northern Levant during the Late Epipalaeolithic; however, some authors believe that they represent a local cultural tradition, while others interpret them to be a consequence of the Natufian's expansion from the south. One difficulty in investigating this issue is that well-documented Late Epipalaeolithic sites of the northern Levant are confined to the inland steppe—notably, Tell Abu Hureyra and Mureybet on the Upper Euphrates. These sites are rather isolated from the Natufian homeland in the southern Levant and sites bridging the two regions are absent. In addition, the environmental setting of the Euphrates steppe is significantly different from the Mediterranean woodland dominating the Natufian homeland. This sharp contrast might have resulted in functional variability of sites and would thus blur cultural affiliation of the northern group. In this respect, the discovery of Late Epipalaeolithic assemblages at Dederiyeh Cave in the woodland region near the Syrian-Turkish border is remarkable for providing us with a different dimension. The case at Dederiyeh is comparable to the Natufian homeland in terms of ecological setting, but is geographically closer to the Euphrates steppe. Comparing the cultural remains from Dederiyeh, the southern Levantine Natufian, and the Upper Euphrates entity should help clarify the issue.

ORAL

### 19. BETWEEN THE DESERT AND THE SEA - THE LEVANTINE CORRIDOR DURING EARLY PREHISTORY

*Sharon, Gonen (Tel Hai College) gonen@telhai.ac.il*

The Mediterranean environment of the narrow strip of land between the Mediterranean Sea to the west and the Arabian Desert to the east has enabled its use as the king's highway leading in and out of Africa since the dawn of human evolution. World famous archaeological sites, ranging in age from 1.5 million years to present, excavated along the Levantine corridor offer a unique opportunity to explore the fundamental questions of Early Human migration and evolution. The rich lithic assemblages excavated are the primary tool enabling us to reconstruct the history of human migration, behavior, technology and cultural development. The primary assemblages represent migration waves Out-of-Africa. As many as five distinguishable phases can be identified within the Lower Palaeolithic cultural sequence in the Levantine Corridor. The Middle Palaeolithic is an additional, stand-alone cultural phase in which the emergence of Anatomically Modern Humans occurred. Studying the uniquely preserved sites of the Levantine Corridor al-

lows us to suggest a continuous sequence of migration waves (or local cultural developments?) in a resolution that cannot be achieved in other regions of the world. This paper aims to present the different identifiable migration "waves" visible from the Levantine Corridor lithic assemblages, estimate their chronology, origin and geographical distribution and discuss their significance for our understanding of Early Human migration and behavior during the Middle and Late Pleistocene at the gateway to Europe.

ORAL

### 20. THE RELATIONS BETWEEN THE NORTHERN AND SOUTHERN LEVANT DURING THE SECOND HALF OF THE 7TH MILLENNIUM CAL BC: ÉVIDENCES FROM POTTERY

*Vieugué, Julien (Centre de Recherche Français de Jérusalem) archeojulien@hotmail.com*  
*Garfinkel, Yosef (Hebrew University of Jerusalem) garfinkel@mscc.huji.ac.il*

The second half of the 7th millennium cal BC corresponds to the end of the Neolithisation process in the Near-East which is connected with the widespread adoption of ceramic vessels throughout the region. The completion of the Neolithic "revolution" goes hand in hand with a process of splitting up of cultural entities. This paper addresses the relations between the northern and southern Levant during the Pottery Neolithic period, relying on the typo-functional aspects of fired clay containers. Recent research on the use of the earliest ceramic vessels from the southern Levant has demonstrated the diversity of the culinary functions of pottery, ranging from the storage to the consumption of foodstuffs. Storage vessels and cooking pots are the most frequent functional categories within the ceramic assemblages. This is apparently not the case in the northern Levant where the pottery from the same period seems to have been mainly used for the food presentation and consumption. Such differences in the pottery range emphasize the existence of regional variations in the culinary habits of Neolithic communities during the second half of the 7th millennium cal BC.

# A259 Megalithism in the north-west of the Iberian Peninsula Commission on Neolithic Civilizations of the Mediterranean and Europe

Organiser: Anton A. Rodríguez Casal

Monday 1st (14:30 to 19:30)  
Meeting Room B06



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ORAL

**1. ROCKS, SOILS, MOUNDS AND MEGALITHS: AN APPROACH TO NEOLITHIC LANDSCAPES AND THE ENVIRONMENT OF NORTH-EASTERN GALICIA**

*Rodríguez Casal, Antón Abel (Universidad de Santiago de Compostela) antonabel.rodriguez@usc.es*

*García-Rodeja Gayoso, Eduardo (Universidad de Santiago de Compostela) eduardo.garcia-rodeja@usc.es*

Considering the megalithic culture as an atlantic and coastal phenomenon has been a cliché in Galician archaeological literature. This concept was supported by the fact that most megalithic necropolises were located in the northwestern areas of Galicia. With odd exceptions, the province of Lugo had always been marginalized in research programmes. In 1993 we proposed an ambitious research project, which saw the start of archaeological prospection from precisely the most unexplored area, the province of Lugo. The intention was to try to provide answers to a few questions that had been raised. On the occasion of the International Meeting held in Santiago de Compostela in 1996, we had already presented a synthetic work about the megalithic culture of Lugo. Nowadays, we have a number of 1.051 megalithic monuments and a number of pedological and petrographical analytics in which this work is based. In order to establish the relationship between geological and pedological characteristics of the megalithic surroundings sites, the geological materials and the soils of 29 mounds of Lugo have been sampled, described and analyzed. In the different levels that were studied (131 samples), both the characterization of their physicochemical properties and the particle size analysis were performed. In order to determine the rock type and its mineralogical composition, were carried out the petrographic analysis of 36 thin rock sections using an optical microscope. For some samples, a brief description of their weathering degree was also included.

The mounds generally presented the existence of soil materials with properties comparable to those of the most representative soils of the surrounding area. In general, the organic matter contents on the surface horizons of the mounds are lower than those on the surface horizons of the surrounding soils. The contribution of the vegetation developed on the monuments over time could explain the trend to a higher organic matter content in many of the studied surface layers. The results of the particle size analysis are consistent with what would be expected from the soils developed from the local geological materials. Through

petrographic analysis we have determined the rock type used in the construction of the megaliths and their relationship with the local geology.

Our contribution to the study on the interrelations between environment and megalithic monuments, with the newness of systematically using, for the very first time in Galicia, pedological and petrographical data, challenges previous theories, which were based more on speculation than on scientific scrutiny. In this sense, we have clearly seen that the nature of soil seems to be less important than the litology when it comes to the choice of the megalithic monuments location.

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ORAL

**2. NEOLITHIC SETTLEMENT AND FUNERAL SPACE IN GALICIAN MEGALITHIC PHENOMENON: A SYNTHETIC STUDY BASED ON TWO DECADES OF RESEARCH**

*Carrero Pazos, Miguel (Universidad de Santiago de Compostela) miguel.carrero@usc.es*

*Rodríguez Casal, Antón Abel (Universidad de Santiago de Compostela) antonabel.rodriguez@usc.es*

Since the 1990s, the research group "Arqueoloxía e ecoloxía do fenómeno megalítico galego" at the University of Santiago de Compostela, has been developing intensive fieldwork prospection that has generated a large database, containing about 4.000 monuments. Therefore, we now are in a position to establish the basis of a methodology for studying the Galician megalithic complex based on different statistical analysis, using computer tools like the geographical information system (with LiDAR extension), all from a holistic perspective.

The main purpose, hence, will be to provide us with a whole range of formal tools that will help us to explore the new realities of the megalithic phenomenon. In this sense, on the database, that nowadays has more of four thousand monuments, we are to test mathematical and statistical analysis. The guideline established by our research group will be followed when the first assessments of the work developed in the megalithic phenomenon of Lugo province (1997) were studied, then also, later in the Galician-Portuguese Miño region (Eguileta, 1994; Sousa, 2012; Carrero, 2012), as well as the more intensive work developed in other country areas. Accordingly, we are to try to characterize and contextualize both dolmenic monuments and burial mounds, all according to their relation with the

environment. We will also go deeper into the patterns of location and settlement in order to indicate similarities and differences in the main groups of monuments, by implementing the predictive model. Furthermore, we are to study the volumes of these monuments.

Nowadays, it can be highlighted that one of the main study tools for the megalithic complex are the geographical information systems, to such an extent that they have constituted as a separate, specialized line of research. This technology is now widely used for the wide array of possibilities it gives, not only analytical but also those dealing with time saving.

In addition, through the use of LiDAR, which is now publicly available to all the regions of Galicia (although the data are not rated and they appear in ellipsoidal heights), we can implement our archaeological prospection, something in fact is already being done by checking the database. The rugged Galician terrain, characterized by intense vegetation, often makes intensive exploration impossible. The development of this applied technology seems to fill the gap in the survey prospection, although at the moment it is at an early stage.

To sum up, we can establish the basis, together with using the traditional methodology based on archaeological prospection, as a general outline of the possibilities that the mathematical-statistical analysis and new technologies (GIS and LiDAR) could provide in the research of the Galician megalithic phenomenon.

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ORAL

### 3. STRATIFIED MEMORIES: PAINTED ORTHOSTATES AND MEGALITHIC ARCHITECTURES

*Carrera, Fernando (Escola Superior Conservación Galicia)*  
[fcarrera@uvigo.es](mailto:fcarrera@uvigo.es)

*Fábregas, Ramón (Universidade de Santiago de Compostela)*  
[ramon.fabregas@usc.es](mailto:ramon.fabregas@usc.es)

The systematic analysis of the preserved paints on the stones making up the megaliths can bring insights about the Neolithic cultural complex surrounding this kind of funerary architectures. From that standpoint, we have centered our efforts in NW Iberia approaching, among other issues, the question of the diverse painting techniques and the eventual superimpositions reported. Other issues we have dealt with are the images associated to certain painting techniques, the radiometric dates –either from the paints or from the

monuments themselves- or the architectonic designs and their transformation.

As a result, we shall be putting forward some proposals regarding the relationship between certain chamber designs and specific painting techniques in a well-defined lapse of time. Such an interpretive exercise might be particularly useful for the research of the earlier stages of the regional megalithic phenomenon.

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ORAL

### 4. MEGALITHIC ARCHAEOASTRONOMY IN GALICIA: AN ENLARGEMENT OF THE ARCHAEOASTRONOMICAL DATABASE OF ORIENTATIONS OF GALICIAN MEGALITHS IN QUANTITY AND QUALITY

*Vilas Estevez, Benito (University of Wales Trinity Saint David)*  
[vieito4@hotmail.com](mailto:vieito4@hotmail.com)

Galician Megalithic culture is characterized by a large number of monuments throughout the country, albeit of different types. Following the classification of Anton Rodríguez Casal there are: paramegalithic chambers, simple dolmens, passage graves and megalithic cists. Chronology of the megalithic period in Galicia could be situated between 4500-2000 cal BC. All these different megalithic monuments display clear orientations in the way they are structured. Comprehensive surveys of similar monuments elsewhere have suggested that they are oriented toward particular areas of the horizon, drawing attention to natural markers in the landscape (Christopher Tilley) or to places where astronomical events, such as sunrise, moonrise and the rising of the stars, could be witnessed and even predicted (Michael Hoskin, Clive Ruggles). With respect to the megalithic orientations in Galicia only two previous studies have been undertaken: one in 1993 which measured two dolmens, and another in 1997 where 36 dolmens in different regions of Galicia were measured and both considered only solar alignments. This project aims to amplify the database in quantity and quality, considering not only potential solar alignments but also lunar, stellar and topographic alignments.

To study the orientation of the monuments, it is required to measure the azimuth and the horizon altitude. In this project all measurements were made using a compass (which values were corrected for the True North by using the NGDC geomagnetic calculator), a clinometer (when this will not be possible due to vegetation, the software HeyWhatsThat will be used to obtain horizon altitudes) and a handheld GPS unit.

To define the line of orientation, that is the line one wants to measure the azimuth of, Hoskin used the middle point of the backstone and the middle point of the corridor. This determines something he called the axis of symmetry. But given the present state of dolmens in Galicia, and that not all megalithic structures have a corridor this method was adapted.

In addition a new method to complement this study will also be used: the window of visibility, developed by Fabio Silva, that it is based on the idea that our notions of a defined axis and a precise alignment were not a primary concern of the dolmen builders. So as not to exclude other possible alignments that fall on this window of visibility, but not on the axis of symmetry, the total arc of horizon visible from within the chamber is measured. The results show that the monuments are oriented towards particular areas of the horizon where astronomical events, such as sunrise, moonrise and the rising of the stars, could be witnessed and even predicted.

This project has helped to amplify the database of orientations of Galician Megaliths, in quantity and quality, by direct fieldwork measurement and it has proved that the monuments were not randomly oriented but on the contrary to specific astronomical events. This project also reveals the importance of this kind of studies to help developing our knowledge about past civilizations.

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#### ORAL

### **5. ARCHAEOLOGY AND MEGALITHIC HERITAGE OF COSTA DA MORTE: THE OUTCOMES OF AN INTERDISCIPLINARY RESEARCH.**

*Rodríguez Casal, Antón Abel (Universidad de Santiago de Compostela) antonabel.rodriguez@usc.es*

*Romaní Fariña, Emiliana (Universidad de Santiago de Compostela) emiliana.romani@usc.es*

Costa da Morte, in the Galician Land's End is one of the areas with the highest megalithic density in the northwest of the Iberian Peninsula, and also has some of the more emblematic monuments (such as Dombate, Parxubeira, Pedra da Arca, Arca da Piosa, Casa dos Mouros, Casota de Freán, Pedra Cuberta...). These were some of the reasons why the Galician Megalithic Park, was placed here, within the Galician Archaeological Heritage Network, created by the Galician autonomic government.

Our research group, consisting of archaeologists, geologists, edaphologists, geographers and art historians of the University of Santiago de Compostela, has carried out intensive field work over the fourteen municipalities of Costa da Morte in the last few years, providing a wide monument field record, the creation of distribution maps, database, topographical surveys and the detailed analysis of burial mounds. All of this has been completed with laboratory work: database creation, geographic information systems, statistics and mathematical analysis.

The work contains a very specific line of research that our group has been developing since 1995. The first main objective that we proposed were to obtain a rigorous and updated mound distribution map, which allowed us to fill in the gaps in archaeological literature and to investigate the megalithic culture from an objective base and contextual evidence. After this initial stage, we started a second, focused on field work using an extensive and probabilistic prospecting, combined with intensive prospection in some areas. The result of the campaigns was the cataloging of 304 megalithic sites. Likewise, we have carried out the survey with total station of the main megalithic sites, a diagnosis of the monument's conservation, including some proposals for restoration and heritage management.

From the field work database we are able to define the environment factors that are conditioning and/or determining the choice of setting the megalithic tombs. In connection with this, we also have analyzed the possibility that the transit and visibility would influence the location of the mounds. In conclusion, we are able to say that the results we obtained provide us with a better understanding of the ecotypes used by the communities who built the megalithic monuments, as well as an in-depth approach to the regional differences that exist among them. Our research provides substantial support for the creation of a Galician megalithic park in the Costa da Morte, which will include the entire catalogued heritage. Nearly twenty large megalithic structures are to be reevaluated, linked to cultural tourism. Archaeology, conservation and musealization are therefore, the main axes of the ongoing project on the megalithic culture in the Costa da Morte.

ORAL

## 6. A VIEW FROM THE CENTER: MEGALITHS OF THE DEZA REGION

*Vilaseco Vázquez, Xosé Ignacio (Grupo de Estudos para a Prehistoria do NW Ibérico. Departamento de Historia I. Universidade de Santiago de Compostela) ignacio.vilaseco@usc.es*

*Fábregas Valcarce, Ramón (Grupo de Estudos para a Prehistoria do NW Ibérico. Departamento de Historia I. Universidade de Santiago de Compostela) ramon.fabregas@usc.es*

The Deza district, with 1.027 km<sup>2</sup> of surface, lies in a fairly central position within the Galician lands. It has a varied landscape, being formed by a series of parallel valleys running down from the mountain ranges to the South and East while the river Ulla constitutes a clear boundary towards the North.

Before the surveys done by our research group in 2002-2004 no systematic work had been carried out in that area. Still, it was reknown as a megalith-rich region with a significant number of painted or carved chambers. The aim of our research was making an appraisal of the preservation of the numerous mounds, noting the alterations affecting them and evaluating the risks for their survival. Though no intensive survey was undertaken, we came in the end with information on 475 barrows, 125 previously unknown. Later on, other researchers raised that figure to 570, or a density of 0,55 mounds/km<sup>2</sup>.

Such a large sample allows us to make some statements about the siting of the mounds, their formal variability, chamber tipology or the artistic decoration found in several cases. As to the first aspect and unlike the usual pattern elsewhere in Galicia, the largest concentrations are not found on the flattened tops of the mountain ranges. Moreover, the find of rock-art on stone outcrops nearby puts some qualification on the alleged relationship between both phenomena. Otherwise, recent digs are giving interesting glimpses on the building process and use of the megaliths.

A final word on the issue of the survival of the mounds: 19% of those previously known had been destroyed at the time of our survey, mostly during the last 20 years; the main part show serious problems of preservation and barely a 14% were in good condition.

ORAL

## 7. THE MEGALITHIC PHENOMENON IN THE GALICIAN-PORTUGUESE MIÑO REGION: NEW RESEARCH PROPOSALS FROM A COMPREHENSIVE STUDY MODEL

*Sousa, Goreti (CIESG/Escola Superior Gallaecia) goretisouza@esg.pt*

*Carrero Pazos, Miguel (Universidade de Santiago de Compostela) miguel.carrero@usc.es*

*Eguileta Franco, José María (Departamento de Arqueoloxía. Concello de Ourense) arqueoloxia.jeguileta@ourense.es*

The Miño River, main defining element of the current political border between northern Portugal and Galicia, is here taken from an integrative perspective, as a communication element between landscapes and communities in what is here identified as the Galician-Portuguese region of Miño. This region shows a clear geographical unity. The Galaico-Duriense massif extends to Portugal the natural elevations of Galicia and the alignment of the large river valleys straightens that unity. Archaeologically, a ??cultural identity in the North western region of Iberia has been suggested by authors such as López Cuevillas. However, several factors associated with different traditions and methodologies of archaeological work hampered, until recently, the development of comprehensive studies of this reality. The field work carried out in this area, since 2011, resulted in a database with more than 400 monuments, providing a solid base on which to perform statistical analysis, trying to achieve global interpretations.

An integrated methodology, applied to one of the most interesting Megalithic areas of the Northwest, provides excellent conditions for undertaking a comprehensive project, based on the work started on the beginning of the XX century that was also the subject of the PhD thesis of Eguileta Franco (1994). Despite its small size this area presents more than two hundred dolmen, of monumental architecture. The relationship between Megalithic culture and topography is evident, with two concentrations, one on the Salas valley and other in the Serra do Leboreiro mountain.

Finally some conservation work (eg: displacement of Casiña da Moura) and pedagogic activities (creation of a megalithic circuit on the Salas Valley) have already been carried out.

The proposed research methodology will follow, both, the propositions of previous work in Galicia and northern Portugal (Eguileta Franco, 1994, 2003; Rodríguez Casal,

et al., 1997; Sousa, 2012; Carrero Pazos, 2012) and the models carried out in other peninsular areas.

Different variables will be mathematically processed to study the regularities regarding types, resources, settlement patterns, etc... GIS technology will be applied to study patterns such as mobility and visibility/intervisibility between monuments and territory.

Thus enabling the study of functional significance of megalithic monuments, beyond the strictly funerary aspect. The results allow the establishment of general trends and eventually regional variants, also revealing the criteria behind the construction of each type of mound in a specific place or in association with a particular natural element.

Presented from a holistic perspective, this work will undoubtedly provide, in a comprehensive way, relevant theoretical and operational data for the study of the megalithic phenomenon in the North western region of Iberia. This research model can, then, be applied to other megalithic regions.

# B25h Domestication of Plants and Animals in the Near East

Commission on Neolithic Civilizations of the Mediterranean and Europe

Organisers: Marie Besse, Jean Guilaine

Tuesday 2nd (14:30 to 19:30)  
Meeting Room B07



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ORAL CONTRIBUTION

ORAL

## 1. NEW INSIGHTS FROM CYPRUS ON THE BEGINNING OF ANIMAL DOMESTICATION AND ON THE NEOLITHISATION IN THE NEAR EAST

*Vigne, Jean-Denis (CNRS-MNHN) vigne@mnhn.fr*

The recent discoveries in the Cypriot sites of Aetokremnos, Klimonas and Shillourokambos shed new light on the beginning of animal domestication in the Near East, between 10,500 and 7000 cal BC.

The results presented here are based on archaeological and archaeozoological analyses, and on radiocarbon dating.

The osteological analyses and radiocarbon dating of large mammal remains at Aetokremnos and Klimonas evidenced the overseas introduction of this species to the island during the Epipaleolithic, and the control of wild animals long before the earliest evidence of anatomic modification due to domestication.

The introduction of cats as early as 9000 cal BC confirms that the domestication of this species was tightly connected to the birth of agriculture and rodent commensalism.

The later introduction of early domestic goat and cattle evidence an intensification of exchanges of domesticates and early husbandry practices within a vast Near Eastern area of incipient neolithisation (including Cyprus).

The later introduction of sheep (8000 cal BC) emphasizes the diversity of the processes in the different mainland areas and the diversity of the areas of origin of the different domesticates.

The detailed analyses of the evolution of the relationships between humans and the different species of large mammal during the occupation of the village of Shillourokambos (8300-7000 cal BC) provide a very rich image of the opportunistic techniques and strategies which have been used by the PPN people during this time when hunting and control of wild animals was still important besides early husbandry practices.

ORAL

## 2. AN INTEGRATED APPROACH TO THE STUDY OF PIG DOMESTICATION PROCESSES IN THE NEAR EAST

*Alcàntara Fors, Roger (Universitat Autònoma de Barcelona) roger.alcantara.fors@gmail.com*

*Cucchi, Thomas (Muséum National d'Histoire Naturelle. UMR 7209, Paris) cucchi@mnhn.fr*

*Tornero Dacasa, Carlos (Muséum National d'Histoire Naturelle. UMR 7209, Paris) ctornero@mnhn.fr*

*Evin, Allowen (Muséum National d'Histoire Naturelle. UMR 7209, Paris) evin@mnhn.fr*

*Saña Seguí, Maria (Universitat Autònoma de Barcelona) maria.sana@uab.cat*

Recent studies demonstrate that early pig domestication is a complex and very variable phenomenon. Tell Halula, a PPNB site located in the Middle Euphrates Valley in the Arab Republic of Syria, presents an exceptional archaeological sequence representative of the historical changes that occurred between 7.800-5.800 cal BC, a crucial time interval during which significant transformations related to husbandry practices are documented. This presentation focuses on the results obtained from exhaustive analyses on *Sus* remains samples recovered from Tell Halula with the aim to elucidate the dynamics of pig domestication and exploitation strategies, in relation to adjacent regions.

A detailed analysis of the totality of pig bone remains was carried out according to the different occupation phases documented at tell Halula. The evaluation of the management and exploitation dynamics was established through the analysis of the variability in representation percentages, demographic patterns of the flocks, anatomical variability, physical characteristics of the animals and spatial analyses of the faunal remains according to settlement space use. Differentiation between wild and domestic specimens is established through morphological criteria, biometric analyses and geometric morphometric data, correlated with pig consumption and distribution patterns. The integrated analyses of all these parameters allows us to evidence dynamics and changes in husbandry strategies at tell Halula and elucidate how pig domestication process was performed. In order to establish the spatial and temporal dynamics of pig husbandry adoption in a wider geography of the Near East, we compare this data with the published results, and finally discussing the continuities and discontinuities in pig domestication processes and the role of pig husbandry in Neolithic economy.

The obtained results support a high degree of variability in pig exploitation during the early phases of pig husbandry adoption. Animal domestication and the adoption of domesticated animals were probably not mutually exclusive options during initial stages. This variability is not represented through physical characteristics of the animals only.

From a methodological point of view, an integrative approach is required to differentiate between wild and domestic populations. Archaeological and historical parameters as production and consumption patterns are key variables for this purpose. On the other hand, further progress on methods such as geometric morphometrics and aDNA analysis should give us a better comprehension of the biological steps guiding boar to its domestic forms.

POSTER

### 3. A FORAGER-HERDER TRADE OFF, FROM BROAD SPECTRUM HUNTING TO SHEEP MANAGEMENT AT ASIKLI HÖYÜK, TURKEY

*Stiner Stiner, Mary C. (University of Arizona) mstiner@email.arizona.edu*

*Buitenhuis, Hijlke (Archeosupport)*

*Duru, Güne (Istanbul University)*

*Mentzer, Susan M. (Eberhard Karls University of Tübingen)*

*Munro, Natalie D. (University of Connecticut-Storrs)*

*Peters, Joris (Ludwig-Maximilians-Universität München)*

*Pöllath, Nadja (Ludwig-Maximilians-Universität München)*

*Quade, Jay (University of Arizona)*

*Tsartsidou, Georgia (Ephoreia of Palaeoanthropology-Speleology Southern Greece)*

*Özbaşaran, Mihriban (Istanbul University)*

Asikli Höyük is the earliest known pre-ceramic Neolithic mound site in Central Anatolia. The oldest Levels 4 and 5 span 8200 to ca. 9000 cal BC, associate with round-house architecture and arguably represent the birth of the Pre-Pottery Neolithic in the region.

Results from upper Level 4, reported here, indicate a broad meat diet that consisted of diverse wild ungulate and small animal species. The meat diet shifted gradually over just a few centuries to an exceptional emphasis on caprines (mainly sheep). Age-sex distributions of the caprines in upper Level 4 indicate selective manipulation by humans by or before 8200 cal BC. Primary dung accumulations between the structures demonstrate

that ruminants were held captive inside the settlement at this time.

The zooarchaeological and geoarchaeological evidence together demonstrate an emergent process of caprine management that was highly experimental in nature and oriented to quick returns. Stabling was one of the early mechanisms of caprine population isolation, a precondition to domestication.

POSTER

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### 4. CHANGE AND CONTINUITY IN BEHAVIORAL PATTERNS OF HUNTER-GATHERERS AND PASTORALS AT QUMRAN CAVE 24

*Schechter, Heeli C. (Tel Aviv University) heelinka@gmail.com*  
*Gopher, Avi (Tel Aviv University) agopher@post.tau.ac.il*

The cave site of Qumran 24 is a good example for the study of the transition from hunting-gathering to herding. The cave is located on the north-western shore of the Dead Sea, in an extremely arid environment. The area does, however, offer seasonal resources, especially in the late winter and spring, for both hunter-gatherers and pastoral herders. The cave was used as a seasonal camp, intermittently, from the PPNA to the Chalcolithic period. Major socio-economic transformations take place during this long period of time in the region and Qumran Cave 24 provides an opportunity to monitor and follow these changes from a peripheral context.

Analysis of faunal remains and bone tools, as well as lithic assemblages, including flint and stone tools. Comparison of assemblages from the different layers of the cave.

Comparisons of faunal remains and lithic finds from the different layers indicate both elements of continuity and change. A major change is the appearance of domesticates in the late Neolithic and the use of the cave as a pen for domesticated herds during the Chalcolithic period. Another apparent change along the layers can be seen in the typology of flint tools. However, many behaviors remain constant and continuity is apparent in many aspects: Hunting continues and hunted animals remain an important component of the diet of the cave's users even when domesticates are prevailing, as opposed to the situation in richer farming areas; Very little energy is put into finding quality raw material (flint) for routine use in the cave, while the few exquisite items

are brought prepared to the cave from the “parent” settlements; Domestic activities such as grinding, weaving, and hide processing are performed at the cave in all periods, presumably reflecting the presence of women; and more.

It is concluded that Qumran Cave 24 Shows continuity in many aspects and at the same time reflects the profound changes which took place in the richer Mediterranean zones, especially the domestication of animals and specifically the adoption of pastoralism.

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## 5. THE BIOLOGICAL AND CULTURAL DISTINCTION BETWEEN PLANT DOMESTICATION AND CROP EVOLUTION

*Shahal, Abbo (Hebrew University, Jerusalem) shahal.abbo@mail.huji.ac.il*

*Avi, Gopher (Tel Aviv University) agopher@post.tau.ac.il*

The Domestication Syndrome (DS) is a collective term denoting morphological and -physiological differences between domesticated crop plants and their wild progenitors. Crop-plants are dynamic entities hence one cannot assume that all parameters distinguishing between wild progenitors and cultigens are associated with domestication. Using agronomic, genetic and archaeobotanical considerations, we refine the Domestication Syndrome concept by distinguishing crucial domestication traits from traits that are likely to have evolved post domestication (i.e., under domestication). We propose that only traits showing a clear dichotomy between the wild and domesticated forms (e.g., strong dormancy imposed by hard seed coat in wild grain legumes vs free germination mediated by water permeable seed coat of domesticated legumes) played an important part in the pristine domestication episode, whereas, traits showing a phenotypic continuum between wild and domesticated genepools (like seed size that show an overlap in values documented in both wild and domesticated cereals and legumes, respectively) mostly reflect post domestication diversification. The genetic and agronomic distinction between crucial Domestication Syndrome traits and post-domestication diversification traits provides valuable arguments for discussing the time frame of plant domestication and might be relevant for modern breeding programs.

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## 6. AGRONOMIC CONDITIONS AND CROP EVOLUTION IN ANCIENT NEAR EAST AGRICULTURE

*Araus Ortega, José Luis (Universitat de Barcelona) jaraus@ub.edu*

*Ferrio Dñiaz, Juan Pedro (Universitat de Lleida) pitter.ferrio@pvcf.udl.cat*

*Voltas Velasco, Jordi (Universitat de Lleida) jvoltas@pvcf.udl.cat*

*Aguilera Delgado, Mónica (Universitat de Lleida) monica.aguilera@udl.cat*

*Buxó Capdevila, Ramon (Museu d'Arqueologia de Catalunya, Seu de Girona) ramonbuxo@gmail.com*

The appearance of agriculture in the Fertile Crescent propelled the development of Western civilization. The study of how growing conditions, farming practices and crop domestication evolved from the beginning of agriculture is crucial for revealing the complexity and dynamics of ancient societies and to understand the current Mediterranean landscapes. The initial steps toward plant domestication in the Fertile Crescent can be pushed back to the 12<sup>th</sup> millennium cal BP, with different cereals being the main staples. Plant domestication in this region was a slow process with crop cultivation appearing at least 1,000 years before the earliest morphological changes supporting domestication (e.g. changes in seed shedding, increase in kernel size). However, evolution of agricultural systems after domestication, including water availability, soil fertility and potential yields achieved, as well as the pace of “post-domestication” progress in kernel size, remains mostly unknown.

The evolution of agronomic conditions in the Fertile Crescent was investigated by reconstructing cereal kernel weight and using stable carbon and nitrogen isotope imprints of kernels and charcoal from a set of 11 archaeological sites from Upper Mesopotamia, with chronologies spanning from the onset of agriculture to the turn of the era.

Water availability for crops, inferred from  $\Delta^{13}\text{C}$ , was two- to fourfold higher in the past than at present, with a maximum between 10,000 and 8,000 cal BP.  $\delta^{15}\text{N}$  decreased over time, which suggests cultivation occurring under gradually less fertile soil conditions. Domesticated cereals showed a progressive increase in kernel weight over several millennia following domestication.

Our results provide a first comprehensive view of agricultural evolution in the Near East inferred directly from archaeobotanical remains.

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## 7. OVERLOOKED CROPS: EARLY HISTORY OF BARLEY VARIETIES IN WESTERN ASIA

*Charles, Michael (School of Archaeology, University of Oxford) michael.charles@arch.ox.ac.uk*

Domesticated barley is one of the major crop components of late PPNB deposits of the West mound at Çatalhöyük, Turkey, [7400 to 7100 cal BC] as it is in many sites of the period. Unusually the barley is of the naked form and even more unusually two-row marking this crop's first significant appearance in the archaeobotanical list. A thousand years later on the Chalcolithic East mound at Çatalhöyük the barley crop was exclusively made up of hulled forms. This paper considers the early history of barley, in all its forms, in Western Asia based on improved identification criteria, morphometric analysis and a comprehensive database of plant remains from early farming sites. Particular reference is given to the shifting fortunes of naked barley in the region and its implications for the study of crop plant use.

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## 8. THE CEREAL DOMESTICATION PROCESS VIEWED THROUGH THE QUANTIFIED ANALYSIS OF HARVESTING GLOSS.

*Ibáñez Estévez, Juan José (IMF-CSIC) ibanezjj@imf.csic.es*  
*Anderson, Patricia (CEPAM-CNRS) peachypie616@hotmail.com*  
*González Urquijo, Jesús Emilio (IIIPC-UC) jesuse.gonzalez@unican.es*  
*Gibaja Bao, Juan Francisco (IMF-CSIC) jfgibaja@imf.csic.es*

There are still many open questions about when, where and how cereal domestication took place in the Near East.

As one way to advance in this topic, we propose focusing on the use-wear analysis of sickle elements. Wild cereals must be harvested before the complete maturation of the plant, while domestic cereals are harvested ripe. Most probably, wild cultivated cereals were harvested in an intermediate state of maturity. This variability

in the degree in humidity when harvesting provokes differences in the characteristics of the use-wear polish. We have measured harvesting polish from 19 experimental tools used for cutting wild cereals in natural stands (in Syria and Israel), cultivated wild cereals (in Jalès, France) and domestic cereals (in France and Spain) through confocal microscopy. Later, the discriminant function which distinguishes the three types of use-wear polishes was used to classify 75 archaeological sickle elements from the Early Natufian of Hayonim Terrace, the Late Natufian of Mureybet and Abu Hureyra, the Khiamian, Mureybetian (PPNA) and Early PPNB levels from Mureybet, the Middle PPNB from Abu Hureyra and the Middle and Late PPNB from Tell Halula.

Results suggest the early cultivation of wild cereals in the Middle Euphrates (in the Khiamian and maybe even in the Natufian) and the first appearance of harvesting of fully ripe (domestic cereals) in the Early PPNB.

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## 9. PLANT USE AT THE EARLY NEOLITHIC SITE OF SHEIKH-E ABAD IN THE EASTERN FERTILE CRESCENT CA. 10 000 - 7600 BC

*Whitlam, Jade (University of Reading) jade.whitlam@gmail.com*  
*Bogaard, Amy (University of Oxford)*  
*Charles, Michael (University of Oxford)*  
*Matthews, Roger (University of Reading)*  
*Matthews, Wendy (University of Reading)*

During the 1960s research on the origins of agriculture was focused at the eastern end of the Fertile Crescent, with areas of Iran and Iraq assuming prominence in models of plant and animal domestication. Subsequent geo-political events caused a shift in focus to the west and resulting excavations, coupled with the development of modern archaeobotanical techniques, have generated our current model of pre-domestication cultivation, which sees this region as the centre for the origins of agriculture. In recent years renewed research and excavations in the eastern Fertile Crescent, including by the Central Zagros Archaeological Project (CZAP - www.czap.org), have provided us with the opportunity to reassess the role this region played in the domestication of plants and animals.

The archaeological mound of Sheikh-e Abad is located in the Central Zagros of western Iran. It was excavated by CZAP in 2008 and deposits at the base of the mound

returned a date of 9800 cal BC. This makes it one of the earliest Neolithic sites known in the area; only Chogha Golan has produced similar dates (Riehl *et al.*, 2012). Occupation at the site covers a period of ca. 2200 years, which spans the agricultural transition. The location and chronology of Sheikh-e Abad make it significant for addressing biases in the current archaeobotanical record.

Charred macrobotanical remains were recovered during a single season of excavation at the site, from multiple contexts including open-area/midden deposits, areas of *in situ* burning/hearths and the fill and floors within rooms. This yielded a limited but significant dataset allowing us to assess long-term plant use, including tracking the emergence of domesticates.

Notable across the assemblage is the frequent occurrence of a suite of large-seeded grasses (including *Piptatherum*, identified here for the first time in the eastern Fertile Crescent) in conjunction with both wild and domestic-type barley in later levels. We suggest these formed part of the inhabitants diet and more tentatively that this provides evidence for the auditioning of wild species (*sensu* Smith, 2011) prior to the emergence of a narrower range of domesticated crops as part of a farming package. It is also striking that the small-seeded grasses, which are relatively rare in earlier levels, come to dominate later levels along with other taxa that potentially originate from the burning of animal dung. This may represent a change in plant use and deposition practices associated with an increasing intensity in animal management that is implied across the site at this time. Future work at the site is planned that will allow zooarchaeological aspects to be investigated further. Integration of macrobotanical analyses with micro-stratigraphy and micro-morphology is also currently being undertaken within the CZAP project as a means of understanding plant use and preservation in archaeological deposits.

The archaeobotanical assemblage from Sheikh-e Abad provides a new and much needed dataset for the eastern Fertile Crescent. Crucially our findings support recent evidence from Chogha Golan (Riehl *et al.*, 2012) for the independent cultivation and domestication of plants in the eastern Fertile Crescent.

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## 10. THE VICIA FABEA IN SOUTHERN LEVANT: NEW DISCOVERIES FROM PRE-POTTERY NEOLITHIC SITES IN THE LOWER GALILEE (ISRAEL)

*Caracuta, Valentina* (Weizmann-Max Planck Centre for Integrative Archaeology and Anthropology, D-Reams Radiocarbon Laboratory) [valentina.caracuta@weizmann.ac.il](mailto:valentina.caracuta@weizmann.ac.il)

*Boaretto, Elisabetta* (Weizmann-Max Planck Centre for Integrative Archaeology and Anthropology, D-Reams Radiocarbon Laboratory) [elisabetta.boaretto@weizmann.ac.il](mailto:elisabetta.boaretto@weizmann.ac.il)

*Barzilai, Omry* (Israel Antiquities Authority) [omry.barzilai@weizmann.ac.il](mailto:omry.barzilai@weizmann.ac.il)

*Vardi, Jacov* (Israel Antiquities Authority) [kobi.vardi@gmail.com](mailto:kobi.vardi@gmail.com)

The faba bean (*Vicia faba* ssp.) is an important legume in the Mediterranean regions, where it is either consumed as food in its major form (*Vicia faba* var. *major*), or used as fodder for livestock in its minor (*V. faba* var. *minor*) form. Despite the value of this protein-rich species in the human and animal diet, little is known about it and the pristine centre of its domestication, although Taxonomical and genetic analyses point out at the Near East as the 'core' area of origin.

So far, the largest evidences of cultivated small faba beans (*V. faba*) come from the Middle Pre-Pottery Neolithic B site of Yiftah'el, in Southern Levant, and radiocarbon dated them to the end of the 8<sup>th</sup>-beginning of the 7<sup>th</sup> millennium cal. BC.

New discoveries of *V. faba* in Southern Levant PPNB site Nahal Zippori 3, re-open the debate about the pristine centre of domestication. New radiocarbon dating of the Nahal Zippori legumes assists in refining the chronology of such a process.

# A26

## Southeast Asia: Human Evolution, Dispersals and Adaptation

Commission on Southeast Asia: Human Evolution, Dispersals and Adaptations  
(Organisers: Victor Paz, François Sémah, Hubert Forestier)

Thursday 4th (9:00 to 13:30 – 14:30 to 19:30)  
Meeting Room: Facultad Derecho « Sala Ruta Jacobea » Room



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ORAL CONTRIBUTIONS

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## 1. PUSAKA: HUMAN ECOLOGY IN PREHISTORIC SOUTHEAST ASIA

*Sémah, François - (UMR 7194 CNRS - Département de Préhistoire du Muséum national d'Histoire naturelle (MNHN), 1 rue René Panhard, 75013 Paris, France) semahf@mnhn.fr*  
*Forestier, Hubert - (UMR7194 MNHN-CNRS-UPVD, France) hubforestier@gmail.com*

Southeast Asian Prehistory is part of the most topical questions related to palaeo-history of the human lineage. At the heart of a fantastic natural laboratory to study biodiversity and global changes during past and present times, the continental and island Southeast Asian prehistoric sites document, along a time range of more than one and a half million years, the evolution and the biological and cultural adaptation of several hominids, from *Homo erectus* (the Javan 'Pithecanthropus') up to Anatomically Modern Humans.

The scientific methods that are operated for the multi- and interdisciplinary study of these populations remain similar, since the very first islanders of the history of humankind, via endemic species that still remain mysterious (the Flores Island fossils) up to the Austronesian navigators who reached the banks of the Pacific islands several thousand years ago.

The Pusaka project is grounded on long term international collaborations, each of them aiming at answering the needs of the host countries in terms of: research, education, training, conservation, heritage development in the field and in laboratories or museums. The ambition is to develop a dynamic study of the relations between humans and ecosystems throughout the Pleistocene and during the major part of the Holocene, encouraging the disciplinary bridges between Prehistory and Evolution and Environmental sciences.

The Pusaka network will be meshed by major prehistoric sites and by academic institutions (research centres, universities, museums) as well. In the framework of collaborative projects between Asian countries (including all countries represented in the project) and Europe, these institutions trained numerous young scientists, mainly from ASEAN countries. Such results were acquired notably thanks to the investment Asian institutions, of the European Commission, of the French Ministry of Foreign Affairs, and of research and dissemination institutions (CNRS, IRD, Muséum National d'Histoire Naturelle). Field researches, mobility towards Europe and Asia were the major instruments implemented for such a purpose.

The Pusaka International project is intended to invest in a new generation of Asian researchers and teachers within the framework of emergent scientific and university.

It will answer the need to set up a network based on fundamental research, clearly established in Southeast Asia, whose first mission will be to support and contribute to the sustainability of high quality scientific exchanges at the regional scale.

-A number of young Southeast Asian colleagues have reached the doctoral and post-doctoral level.

-With the collaboration of deeply involved European countries, these scientists might set up a community of interest that will generate human and scientific competence flows, sharing of know-how that will significantly strengthen the quality and the sustainability of the exchanges.

-Beyond Europe-Asia exchanges, this structure will develop in priority, in Southeast Asia, the synergy between the best available scientific and academic instruments in concerned countries (sites, heritage funds that include numerous new collections, analytical laboratories, teaching programs, museums).

-The modern interdisciplinary –and, to a certain extent, inter-sector- approach will also address the development perspective of the Asian partner countries.

ORAL

## 2. THE LATE NEOLITHIC SETTLEMENT SITE OF SAMRONG SEN, CENTRAL CAMBODIA

*Vanna, Ly - (APSARA Authority Preah Norodom Sihanouk-Angkor Museum) vanna1357@gmail.com*

Neolithic research in Cambodia remains meagerly done. The earliest Neolithic settlement site to be archaeologically recognized so far in Cambodia is the cave site of Laang Spean, recently dated back to the 5th millennium BC, from where several evidences of animal domestication, agriculture and polished stone tools using culture are identified. Other known cave sites such as Kbal Romeas (circa 3500BC) and Phnom Laang (circa 2300BC) are also classified to belong to the middle Neolithic settlement sites which are located along the southern coastal area of the country. Samrong Sen (2205BC) and other shell midden sites are the only late Neolithic settlement open air sites to be known in the central floodplain of Cambodia. My paper will discuss exclusively on the cultural complexity of the shell midden site of Samrong Sen by first focusing on the long history of human occupation in the site through analysis of archaeological materials and site stratigraphy excavated between 1999 and 2001.

ORAL

**3. OBSIDIAN ARTEFACTS FROM PAWON CAVE WEST  
JAVA, INDONESIA**

*Ferdianto, Anton - (UMR 7194 CNRS - Département de Préhistoire du Muséum national d'Histoire naturelle, 1 rue René Panhard, 75013 Paris, France) anton.ferdianto@edu.mnhn.fr*

*Simanjuntak, Truman - (enter for Prehistoric and Austronesian Studies (CPAS) Indonesia) simanjuntaktruman@gmail.com*

In Indonesia stone tools are one of the technical object that prehistoric man made for more than million years ago by Homo erectus. Those produce by Modern Human present a high variability of reduction sequences, tool types and rock type materials selection as we can observe in the West part of Java Island where obsidian have been used by prehistoric groups (von Koeningswald, 1934; van Heekeren, 1972). Bandung basin and Pawon Cave site are an interesting study case to understand the human adaptation to the environment i.e the geological determinisms and the cultural choices. From years of research in Pawon Cave by Balai Arkeologi Bandung had been discovered many bones, and lithic remains, including also more than five human burial remains. The high quantity of obsidian artifact (more than 1000 pieces) founded in stratigraphical context, reveals that these sources have been exploited in the Kendan Mounts (Nagrek) around 60 km far from the cave.

The localization of the obsidian sources gives information of the occupation area. Moreover through technological and typological study of the obsidian lithic assemblage from Pawon Cave, are a good example for examining variability of lithic assemblage and also aiming to bring light of the factors determining stone tools production at Pawon Cave during the Pre-Neolithic and Neolithic period. For the same period some comparison should be do with others sites in Java and in across the Archipelago.

ORAL

**4. HUMAN OCCUPATION DURING HOLOCENE IN  
MANGKALIHAT PENINSULA (EAST BORNEO): A  
PLURIDISCIPLINARY APPROACH**

*Plutniak, Sébastien - (EHESS (École des Hautes Études en Sciences Sociales), LISST, Toulouse, France) sebastien.plutniak@gmail.com*

*Oktaviana, Adhi Agus - (National Center for Archaeology, Jakarta, Indonesia) sambamerka@gmail.com*

*Ferrié, Jean-Georges - (CNRS UMR 5288, Laboratoire d'Anthropobiologie Moléculaire et Imagerie de Synthèse (AMIS), Université de Toulouse (Paul Sabatier), Toulouse, France) jgf\_fr@yahoo.fr*

*Sugiyanto, Bambang - (National Center for Archaeology, Jakarta, Indonesia) bsugiyanto67@gmail.com*

*Sarel, Josette - CNRS, UMR 7041, ArScAn, Université de Paris X, Nanterre, France) josete.sarel@inrap.fr*

*Guerreiro, Antonio - (Institut de recherches sur le Sud-Est asiatique (IRSEA), CNRS-Université de Provence, Maison Asie-Pacifique, Marseille, France) antonig7065@yahoo.fr*

*Fauzi, Ruly - (National Center for Archaeology, Jakarta, Indonesia) fauziruly@gmail.com*

*Grenet, Michel - (CNRS, UMR5608 Laboratoire TRACES, France) archelmi@gmail.com*

*Simanjuntak, Truman - (National Center for Archaeology, Jakarta, Indonesia) simanjuntaktruman@gmail.com*

*Ricaut, Francois-Xavier - (CNRS UMR 5288, Laboratoire d'Anthropobiologie Moléculaire et Imagerie de Synthèse (AMIS), Université de Toulouse (Paul Sabatier), Toulouse, France) francois-xavier.ricaut@univ-tlse3.fr*

Island Southeast Asia has been the subject of important archaeological discoveries regarding human population history. However, the eastern part of Borneo (Kalimantan, Indonesia) remains poorly documented despite its strategic location facing the Wallace line on the edge of Sundaland. This region has probably played a more important role than is currently recognised since it was a gateway from Sunda to Sahul during the late Pleistocene period, and had a central location in the Holocene network of cultural, linguistic and population diffusion.

Since 2011, thanks to the French Ministry of Foreign Affairs and Research Center for Archaeology (Indonesia), we have developed a collaborative and interdisciplinary French-Indonesian archaeological research project in the karstic rainforest region of East Kalimantan (Mangkalihat Peninsula, Indonesia).

We aim to determine the chronology of human occupation and its technological development in this part of Kalimantan, and interpret it within the regional context of South East Asia. Our diachronic project combines archaeological surveys and excavations, ethno-linguistic investigations and anthropobiological analyses. In this paper we present a synthesis of the results from the three last years of research from three rock shelter excavations and studies of surrounding indigenous populations.

Our results provide new data that will lead to the reappraisal of the role of this region from the late Pleistocene-Holocene prehistory South-East Asia and the associated cultural and population diffusion processes.



ORAL

## 5. HOABINHIAN IN CAMBODIA: THE TALE OF LAANG SPEAN CAVE

*Sophady, Heng - (Ministry of Culture and Fine Arts, Phnom Penh, Cambodia/MNHN- UMR7194 CNRS) hsophady@yahoo.com*

*Forestier, Hubert - (UMR7194 MNHN-CNRS-UPVD, France) hubforestier@gmail.com*

*Zeitoun, Valéry - (UMR7207, CR2P-CNRS-UPMC-MNHN, France) pythecanthro@gmail.com*

*Puaud, Simon - (UMR7194 CNRS- MNHN-UPVD, France) simon.puaud@mnhn.fr*

*Frère, Stéphane - (INRAP, UMR5197 CNRS-MNHN, France) stephane.frere@inrap.fr*

*Westaway, Kira - (Macquarie University, Department of Environment and Geography (Luminescence Dating Facility), NSW, Australia) Kwestawa@els.mq.edu.au*

*Mourer, Roland - (3 rue Julien, 69 003 Lyon, France) roland.mourer@online.fr*

*Than, Heng - (Ministry of Culture and Fine Arts, Phnom Penh, Cambodia) heng\_than@yahoo.com*

*Billault, Laurence - (UMR 208 IRD-MNHN, 57, rue Cuvier, 75005 Paris, France) lobillault@gmail.com*

Laang Spean is one of the most important prehistoric cave sites in Cambodia with discoveries attempted to Hoabinhian and Neolithic period: Late Palaeolithic hunter-gatherers to Neolithic transition. Laang Spean cave is situated at the upper part of a limestone hill (Phnom) in the North-West of the country not far from the Sangker River in the plain of Battambang.

The site was discovered and previously excavated by French archaeologists R & C. Mourer during the 1960s and recently re-excavated by the Franco-Cambodian Prehistoric Mission (MNHN - Ministry of Culture and Fine Arts, Phnom Penh).

The result obtained during the last five years permit to discuss the position of the Hoabinhian technocomplex in his cultural, stratigraphical, chronological, environmental and spatial context.

The archaeostratigraphy of Laang Spean indicated that around 3300 BP Neolithic burials (including stone adze, pierced canine of Suid used as finery, ochre pencil, turtle, shell etc.) have disturbed a former hunter-gatherer occupation/Hoabinhian level (cobble tool) spanning from 11ka to 5 ka and that an older human occupation (chert flake and core) ranging from 71 to 26 ka.

he Laang Spean archaeological sequence with new OSL and 14C dating results represent one of the best documented stratigraphy in cave (# 5 meters) in Southeast Asia Mainland and intends to open a discussion on: the evolution of the prehistoric cultures and the use of cave for different activities through the time.

ORAL

## 6. THE LARGE CUTTING TOOLS FROM NORTHERN MINDANAO: A SEQUENTIAL UNDERSTANDING OF PREHISTORIC LITHIC TOOL PRODUCTION

*Tiauzon, Archie (Archaeological Studies Program University of the Philippines Diliman) archer.relic@gmail.com*

*Neri, Lee Anthony (Archaeological Studies Program University of the Philippines Diliman) leeeneri@yahoo.com*

*Robles, Emil Charles (Archaeological Studies Program University of the Philippines Diliman) Emilcharlesr@gmail.com*

*Mijares, Armand (Archaeological Studies Program University of the Philippines Diliman) armand.mijares@upd.edu.ph*

*Paz, Victor (Archaeological Studies Program University of the Philippines Diliman) victorpaz67@gmail.com*

*Dizon, Eusebio (Archaeology Division National Museum of the Philippines) drbongdizon@yahoo.com*

*Manipon, Dante Ricardo (Archaeological Studies Program University of the Philippines Diliman) danmanipon@hotmail.com*

*Titton, Stefania (Muséum national d'histoire naturelle) stefania.titton1@gmail.com*

Archaeological exploration in northern Mindanao has led to the discovery of a stone assemblage bearing the Oldowan lithic tradition. The assemblage is predominantly composed of large lithic artefacts made of locally available volcanic cobble-sized blank materials. They were reduced employing hard hammer percussion, executed by either a combination of both a free-handed or anvil technique depending on the size or weight of the blanks. The consistency in the dimensions of the flaking negatives was extracted on the exterior platforms with an exceeding angle of 90° at the lateral and distal sides. This implies the intention of trimming the blanks in preparation for the cutting edges that form them as large cutting tools. The flaking was carried out in a unidirectional orientation which somewhat converges on the center of the blank. This action was repeatedly applied on a one-sided face. Trimming on the peripheral zone of the cobbles produced various morphologies of cutting edges (straight, pointed and semi-round) that can classify them as unifacial choppers and picks. Furthermore, end-scar terminations of the flaking negatives on the

cobbles display inefficient cutting edges for the flakes. Hinge and step fractures combined with sirt and overhangs suggest the reduction was not designed for the acquisition of the flake blanks. Rather, the emphasis of these tools' design was intended for heavy duty tasks.

ORAL

## 7. MATAR, A FORGOTTEN BUT PROMISING SITE IN EAST JAVA

*Simanjuntak, Truman - (enter for Prehistoric and Austronesian Studies (CPAS) Indonesia) simanjuntaktruman@gmail.com*

*Fauzi, Ruly - fauziruly@gmail.com (Archaeological Center Palembang, South Sumatra, Indonesia)*

*Intan, Fadhlán S. - geobugis@yahoo.co.id (National Research Centre for Archaeology, Jakarta, Indonesia)*

*Ansyori, Mirza - ansyorimirza@gmail.com (National Research Centre for Archaeology, Jakarta, Indonesia)*

*Prastiningtyas, Dyah - dee.prastiningtyas@gmail.com (National Research Centre for Archaeology, Jakarta, Indonesia)*

*Wibowo, Unggul P. - uungpuj@yahoo.com (Geology Museum Bandung, Java, Indonesia)*

*Rahmanendra, Haris - (Sangiran conservation office, Java, Indonesia) haris.rahmanendra@yahoo.co.id*

*Wulandari - (Sangiran conservation office, Java, Indonesia) mail\_wulan@yahoo.com*

*Hidayat - (Sangiran conservation office, Java, Indonesia) hidayat\_bpsmps@yahoo.com*

*Widianto, Harry - (Conservation of Cultural Properties and Museums, Jakarta, Indonesia) h-widianto@indo.net.id*

Matar is situated on the banks of Solo river, across from Ngandong where the youngest Homo erectus in Indonesia was found. The site has long been neglected by its hidden location and the greatness of Ngandong. Researches that have just carried out since the last three years at this site have unearthed new interesting data. The site is in fact very large located in a more than 5 km long of the Solo river terraces. Measured from the sea level, the terraces can be distinguished into at least three elevations: Terrace 1 (62-66 m), Terrace 2 (49-56 m), and Terrace 3 (< 40 m), with variations of thickness from <2 metres up to >6 metres. The excavations at different locations of the terrace have unearthed 7187 finds. Faunal fossils are the most dominant, which represent open woodland and aquatic environments with exceptions on several species that indicate the existence of forest environment. Lithic assemblage was found, consisting of pebble tools, bolas, polyhedral, retouched flakes and

cores, made out of varied types of stone. Human remains are yet to be found and is considered as the challenge for future researches. All of the findings mentioned show similarity to those found in Ngandong. Therefore Matar is a promising site for a better understanding on the last Homo erectus, as well as their environment and culture.

ORAL

## 8. AN OUTLOOK OF PREHISTORY IN LAOS, NEW PERSPECTIVES

*Singthong, Sommay - ssingthong96@gmail.com (MNHN/ National University of Laos, Faculty of Social Sciences)*

*Zeitoun, Valéry - (UMR7207, CR2P-CNRS-UPMC-MNHN, France) pythecanthro@gmail.com*

*Pierret, Alain - (UMR 242 iEES Paris) apierret2@gmail.com*

*Forestier, Hubert - (UMR7194 MNHN-CNRS-UPVD, France) hubforestier@gmail.com*

Research in Prehistory in Laos has been previously undertaken by H. Mansuy, J. Fromaget, M. Colani and E. Saurin during the French Indochinese period. After a long time of abandonment due to the geopolitical situation, prehistoric cave sites and rock shelters had been revisited by Laotian Team under the direction of Thongsa Sayavongkhamdy in the beginning of the 2000. Since 2005 there is a new interest of international teams to make prehistorical survey in Laos focusing more especially, on the ancient prehistoric chronology id est (pre-) Hoabinhian lithic technocomplex in the North of Laos but also concerning rock art on the Mekong river bank. We propose to make an overview of the old researches undertaken in Laos and to expose the new perspectives of Laotian Prehistory in the future.

ORAL

## 9. INVESTIGATING PLANT USE IN SOUTHEAST ASIA THROUGH STONE TOOL ANALYSIS. A NEW EXPERIMENTAL REFERENCE COLLECTION

*Xhauflair, Hermine - (Département de Préhistoire, UMR7194-CNRS, Muséum National d'Histoire Naturelle, Paris, France) hermine\_xhauflair@hotmail.com*

*Pawlik, Alfred - (Archaeological Studies Program, University of the Philippines, Diliman) alfred.pawlik@upd.edu.ph*

*Gaillard, Claire - (Département de Préhistoire, UMR7194-CNRS, Muséum National d'Histoire Naturelle, Paris, France) gaillacl@mnhn.fr*

*Forestier, Hubert - (Département de Préhistoire, UMR7194-CNRS, Muséum National d'Histoire Naturelle, Paris, France)*

*hforestier@mnhn.fr*

*Vitales, Timothy - (National Museum of the Philippines, Manila) archaeofreako@yahoo.com*

*Callado, John Rey - (National Museum of the Philippines, Manila) johnreycallado@yahoo.com*

*Tandang, Danilo - (National Museum of the Philippines, Manila) sue93653@yahoo.com*

*Amano, Noel - (Département de Préhistoire, UMR7194-CNRS, Muséum National d'Histoire Naturelle, Paris, France) noelamano@rocketmail.com*

*Manipon, Dante - (Archaeological Studies Program, University of the Philippines, Diliman) danmanipon@hotmail.com*

*Dizon, Eusebio - (National Museum of the Philippines, Manila) drbongdizon@yahoo.com*

Numerous archaeological data, including use-traces and residues present on stone tools, suggest that plants played a major role in the economy of Southeast Asian prehistoric hunters-gatherers. An advanced use of plants and the production of specialised implements made of wood or bamboo has been suggested by some archaeologists[i] to explain the apparently simple lithic technology and paucity of formal stone tools in Southeast Asian prehistory.

Unfortunately, the absence of vegetal artefacts in the archaeological record and at present the lack of a detailed and widespread reference collection of diagnostic use traces from regional lithic assemblages limit the possibilities to detect and characterize plant use and prevent the suggested models to be put to the test.

Therefore, the objective of our research was to apply a multi-disciplinary approach for building up such a reference collection of use traces considering the specific vegetation of Southeast Asia and its large variety of plant material.

First, ethnoarchaeological fieldwork was conducted among Palawan indigenous communities to study what plants are used nowadays, the ways they are used and their potential for a possible use during prehistoric times.

Then, selected activities, involving 15 plant taxa that include three different genus of bamboo were reproduced experimentally in controlled conditions with stone tools made of local red jasper.

These stone tools were carefully analysed for wear traces under low and high power microscopes. The use-wear resulting from each activity and each plant was described and recorded in detail.

The results show some qualitative differences of use-wear between groups of plant taxa and revealed the existence of specific patterns related to specific activities such as fibre preparation for basketry.

The established reference collection opens new perspectives for functional analyses of stone tools and the understanding of human behaviour and human-environment relationship in prehistoric Southeast Asia.

ORAL

## 10. MAPPING PREHISTORIC LANDSCAPES IN HIGHLAND NORTHWEST THAILAND

*Shoocongdej, Rasmi - (Department of Archaeology, Faculty of Archaeology, Silpakorn University, Bangkok 10200, Thailand) rasmi@su.ac.th*

This paper explores the relationships between prehistoric societies and environments in seasonal tropics both synchronically and diachronically. Particular emphasis will place on how prehistoric populations mapping their landscapes through the examination of the variability in settlements associated with economic and ritual activities in the mountainous landscapes of northwest Thailand. Given the complexity and variability of tropical environments in landscape, latitude and altitude, rainfall patterns and vegetation, one important aspect of the research is to explore the change of cultural landscape in order to study prehistoric societies and their beliefs through integrated approaches from multi-disciplines. The analyses of site types, locations and functions, temporal and spatial distribution of sites, and ethnoarchaeological observations permit us to interpret landscape as a cultural map of prehistoric societies.

This paper will focus on the social landscape and resource exploitation of late Pleistocene to early Holocene inhabitants (Iron age), ca. 32,000 – 7,500 B.P). The data derive from my research and previous surveys and excavations in highland Pang Mapha, Pai, and Khun Yuam, northwestern Thailand. Recent archaeological data have witnessed little changes in the physical landscape; especially, cave occupations during the late Pleistocene to early Holocene periods whereas the shifting patterns from habitations to cemeteries were greater in the late Holocene period. The result of analysis increases our understanding of human-environment relations through the study of cultural landscape changes over time and space across the highland Northwest region.

ORAL

## 11. SOUTHEAST ASIA PREHISTORIC DISPERSALS AND ADAPTATION: EVIDENCE FROM LENGGONG VALLEY, MALAYSIA

*Saidin, Mokhtar - (Center For Global Archaeological Research Universiti Sains Malaysia) mmokh@usm.my*

Lenggong Valley with an altitude at present of around 100 m above sea level, is part of a large valley in Upper Perak which roughly follows the northeast-southeast axis of Peninsular Malaysia. It is bordered to the east by the Main Titiwangsa Range,

less than 300m in height, made up of porphyritic granitic rock. On the other site, the valley is limited by the Bintang Range, which is less than 250m in height, also of porphyritic granitic rock. The Lenggong Valley contains slate, phyllite and metamorphic limestone from the Kroh Formation of an age of Odo-visi-Devon. There are eight limestone hills in this valley with 72 caves. Archaeological evidence of the Lenggong Valley, which comprises both open-air and cave sites, provides a series of chronologically-ordered and spatially-associated culture sequences from the Palaeolithic through the Neolithic to the Metal period. These sites have been chronometrically dated from 1.83 million to 1,000 years ago. Lenggong Valley contains a large number of undisturbed in situ Palaeolithic sites making it, in this respect, unique outside of Africa and of extraordinary importance for the study of the culture of Palaeolithic man. All of the sites are located above 72 m above sea level. This suggests that the suitable area for the Pleistocene population in Lenggong Valley was at least at this altitude, and above. Palaeoenvironmental reconstruction at these sites suggest that the area under 72 m above sea level is not suitable for habitation in the Pleistocene because it is still under the waters of the paleolake. Archaeogeological surveys in this valley have mapped more than 30 sites with Quaternary river gravel deposit, the thickness ranged between 30 – 150 cm and at the terraces 72 – 183 m above sea levels, along the paleolake-shore. Therefore, Lenggong Valley was provided with a wealth of materials (river gravel) for a stone tool industry. All of these sites revealed evidence that they were used as workshop to produce Palaeolithic stone tools. And all located along lakeshore, thereby supporting the theory that early man adapted to the lakeshore environment. In addition to the open-air sites, the Lenggong Valley contains numerous cave and rock shelter sites which were occupied by the inhabitants of the valley during late Palaeolithic. The cave sites give further evidence of the prolonged and permanent presence of humans in the Lenggong Valley from the Palaeolithic through the Neolithic into the Metal Period. These cave sites give an extraordinary and unique insight into the culture of the prehistoric societies in the Lenggong Valley. These archaeological discoveries, all located within single valley whose geology and environment have remained stable over the past 2 million years, provide important milestones in dating the presence of prehistoric people in South-east Asia and impact on theories concerning the expansion of hominids throughout Australasia and the evolution of their stone tool cultures. This makes archaeological evidence of the Lenggong Valley a unique cultural landscape of outstanding universal value for the study and understanding of world prehistory.

ORAL

## 12. STUDY OF THE "SA HUYNH-KALANAY" CERAMICS FROM THE KRA ISTHMUS

*Favereau, Aude - (Muséum National d'Histoire Naturelle )  
aufavereau@gmail.com*

*Bellina, Bérénice - (Centre National de la Recherche Scientifique )  
berenice.bellinapryce@gmail.com*

By the middle of the first millennium BC, pottery with shared morpho-stylistical features - the so-called Sa Huynh-Kalanay type of pottery - are found associated with valuable artefacts in metal, glass and stone scattered along the South China Sea, from the Thai-Malay peninsula to the West to the Philippines to the East.

The technological analysis of these ceramics aims at characterising this cultural sphere and how individuals, goods, technologies and ideas have been circulating within the sphere. A particular focus is made on corpus unearthed from settlement and cave sites in the Kra Isthmus excavated by the Thai-French archaeological mission, a region which was highly involved in the early days of the maritime silk roads.

There, the diversity of these ceramics, some locally made others imported, reflect a complexity that echoes the deep social, political and economic evolution this region was then facing. We investigate these trajectories by analysing the different groups of ceramic producers and consumers, the organization of ceramic distribution within the peninsula and its insertion in the South China Sea networks.

ORAL

## 13. CHRONOLOGY AND PALAEOENVIRONMENTAL SIGNIFICANCE OF PLEISTOCENE DEPOSITS IN TAPON CAVE, PALAWAN, THE PHILIPPINES

*Choa, Omar - (UMR 7194 CNRS - Département de Préhistoire du Muséum national d'Histoire naturelle (MNHN), 1 rue René Panhard, 75013 Paris, France) ochoa@edu.mnhn.fr*

*Gallet, Xavier - (UMR 7194 CNRS - Département de Préhistoire du Muséum national d'Histoire naturelle (MNHN), 1 rue René Panhard, 75013 Paris, France) gallet@mnhn.fr*

*Dizon, Eusebio - (Archaeology Division, National Museum of the Philippines, Old Congress Bldg, P. Burgos St, Ermita, Manila, the Philippines & Archaeological Studies Program, University of the Philippines - Diliman, Quezon City, the Philippines) drbongdizon@yahoo.com*

*Ronquillo, Wilfredo - (Archaeology Division, National Museum of the Philippines, Old Congress Bldg, P. Burgos St, Ermita, Manila, the Philippines) wpronquillo@yahoo.com*

Jago-on, Sheldon C. - (Archaeology Division, National Museum of the Philippines, Old Congress Bldg, P. Burgos St, Ermita, Manila, the Philippines) scbjagoon@yahoo.com

Ghaleb, Bassam - (GEOTOP, Université du Québec à Montréal, C.P. 8888 Montréal, Québec H3C 3P8, Canada) ghaleb.bassam@uqam.ca

Lebon, Mathieu - (UMR 7194 CNRS - Département de Préhistoire du Muséum national d'Histoire naturelle (MNHN), 1 rue René Panhard, 75013 Paris, France) lebon@mnhn.fr

Détroit, Florent - (UMR 7194 CNRS - Département de Préhistoire du Muséum national d'Histoire naturelle (MNHN), 1 rue René Panhard, 75013 Paris, France) fdetroit@mnhn.fr

Falguères, Christophe - (UMR 7194 CNRS - Département de Préhistoire du Muséum national d'Histoire naturelle (MNHN), 1 rue René Panhard, 75013 Paris, France) falguere@mnhn.fr

Sémah, François - (UMR 7194 CNRS - Département de Préhistoire du Muséum national d'Histoire naturelle (MNHN), 1 rue René Panhard, 75013 Paris, France) semahf@mnhn.fr

Tabon Cave in Palawan, the Philippines is one of the most important sites for the understanding of regional prehistory in Southeast Asia. First excavated by Dr Robert Fox of the National Museum of the Philippines in the 1960s and later reinvestigated through a partnership between the National Museum of the Philippines and the Muséum national d'Histoire naturelle in Paris, France in the 2000s, the cave has delivered the earliest confirmed Homo sapiens remains in the Philippines dating back to as far as around 47,000 years ago. Upper Palaeolithic occupation layers characterised by chert flake assemblages, as well as later jar burials placed in the Philippine Early Metal Age, make Tabon Cave important for understanding the lifeways of early modern man in the region. The lack of complete stratigraphical information, however, has hampered the construction of a sound geochronological framework for the cave. In an attempt to address this, stratigraphic studies were undertaken in recent years, and the presence of organic deposits consisting of guano in various stages of alteration was brought to the fore. Mineralogical characterisation of these deposits reveals phosphate mineral assemblages that could have implications for the preservation of archaeological remains and thus touch on issues of prehistoric cultural heritage, while geochemical analysis suggests that the deposits could be used for geochronological and palaeoenvironmental reconstruction. Efforts to apply uranium-series dating to the deposits have so far not borne positive fruit due to the open-system nature of the cave with respect to uranium mobility, but investigation of  $^{13}\text{C}$  and  $^{15}\text{N}$  isotopes suggests the possibility of inferring information on vegetation and ecology. Ongoing research on Tabon Cave combines and expands these various approaches in order to gain a deeper understanding of the archaeological preservation, geochronology, and palaeoenvironment of the site.

ORAL

#### 14. 40AR/39AR DATING OF THE ARCHAEOLOGICAL LAYERS IN MATA MENGE, INDONESIA

Lindelof, Poul Erik - (Niels Bohr Institute and Saxo Institute, University of Copenhagen) lindelof@it.dk --<http://www.nbi.ku.dk/english/about/>

Bohr, Niels (Institute Blegdamsvej 17, 2100 Copenhagen) <http://www.nbi.ku.dk/english/about/>

Southeast Asia plays an important role in understanding the human evolution (Dennell 2009). On Java, Indonesia, 1.6 million years old Homo erectus skeletons and artefacts show a very early immigration. The recent findings by Brumm et al. (2010) show that settlements on Flores are as early as 1 million years BP. This is in spite of two sea crossings of no less than 30 km. The discovery of Homo floresiensis on Flores has accelerated the interest.

In 2011 a major excavation at Mata Menge was ongoing, and I took volcanic material for dating of layers just above the archaeological artefact layer [Lindelof 2013]. The findings of fossils of Stegodons (elephants) and of stone artefacts indicated former life at a seabrink. In the laboratory at Roskilde University, Denmark, sanadine (potassium feldspar) crystals were collected out of the volcanic ash. Irradiation in a nuclear reactor converted a known part of the remaining  $^{40}\text{K}$  into  $^{39}\text{Ar}$ . This was then the precondition for Ar mass spectroscopy, and the ratio of  $^{40}\text{Ar}$  to  $^{39}\text{Ar}$  was determined by stepwise heating of the sanadine crystals. This, in turn, yielded an accurate age of the sanadine crystals from the volcanic eruption.

The volcanic layer on top of the archaeological layer at Mata Menge was dated by the  $^{40}\text{Ar}/^{39}\text{Ar}$  method to  $1.02 \pm 0.02$  million years BP. This was surprisingly close to the  $^{40}\text{Ar}/^{39}\text{Ar}$  dating at Wolo Sege and indicated a population of presumably Homo erectus at that time. There are always possibilities of rework due to streaming water, which may confuse chronology. But the very large fossils of Stegodons found and the two independent datings as well as studies of the volcanic layers makes this unlikely.

A volcanic layer at Mata Menge immediately above a layer with archaeological artefacts and animal fossils has been dated by the  $^{40}\text{Ar}/^{39}\text{Ar}$  technique. The result is  $1.02 \pm 0.02$  million years BP. The results are much more accurate than the previous fission track methods. Together with the previous  $^{40}\text{Ar}/^{39}\text{Ar}$  dating at Wolo Sege only 1 km away from Mata Menge in the Soa Basin, the results confirm human settlements on Flores to at least 1 million years BP.

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age estimates resulting from the implementation of several dating methods, though being sometimes less precise, have a higher reliability.

ORAL

**15. GEOCHRONOLOGY OF EARLY HUMAN SETTLEMENTS IN JAVA: WHAT IS AT STAKE?**

*Falguères, Christophe - (CNRS/MNHN) falguere@mnhn.fr*  
*Saleki, Hassane - (MNHN) saleki@nomade@fr*  
*Hameau, Sébastien - (MNHN) sebastien\_hameau@yahoo.fr*  
*Tu, Hua - (Nanjing University) huatu87@hotmail.com*  
*Feraud, Gilbert - (University of Nice) Gilbert.Feraud@unice.fr*  
*Simanjuntak, Truman - (Center for Prehistoric and Austronesian Studies (CPAS) simanjuntaktruman@mnhn.fr*  
*Widianto, Harry - (Ministère de la culture, Jakarta) h-widianto@indo.net.id*  
*Semah, François - (MNHN) semahf@mnhn.fr*

Java Island geodynamic context may be a priori considered as a favourable one in order to build a detailed chronological framework of early human settlements, from the oldest Homo erectus fossils recovered in Lower Pleistocene layers up to the dispersals that followed the severe environmental change subsequent to the Holocene sea level rise. Such a long history of human presence in the Southeast Asian archipelagos includes numerous milestones that are critical for the study of human lineage (e.g. the dating of early Palaeolithic archaeological assemblages or the replacement of Homo erectus by Homo sapiens).

This paper provides examples of various methods that are currently implemented on volcanic effluents, sedimentary elements, speleothems and fossil animal remains, including radiometric and palaeodosimetric grounded techniques as well as magnetostratigraphy. Analyses may also be performed directly on human remains. Though isolated results are sometimes widely disseminated in the scientific literature in order to support chronological hypotheses addressing the above mentioned scientific issues.

However, a number of results must be considered with caution, in order to identify bias that might be for example linked to uncertainties related to several analytical parameters, to the geochemical evolution of the sedimentary matrix, or to the natural reworking of dated minerals (e.g. natural sweeping of volcanic chimneys, erosion and re-deposition of volcanic tuffs).

Such bias, mostly related to this contextual complexity, might well explain apparent contradictions between absolute dating results and other, chronologically significant records (e.g. the biostratigraphical one). Experience shows that converging

ORAL

**16. GEOLOGICAL STRUCTURE, SEDIMENTATION DYNAMICS AND PREHISTORY IN THE SOUTHEASTERN PART OF THE SANGIRAN DOME (JAVA-INDONESIA): RESEARCH AND CONSERVATION STRATEGIES**

*FPurnomo, Andri - (PREHsea, www.prehsea.mnhn.fr) andri.purnomo@live.com*  
*Sémah, François - (UMR 7194 CNRS - Département de Préhistoire du Muséum national d'Histoire naturelle (MNHN), 1 rue René Panhard, 75013 Paris, France) semahf@mnhn.fr*  
*Simanjuntak, Truman - (enter for Prehistoric and Austronesian Studies (CPAS) Indonesia) simanjuntaktruman@gmail.com*

The Sangiran Dome (Central Java, Indonesia) is one of the most important sites regarding Homo erectus evolution, including dispersals and adaptation to isolated conditions during the Late Lower and Early Middle Pleistocene. Though, characterized archaeological assemblages are still rare poorly studied in the dome.

The SSE quarter of the dome, between Dayu and Pucung villages, includes the sites that yielded the oldest artefacts found in Sangiran, the quite complete Sangiran 17 Homo erectus skull, and several important archaeological and paleontological layers.

Cartographic and structural records allow to locate the main sites along a synthetic stratigraphical log, and also to discriminate several structural zones (where the dip varies) linked to the formation of the dome. Our work, that includes the excavation of the Pucung PCTS site, provides a stratigraphical and structural instrument which is hopefully able to help future paleontological and archaeological surveys, allowing to infer the probable location of rich horizons in the topography and to identify possibilities regarding conservation aspects and values.

POSTER

**17. MOLLUSCAN ISOTOPE GEOCHEMISTRY AND SEDIMENTOLOGICAL ANALYSES FOR PALAEOENVIRONMENTAL RECONSTRUCTION OF THE EARLY PLEISTOCENE IN SANGIRAN DOME, CENTRAL JAVA, INDONESIA**

*Jatiningrum, Resti - (UMR 7194 CNRS - Département de Préhistoire du Muséum national d'Histoire naturelle, 1 rue René Panhard, 75013 Paris, France) restisamyati@yahoo.com*

*Joordens, Josephine C.A. - (Faculty of Archaeology, Leiden University, P.O. Box 9515, 2300 RA Leiden, The Netherlands & PREHsea, mnhn.fr) j.c.a.joordens@arch.leidenuniv.nl*

*Purnomo, Andri - (PREHsea, www.prehsea.mnhn.fr) andri.purnomo@live.com*

*Wesselingh, Frank P. - (Naturalis Biodiversity Center, P.O. Box 9517, 2300 RA Leiden, The Netherlands) frank.wesselingh@naturalis.nl*

*Vonhof, Hubert. B - (Faculty of Earth and Life Sciences, VU University, De Boelelaan 1085, 1081 HV Amsterdam, The Netherlands) vonh@falw.vu.nl*

*Sémah, Anne-Marie - (Institut de Recherche pour le Développement, UMR LOCEAN 7159, 32 avenue Henri Varagnat, 93143 Bondy Cedex, France) anne-marie.semah@ird.fr*

*Sémah, François - (UMR 7194 CNRS - Département de Préhistoire du Muséum national d'Histoire naturelle (MNHN), 1 rue René Panhard, 75013 Paris, France) semahf@mnhn.fr*

The Sangiran Dome features Quaternary sediments that have yielded important fossil discoveries such as remains of *Homo erectus* and other vertebrates. Moreover, the Dome preserves an abundant molluscan fauna, stratified in a continuous succession that demonstrates the shift from a marine to a freshwater environment (upper Kalibeng and Lower Pucangan Formations). While research on the Early Pleistocene palaeoenvironment at the Dome has been underway, the approaches used so far have not included isotope geochemical studies of mollusc shells. Isotope geochemistry, notably the analysis of carbon, oxygen and strontium isotopes, is a powerful tool for palaeoclimatic and palaeoenvironmental reconstruction. In this study, we perform stable isotope analysis on growth increments and bulk carbonate of molluscan shells from 16 stratigraphic levels in the lower part of the Sangiran Dome series and combine this with sedimentological analyses to understand the scenario of climatic and environmental changes in the Early Pleistocene of Sangiran. It is hoped that the study will contribute to filling in the gaps in current knowledge on the environmental context of the Sangiran Dome, just prior to the arrival of earliest hominins on Java.

POSTER

**18. GENOMIC AND CRANIOMETRIC INSIGHTS ON PLEISTOCENE MODERN HUMAN DISPERSALS IN ASIA**

*Reyes-Centeno, Hugo - (Palaeoanthropology, Senckenberg Center for Human Evolution and Palaeoenvironment, Eberhard Karls Universität Tübingen) hugo.reyes-centeno@senckenberg.de*

*Ghirotto, Silvia (Università degli studi di Ferrara, Department of Life Sciences and Biotechnologies, Italy) silvia.ghirotto@unife.it*

*Détroit, Florent - (UMR 7194 'Département de Préhistoire, Muséum national d'Histoire naturelle, Paris, France) fdetroit@mnhn.fr*

*Grimaud-Hervé, Dominique - (UMR 7194, Dpt Préhistoire, MNHN, Paris, France) dgherve@mnhn.fr*

*Barbujani, Guido (Università di Ferrara - Dipartimento di Scienze della Vita e Biotechnologie) g.barbujani@unife.it*

*Harvati, Katerina (Palaeoanthropology, Senckenberg Center for Human Evolution and Palaeoenvironment, Eberhard Karls Universität Tübingen) katerina.harvati@ifu.uni-tuebingen.de*

While there is consensus that Africa is the primary place of origin for anatomically modern humans, the timing and geographical dispersal pattern out of the continent continues to be intensely debated. Out-of-Africa hypotheses include either a single dispersal out of the continent or multiple dispersals that entail an initial migration into Southeast Asia via a "southern route." In the latter scenario, Australo-Melanesian and "Negrito" populations of Southeast Asia have been hypothesized to represent descendants of the first modern humans in Asia. Using Mantel tests, we examined competing out-of-Africa models by determining the association of their geographical distance predictions with biological distances between modern human populations from Africa and Asia. Our biological data consisted of genomic single nucleotide polymorphisms of N=714 individuals and anatomical 3D landmark data of N=233 crania. Sampled individuals were grouped into ten populations demarcated by geographic and ethno-linguistic provenance. We controlled for ancient demographic effects by calculating effective population sizes and divergence times using the genomic data, as well as estimates from archaeological, paleontological, and climatological data.

The best supported model was a multiple dispersals scenario in which Australo-Melanesian populations are relatively isolated descendants of an early southern route dispersal, whereas other Asian populations are descended from members of a subsequent migration event. The genetic divergence estimate between South Africans and Melanesians at ~116 ka is in intriguingly close correspondence with archaeological and pa-

leontological evidence of modern human occupation in the Arabian Peninsula and the Levant. Interestingly, the Aeta/Agta "Negritos" of the Philippines were determined to be highly admixed descendants of both dispersal events.

Our biogeographical approach supports a multiple dispersals out-of-Africa model and a southern route into Asia. Our results have important implications for detailing the mode and tempo of modern human occupation in Southeast Asia. They point to the importance of continued field work in this region and highlight the value of integrative, multidisciplinary approaches.

Acknowledgements: This work was supported by the SenckenbergGesellschaftfürNaturforschung.

ORAL

### 19. OUT OF AFRICA AND INTO ASIA: POPULATION GENETIC AND CRANIOMETRIC PERSPECTIVES ON PLEISTOCENE MODERN HUMAN MIGRATIONS

*Reyes-Centeno, Hugo - (Palaeoanthropology, Senckenberg Center for Human Evolution and Palaeoenvironment, Eberhard Karls Universität Tübingen) hugo.reyes-centeno@senckenberg.de*

Recent multidisciplinary work has supported a model stipulating that Asia was populated by two separate modern human dispersal events from Africa (Reyes-Centeno et al., 2014; Reyes-Centeno et al., In Review), with an initial migration via a "southern route" into Southeast Asia and a subsequent migration into northern Eurasia. This scenario originated in large part from the "Negrito" hypothesis, which considers short-statured and dark skin-colored populations of Southeast Asia to be descendants of the first modern humans in Asia and from a common ancestor. In this talk, I review how population genetic and craniometric data of Pleistocene-Holocene modern humans were used as two independent lines of biological evidence for testing competing dispersal models. Likewise, the "Negrito" hypothesis is revisited by looking at how the Aeta/Agta of the Philippines have been determined to be a highly admixed population descended from both dispersal events (Reyes-Centeno et al., 2013, 2014). These findings are placed in the context of other lines of evidence, assessing to what degree a multiple dispersals and southern route model is consistent with the extant archaeological, paleontological, and climatological records.

Acknowledgements: This work was supported by the Senckenberg Gesellschaft für Naturforschung.

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### 20. MIDDLE MENINGEAL VASCULAR SYSTEM IN INSULAR ASIAN HOMO ERECTUS AND CONTEMPORANEOUS EUROPEAN FOSSILS HOMININS

*Grimaud-Hervé, Dominique - (UMR 7194, Dpt Préhistoire, MNHN, Paris, France) dgherve@mnhn.fr*

Among hominins, modern humans have the most complex meningeal patterning, with many vascular ramifications and anastomoses constituting a dense network. Differences in development and orientation of vascular impressions are observed during human evolution. Here, I compared the endocranial vasculature of contemporaneous human fossils remains from insular Asia (Java) and western Europe.

Comparison were made between the endocasts of fossil humans from insular Asian (Sangiran, Trinil, Sambungmacan and Ngandong, Java) and contemporaneous European sites (Arago, Swanscombe, Reilingen, Biache-Saint-Vaast 1) and some classical Homo neanderthalensis (e.s. La Chapelle aux Saints, La Ferrassie, La Quina...). This endocranial material is described morphologically with specific attention to their dural venous sinuses and middle meningeal impressions. Comparison between these two geographical samples is done chronologically.

The morphology of sinus impressions are similar for most specimens, with the exception of the development of the sphenoparietal sinus, which is more developed in later European specimens. The pattern of middle meningeal vascular impressions of all insular Asian and European endocasts shows identical development, even through time.

The question is how does one interpret the similar pattern of middle meningeal system evolution in such large and distant geographical region?

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### 21. AUSTRONESIAN WESTWARD EXPANSION: MAANYAN INDONESIAN GROUPS AND THE SETTLEMENT OF MADAGASCAR

*Kusuma, Pradiptajati - pradiptajati.kusuma@gmail.com (Laboratoire d'Anthropologie Moléculaire et Imagerie de Synthèse UMR5288, Université Paul Sabatier Toulouse-III, Toulouse, France; Eijkman Institute for Molecular Biology, Jakarta, Indonesia)*

*Cox, Murray P. - Institute of Molecular BioSciences, Massey University, Private Bag 11 222, Palmerston North, New Zealand*



land) [m.p.cox@massey.ac.nz](mailto:m.p.cox@massey.ac.nz)

Razafindrazaka, Harilanto - (Laboratoire d'Anthropologie Moléculaire et Imagerie de Synthèse UMR5288, Université Paul Sabatier Toulouse-III, Toulouse, France)

[razafindrazaka.harilanto@gmail.com](mailto:razafindrazaka.harilanto@gmail.com)

Letellier, Thierry - (Laboratoire d'Anthropologie Moléculaire et Imagerie de Synthèse UMR5288, Université Paul Sabatier Toulouse-III, Toulouse, France) [thierry.letellier@u-bordeaux2.fr](mailto:thierry.letellier@u-bordeaux2.fr)

Herawati, Sudoyo - (Eijkman Institute for Molecular Biology, Jakarta, Indonesia) [herawati@eijkman.go.id](mailto:herawati@eijkman.go.id)

Ricaut, François-Xavier - (Laboratoire d'Anthropologie Moléculaire et Imagerie de Synthèse UMR5288, Université Paul Sabatier Toulouse-III, Toulouse, France) [francois-xavier.ricaut@univ-tlse3.fr](mailto:francois-xavier.ricaut@univ-tlse3.fr)

The spread of Austronesian-speakers is the widest expansion in human history, occurring eastward across the Pacific Ocean and westward across the Indian Ocean to Madagascar. The settlement of Madagascar by Austronesian-speakers more than 1000 years ago may be considered as one of the last major Austronesian expansions.

The genetic, cultural and linguistic characteristics of the Malagasy suggest that people from both Africa and Island Southeast Asia (ISEA) were involved in the colonization of the island. However, populations from the Indonesian archipelago played a major role as (1) linguistic evidence suggests that the Malayo-Polynesian language spoken by the Malagasy is related to the Barito language of southern Borneo (Maanyan speakers), and (2) genetic evidence suggests that the Southeast Asian genetic ancestry of the Malagasy may have originated from populations in the Java-Kalimantan-Sulawesi area. Despite these results, major issues remain unresolved regarding the contribution of Indonesian populations to the settlement of Madagascar.

In this paper we aim to determine if the linguistic affinity between Maanyan speakers (Barito River) and Malagasy (Madagascar) is correlated with a genetic affinity, and, if there is a sex bias origin of the Malagasy (Malagasy men and women have different origins in Indonesian archipelago).

The study uses Indonesian samples, well-defined from their historical/linguistic contexts, as the best proxy of descendants of those populations involved in the settlement of Madagascar. DNA was collected from 145 Ma'anyan individuals from 14 villages (Tamiang Layang region, Central Borneo), analysed using uniparental markers (mitochondrial DNA and Y chromosome) and compared to more than 102 Indonesian populations from 24 islands and 4 Malagasy populations.

Phylogeography analysis of maternal and paternal DNA lineages suggest multi-regional ancestral origins of the Malagasy in Indonesia (several Indonesian sources), and a Maanyan contribution restricted mainly to male lineages.

Our data support a more complex scenario of Austronesian-speakers settlement in Madagascar than is currently recognised.

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## 22. THE EVOLUTIONARY HISTORY OF THE GENUS HOMO IN ISLAND SOUTHEAST ASIA: A PALAEOANTHROPOLOGICAL TEST OF THE HYPOTHESES OF HYBRIDIZATION AND INSULAR ENDEMISM

Détroit, Florent - (UMR 7194 ' Département de Préhistoire, Muséum national d'Histoire naturelle, Paris, France) [fdetroit@mnhn.fr](mailto:fdetroit@mnhn.fr)

Mijares, Armand Salvador B. (Archaeological Studies Program, University of the Philippines, Quezon City, Philippines) [armand.mijares@up.edu.ph](mailto:armand.mijares@up.edu.ph)

Corny, Julien (UMR 7268 - Faculté de Médecine, Université Aix-Marseille, Marseille, France) [julien.corny@univ-amu.fr](mailto:julien.corny@univ-amu.fr)

Ingicco, Thomas - (Archaeological Studies Program, University of the Philippines, Diliman) [thomas.ingicco@gmail.com](mailto:thomas.ingicco@gmail.com)

Grimaud-Hervé, Dominique - (UMR 7194, Dpt Préhistoire, MNHN, Paris, France) [dgherve@mnhn.fr](mailto:dgherve@mnhn.fr)

Dizon, Eusebio Z. (National Museum of the Philippines and Archaeological Studies Program, University of the Philippines, Quezon City, Philippines) [drbongdizon@yahoo.com](mailto:drbongdizon@yahoo.com)

Since the late XIXth century, the Southeast Asian archipelagos have played a central role in the study of the extinct species *Homo erectus*. To the contrary, the study of *H. sapiens* in the same region received much less attention. Since the 1990' however, several field researches and analytical approaches developed in Indonesia and the Philippines brought to light important fossil finds and significant new results. Those discoveries and data are particularly relevant to a better understanding of the origin and evolutionary history of *H. sapiens* and its contemporaries in the region, including the diminutive insular endemic species *H. floresiensis*. In the same time, numerous results obtained from population genetics and ancient DNA focused a particular attention on several aspects of human evolution in the easternmost part of the Old World. While Africa is still widely recognized as the major place of origin of the species *H. sapiens*, the hypothesis of several episodes of interbreeding between local populations of archaic hominins and newly arriving modern humans is becoming more and more pregnant. In some scenarios, Island Southeast Asia East of the Wallace Line is even seen as the most probable place for past events of hybridization with "Denisovans".

Using 3D geometric morphometrics, we examine the size and shape characteristics of the predecessors of *Homo sapiens* in East and Southeast Asia, as well as those of the Callao third metatarsal (MT3). Cranial shape analyses include large samples of Australasian fossil hominins, with a particular focus on the late Middle Pleistocene hominins from China (Dali, Jinniushan) and Indonesia ("Solo series"). The analyses show that late Middle Pleistocene Chinese hominins share cranial shape affinities with *H. sapiens*, while their Indonesian con-

temporaries present *H. erectus* –like cranial shapes, with the addition of derived features of their frontal bone. The second series of analyses aims at characterizing the size and shape affinities of the Callao MT3 that was directly dated to ca. 66 ka and thus represents the oldest human remain known from the Philippines so far. We present here the results of a Procrustes analysis that includes a large comparative sample of 138 third metatarsals of adult *H. sapiens* and other Asian mammals for which the morphology and size of the MT3 is relatively close to human. The shape of the Callao MT3 is clearly closer to that of *H. sapiens* than to any other group included in the analysis. It lies however at the margin of the variation of *H. sapiens*, with a small size and a series of particular anatomical traits.

Both series of results are discussed with particular reference to recent hypotheses on the origin and evolutionary history of *H. sapiens* that accommodate in their scenarios one or several episodes of hybridization with archaic hominins, as well as the influence of isolation and insular endemism on human groups in Southeast Asia.

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### 23. THE LATEST DISCOVERIES OF HOMO ERECTUS IN JAVA ISLAND

*Widianto, Harry - (Directorate of Cultural Heritage Preservation and Museums, Directorate General of Culture, Ministry of Education and Culture, Republic of Indonesia) h-widianto@indo.net.id*

*Grimaud-Hervé, Dominique - (UMR 7194, Dpt Préhistoire, MNHN, Paris, France) dgherve@mnhn.fr*

Hominid, *Homo erectus*, and Java Island are three inseparable words on the human evolution context in the world. The discovery from the ancient deposits of Kendeng Hills – cut off by the Bengawan Solo river- in Trinil, East Java, in 1891, had enlightened the knowledge about the early man. From such deposits, Eugene Dubois discovered – for the first time- a species of an early man called *Pithecanthropus erectus*.

Based on this, paleoanthropology science was born in this eastern region of Southeast Asia, that later becomes one of the reputed centers of human evolution in the world, with further discoveries from: Sangiran (Solo depression), Kedungbrubus and Mojokerto (Kendeng Hills range), Ngandong and Ngawi (Bengawan Solo alluvial deposit), Patiyam (Muria volcanic deposit), and Samedo (North Serayuvolcanic range). The morphological comparisons, traditional linear measurements for 2D metric analysis and landmarks for 3D geometric morphometric analysis studied on the assemblage of *Homo erectus* specimens in Java had unveiled three stages of human evolution: archaic *Homo erectus* (1.5 – 0.9 my), typical *Homo erectus* (0.8 – 0.3 my), and progressive *Homo erectus* (0.2 – 0.1 my).

As a matter of fact, the discovery machine never stops working on this area. For the last 10 years, various kinds of human fossils have been exposed. These findings add not only the quantity of existing information, but also the new information. A 700.000 years old skull cap from Samedo, Tegal, western part of Central Java, for example, gave a new look on the migration mechanism of the early man in Java Island during the Pleistocene. The site was located in the tip of north western part of Central Java, far from other hominid sites where normally located in the eastern part of Central Java and East Java. These discoveries of *Homo erectus* will be presented along with the spectacular discovery of *Homo floresiensis* in East Nusa Tenggara.

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### 24. THE FAUNA OF SONG TERUS CAVE (EAST JAVA, INDONESIA) AND LGM IMPACT ON THE SUNDA SHELF : IS THE KEPEK FAUNA AN IMPOVERISHED WAJAK FAUNA?

*Ingicco, Thomas - (Archaeological Studies Program, University of the Philippines, Diliman) ingicco@mnhn.fr*

*Moigne, Anne-Marie - (Département de Préhistoire, UMR7194-CNRS, Muséum National d'Histoire Naturelle, Paris, France) moigne@mnhn.fr*

*Setiagama Fajar, Kasman - (Directorate of internalization of values and cultural diplomacy, Jakarta, Indonesia) kasman.setiagama@gmail.com*

*Amano, Noel - (Département de Préhistoire, UMR7194-CNRS, Muséum National d'Histoire Naturelle, Paris, France) noelamano@rocketmail.com*

*Kusno, Abi - (Directorate of cultural properties and museums, Jakarta, Indonesia) kusnoabi@yahoo.com*

*Mirza, Ansyori - (Pusat Arkeologi Nasional, Jakarta, Indonesia) ansyorimirza@gmail.com*

*Détroit, Florent - (Département de Préhistoire, UMR7194-CNRS, Muséum National d'Histoire Naturelle, Paris, France) fdetroit@mnhn.fr*

*Sémah, Anne-Marie - (Institut de Recherche pour le Développement, UMR LOCEAN 7159, Bondy, France) Anne-marie.semah@ird.fr*

*Sémah, François - (Département de Préhistoire, UMR7194-CNRS, Muséum National d'Histoire Naturelle, Paris, France) semahf@mnhn.fr*

Among the seven biozones presently used for Java Island Quaternary, the most recent one, the so-called Wajak, composed of modern species, has recently been aged to before the Last Glacial Maximum (28.5 ka; Strom et al., 2013). The consequence is the absence of any description of the faunal diversity of Java after the dry OIS2 and the related impact of

the possible resulting impoverished fauna on Australo-Melanesian prehistoric groups behavior.

The Southern Mountains that border the Indian Ocean coast in East Java (Indonesia) include karstic massifs such as the Gunung Sewu near Punung, in which numerous caves recorded human occupation of the area since the late Middle Pleistocene. Most of them include rich archaeological records dating back to the early Holocene.

The Song Terus cave, excavated since the 1990s, provides a rich sequence dated around 9 000 BP, so-referred to as Keplek layers, including the remains of occupation floors and human burials as well. It documents a strong relationship between the pre-Neolithic groups and the monkey communities (mostly *Trachypithecus auratus*), that is illustrated in the analysis of subsistence, technical and symbolic behaviors.

Although those prehistoric groups show some specialization, the fauna appears to be very diverse, including very large mammals such as *Rhinoceros sondaicus* or *Elephas maximus*. The whole range of the extant climatic mammalian fauna of Java are represented in the Keplek assemblage of Song Terus, including *Bibos sondaicus*, *Bubalus*, *Axis kuhli* and *Cervus timorensis*, *Sus vittatus*, *Panthera tigris*, *Cuon javanicus*, *Paradoxurus*, *Martes* and *Herpestes*. Grounding on the recently published Wajak fauna dating, it appears that no major extinction seems to have occurred during the LGM, while several species disappeared (or would have if not protected) more recently. Notable, cultural differences appear between the Holocene layers and the older ones, among them are forest games targets, symbolic behaviors and the utilization of the osseous industry which appears to be much more intense.

Further characterization of this naturally equilibrated fauna is also critical to understand the disturbances resulting from the later introduction of domestic species by Austronesian people.

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### 25. THE CULTURAL ANTIQUITY OF RAINFORESTS: A 6000 YEAR ENVIRONMENTAL AND ARCHAEOLOGICAL RECORD FROM THE INTERIOR HIGHLANDS OF SARAWAK, MALAYSIAN BORNEO

*Jones, Samantha - (IPHES) sjones@iphes.cat*

Tropical rainforests contain a wealth of resources for health, construction, food and commodities. Survival and development is about knowing how to manage the resources around you. It seems only natural that modern-humans (*Homo-Sapiens*) have always been altering and manipulating tropical forests, to gain maximum benefit from these economically useful plants. This is far from previous beliefs, that tropical forests remained pristine environments, relatively untouched by humans; the

cultural antiquity of early tropical forest manipulation by hunter gatherers and the transition to farming however, is still poorly understood. This is partly due to rapid decomposition and poorer preservation of organic material in tropical environments. It is also due to the rich biodiversity of plant specimens in tropical forests, making accessibility to search for archaeological sites difficult. In 2005, the International Timber Trade Organisation (ITTO) mapped c. 50 archaeological sites around the Kelabit Highlands of Sarawak, Malaysian Borneo. This led to the establishment of an interdisciplinary project in 2007, directed by Professor Graeme Barker from the McDonald Institute at Cambridge University and sponsored by the Arts and Humanities Research Council (AHRC). The project was entitled 'The Cultured Rainforest project' and combined anthropology, archaeology and palaeoecology to investigate the long term and the present day interactions between people and the rainforest in the interior highlands of Borneo, with an aim to better understand past and present agricultural and hunter-gatherer lifestyles and landscapes.

Archaeological sites were selected predominantly from the southern Kelabit Highlands within the vicinity of Pa'Dalih and Long Kelit. Sites selected included abandoned settlement sites, occupation sites, ditches and cemeteries. Palaeological sites were selected from both the northern and southern Kelabit Highlands. Multi-proxy analysis was undertaken on cores extracted from Bario, Pa'Dalih and Pa'Buda. Analysis included pollen, phytoliths, lithology, magnetic susceptibility and loss on ignition, and produced a 50,000 year environmental record from two of the cores.

The archaeological excavations and palaeoecological analysis combined produced a c. 6000 year record of potential human clearance episodes and a c. 3800 year record of potential settlement; although secure evidence of human occupation and cultivation is not present until c. 2800 cal BP. This includes archaeological contexts which stretch back almost 2000 years and evidence for palm cultivation c.2800 cal BP. Experimental forms of rice cultivation may also have been taking place 1800 cal BP: although evidence is limited and does not become pronounced in the record until more recently.

Project Members:

Prof. Graeme Barker (Principle Investigator-Mc Donald Institute Cambridge), Dr Lindsay Lloy-Smith, Dr Huw Barton, Dr Monica Janowski, Prof. Chris Gosden, Dr Lucy Farr, Dr samantha Jones, Dr Ian Ewart, Dr Chris Hunt, Dr Borbala Nyiri, Ipoi Datan (Director-Sarawak Museum), Dr Dan Britton, Dr Ben Davenport, Dr Beth Upex, Henry, Reedy, Dr.Efrosyni Boutsikas, Jeffrey (Tadan Bala), Dr Rose Ferraby).

#### Websites

CRF Website: <http://www.landscape.ac.uk/landscape/research/largergrants/theculturedrainforest.aspx>

Virtual tour of the CRF archaeological sites: <http://www.z360.com/sara/>

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#### ORAL

### 26. DETERMINING HUMAN SUBSISTENCE STRATEGIES IN INSULAR ENVIRONMENTS: ZOOARCHAEOLOGICAL INSIGHTS FROM WALLACEA ISLANDS

*Samper Carro, Sofia Cristina - (Department of Archaeology & Natural History, ANU College of Asia & the Pacific, Australian National University) sofia.samper@anu.edu.au*

*O'Connor, Susan - (Archaeology & Natural History, ANU College of Asia & the Pacific, Australian National University) sue.oconnor@anu.edu.au*

*Louys, Julien - (Department of Archaeology & Natural History, ANU College of Asia & the Pacific, Australian National University) julien.louys@anu.edu.au*

The islands of Wallacea (which include Alor, Pantar, Lembata, Kisar, Leti, Wetar and Timor) are remarkable on a world scale as they register first hominin occupation by 60,000 cal BP, with firm evidence of permanent habitation by modern humans by 45,000 cal BP. Despite lower sea level during the late Pleistocene, these islands have never been connected to Sunda (including the Malay Peninsula, Borneo, Sumatra and Java) or Sahul (including Australia and New Guinea). Thus, crossing to any of the Wallacean islands resulting in sustainable populations would have required the use of watercraft.

Jerimalai rock shelter, East Timor, has yielded remains of pelagic fishes, as well as the earliest fishhook manufacture demonstrating that early modern humans in this region were well equipped to undertake complex exploitation of the marine environment. Despite the impoverished land-based fauna identified in Wallacea, stegodons, rodents, marsupials, birds and bats were or are still present on many island and would potentially also be exploited by early modern humans. Nevertheless, a holistic understanding of human subsistence strategies on these islands during the Pleistocene remains elusive. This research focuses on the taphonomic analysis of zooarchaeological assemblages from late Quaternary sites in Wallacea. The analysis of skeletal part representation, mortality and fragmentation patterns, and anthropogenic bone modifications (i.e. cut marks, burning, deliberate fracturing to produce bone tools or to access marrow etc.) in archaeological deposits and their comparison with naturally-occurring deposits will provide insights of the subsistence patterns of past human populations in these isolated islands.

The results of this study contribute to identifying whether hu-

man subsistence strategies in Wallacea were predominately arboreal-based, coastal-strand/marine-based or hybrid systems.

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### 27. HUMAN BEHAVIOR AND SUBSISTENCE STRATEGIES IN EASTERN JAVA DURING THE PLEISTOCENE-HOLOCENE TRANSITION: FAUNAL REMAINS FROM SONG TERUS AND BRAHOLO CAVE

*Amano, Noel - (Département de préhistoire du Muséum national d'histoire) noelamano@rocketmail.com*

*Moigne, Anne-Marie - (Département de préhistoire du Muséum national d'histoire) moigne@mnhn.fr*

*Simanjuntak, Truman - (enter for Prehistoric and Austronesian Studies (CPAS) Indonesia) simanjuntaktruman@gmail.com*

*Ingicco, Thomas - (Archaeological Studies Program, University of the Philippines Diliman) thomas.ingicco@upd.edu.ph*

*Sémah, Anne-Marie - (Département de préhistoire du Muséum national d'histoire) Anne-marie.semah@ird.fr*

*Sémah, François - (Département de préhistoire du Muséum national d'histoire) semahf@mnhn.fr*

The climatic fluctuations and the resulting changes in configurations of tropical rainforest in Island Southeast during the Pleistocene-Holocene transition is supposed to have greatly impacted human societies during the period. One way to evaluate human adaptation is to look at faunal remains accumulated in archaeological sites, since they can provide direct evidence for subsistence and hunting strategies and to a general extent human-environment interaction. In this paper, we look at the faunal assemblages recovered from Late Pleistocene to Mid-Holocene layers of Song Terus and Braholo Cave sites in Eastern Java. The faunal turnover observed in these sites have provided concrete evidence for a broad-scale paleoenvironmental reconstruction of the region (see Sémah et al. & Ingicco et al., this session).

First, we present preliminary data from the analyses of cervid postcranial functional anatomy and ecomorphology and their utility as evidence in providing a detailed picture of the environment where past human populations foraged and hunted. Cervid ecomorphology could provide a suitable addition in the suite of paleoenvironmental proxies that currently exist for the area. Cervid species were present in the site all throughout the archaeological sequence, and akin to human groups, they developed behavioral adaptations in response to the dramatic shift in the environment during the onset of the Holocene. Specifically we look at the outlines of the proximal articular surface of the metapodials which are directly related to the substrate/ground hardness (i.e. wet, dry ground) and by extension to the vegetation cover (i.e. close, open environment).

In depth analysis of cervid functional anatomy could also provide insights on the range of environment types utilized by human groups through time.

We then consider these paleoenvironmental reconstructions as a background for detailed zooarchaeological and taphonomical analyses of faunal assemblages from the Song Terus and Braholo Cave. We looked at taphonomic indicators such as carnivore modifications, bone surface damage and skeletal element representation to fine tune the understanding of processes that resulted to the formation of the sites. We also focused at bone element fragmentation and butchery marks, including anatomical placement and microscopic analyses of cutmarks. Detailed analyses of these anthropic modifications, in contrast to those resulting from carnivores or other predators, allowed us to elucidate on carcass processing sequence and ultimately to describe, depending on the animal taxa, the different stages of scavenging, hunting or commensalism. We discuss the findings in the framework of whether changes in human behavior and relationship with animals during this key period resulted from climatic adaptations or cultural development.

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## 28. THE PALAEOENVIRONMENTAL CONTEXT OF THE PALAEOOLITHIC OF JAVA

*Sémah, Anne-Marie - (Institut de Recherche pour le Développement, UMR LOCEAN 7159, Bondy, France) anne-marie.semah@ird.fr*

*Moigne, Anne-Marie - (Département de Préhistoire, UMR7194-CNRS, Muséum National d'Histoire Naturelle, Paris, France) anne-marie.moigne@cerptautavel.com*

*Ingicco, Thomas - (Archaeological Studies Program, University of the Philippines, Diliman) thomas.ingicco@gmail.com*

*Purnomo, Andri - (Sangiran Conversion Office and PREHSEA project) andri.purnomo@live.com*

*Simanjuntak, Truman - (Pusat Arkeologi Nasional, Jakarta, Indonesia) simanjuntaktruman@gmail.com*

*Widianto, Harry - (Directorate of cultural properties and museums, Jakarta, Indonesia) h-widianto@indo.net.id*

*Sémah, François - (Département de Préhistoire, UMR7194-CNRS, Muséum National d'Histoire Naturelle, Paris, France) semahf@mnhn.fr*

Earliest Palaeolithic implements discovered in Java Island are older than 1 Ma, and largely postdate the oldest Homo erectus fossils discovered on the island. The archaeological record subsequently covers the appearance of Acheulean-like tools in early Middle Pleistocene deposits, a diversity of flake tools assemblages found in late Middle/ early Upper Pleistocene sites, and the conspicuous development of cave occupations

during the end of the Pleistocene and the early Holocene.

Along this time frame, the environment of Java was notably impacted by the severe environmental climatic changes which took place during the set up of Mid-Pleistocene characteristic conditions (duration and contrast of major climatic glacial cycles compared to Lower Pleistocene ones). It was impacted as well during conspicuous transitions which took place at the beginning of the Upper Pleistocene and, subsequently, at the boundary between OIS 2 and 1. Though, palaeoenvironmental reconstructions must also consider more local factors such as the repetitive effects of the tectonic and volcanic activities, which had severe consequences on local climate but also on the palaeogeography of the area, notably resulting into major erosional phases, vegetation disturbance, or even isolation of faunistic and floristic groups.

This paper grounds on examples of multidisciplinary studies carried out in Central and Eastern Java, mostly in the Sangiran Dome area (axial depression of the island) for the earliest considered periods and in the Punung karstic massif, along the coast of the Indian Ocean, for the younger ones. The environmental context of the ancient human settlements is considered under numerous aspects, among others: palaeogeography and dispersals (e.g. contacts with the continental mainland through land bridges), nature of the vegetal cover in relation with the extension of human groups' territories (tropical rainforest vs. more open forest or even grasslands during glacial stages), occupation ability of caves, nature and availability of lithic raw material. The associated vertebrate faunas, considered both as an environmental proxy and as a subsistence resource, were influenced in their composition by the contrast between periods of contact with the mainland (increased biodiversity) and periods of isolation favouring endemism, and by local environmental constraints as well.

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ORAL

## 29. A SUSTAINABLE REVIEW OF THE BENCHMARK SITES INCLUDING AILUROPODA-PONGO-STEGODON FAUNAL COMPLEX: THE PROBOSCIDEAN POINT OF VIEW

*Zeitoun, Valéry - (UMR 7207 (CR2P), CNRS-Upmc-Mnhn, Sorbonne universités, Université Pierre et Marie Curie, T. 46-56, 5ème étage, case 104, 4, place Jussieu, 75 252 Paris Cedex 05, France) pythecanthro@gmail.com*

*Chinnawut, Winayalai - (8th Regional Office of Fine Arts Department, Ubon Ratchathani, Thailand) chinstone@hotmail.com*

*Debruyne, Régis - (UMS 2700 OMSI, Service de Systématique Moléculaire du Mnhn, 57 rue Cuvier, CP26, 75231 Paris cedex 05, France) regis.debruyne@gmail.com*

*Frère, Stéphane - (INRAP-UMR7209, Archéozoologie, archéobotanique : sociétés, pratiques et environnements. CRAVO, 36 av*

*Paul Vaillant Couturier* 93120 La Courneuve, France) [sfrere@free.fr](mailto:sfrere@free.fr)  
*Rink, William Jack* - (School of Geography and Earth Sciences, McMaster University, 1280 Main St. W., Hamilton, Ontario, L8S 4L5, Canada) [rinkwj@mcmaster.ca](mailto:rinkwj@mcmaster.ca)  
*Auetrakulvit, Prasit* - (Department of Archaeology, Silpakorn university, Na Phra road, 10 220 Bangkok, Thailand) [sent.hw.aj.prasit@gmail.com](mailto:sent.hw.aj.prasit@gmail.com)

Proboscideans had very different ecologies, times of extinction and 'last stand' in different regions of the world and, Human-Proboscidean interaction may have a span of time covering almost two million years while paleoenvironmental conditions have played a noticeable role in the evolution of both taxa. Focussing on Southeast Asia, since the complex Ailuropoda-Pongo-Stegodon is considered to be a faunal association with chronological significance, further palaeoecological, palaeobiogeographical or biochronological studies are using this assemblage as a benchmark but do not provide sufficient information regarding site formation and duration to be consistent enough to do so. A critical review of the robustness of the geological, taphonomical and chronological data associated to this faunal assemblage suggests a deep reappraisal of this "biochronological assemblage". Focussing attention on the occurrence of Stegodon and Elephas, such a reappraisal is showing that both taxa may co-occur or replace each other, depending of the time resolution used.

ORAL

### 30. THE ROLE OF SUBSISTENCE, ADAPTATIONS AND ENVIRONMENTS IN THE FORMATION OF COMPLEX HUMAN SOCIETIES.

*Paz, Victor* - (Archaeological Studies Program, University of the Philippines Diliman) [victorpaz67@gmail.com](mailto:victorpaz67@gmail.com)

We try to make sense of patterns we see from our field data in very conventional ways. This paper will address two major ways we set as defaults when we formulate research questions, or when we try to make sense of discerned patterns from our excavations. The first way is to see patterns, in terms of transformations through time, as driven by a change in either environment/subsistence, or both. The second way is to limit the description we may call societal complexity within the confines of developed cereal agriculture, together with a suite of domesticated animals. I will argue based on my own observations working in Island Southeast Asia that these may not be the case in the deep human past. This paper will raise questions, and suggest alternative ways of looking at the patterns without prescribing alternative models. It will draw from my own personal research experience, and on my reading of the literature from work done in the region of Southeast Asia.

ORAL

### 31. THE POTTERY ASSEMBLAGE FROM LAANG SPEAN, CAMBODIA

*Plutniak, Sébastien* - (Lisst-Cers, EHESS, France) [sebastien.plutniak@ehess.fr](mailto:sebastien.plutniak@ehess.fr)  
*Sophady, Hang* - (Ministry of Culture and Fine Arts, Phnom Penh, Cambodia/MNHN- UMR7194 CNRS) [hsophady@yahoo.com](mailto:hsophady@yahoo.com)  
*Zeitoun, Valéry* - (UMR7207, CR2P-CNRS-UPMC-MNHN, France) [pythecanthro@gmail.com](mailto:pythecanthro@gmail.com)  
*Puaud, Simon* - (UMR7194 CNRS- MNHN-UPVD, France) [simon.puaud@mnhn.fr](mailto:simon.puaud@mnhn.fr)  
*Forestier, Hubert* - (UMR7194 MNHN-CNRS-UPVD, France) [hubforestier@gmail.com](mailto:hubforestier@gmail.com)  
*Mourer, Roland* - (3 rue Julien, 69 003 Lyon, France) [roland.mourer@online.fr](mailto:roland.mourer@online.fr)

The Laang Spean cave (western Cambodia) has been firstly investigated during the 70's by R. and C. Mourer. One of their most salient result lay in the discovery of a complete footed and ornate vessel. This vessel was associated date which led them to identify Laang Spean as a Neolithic settlement. Since 2009, a French-Cambodian Prehistoric project aims to go further into the archaeological potential of this site. After several decades of archaeological stagnation, data from Cambodia are now of crucial importance in order to supplement to the regional models of Neolithisation in South-East Asia, which have benefit from the numerous excavations performed in neighboring countries, notably in Thailand.

In 2011, Laang Spean appeared as a new landmark toward a better understanding of the late Prehistory in Indochina with the discovery of a burial dated back (radiocarbon dating of bone) to 3310±29 BP. The burial contains several items, including five complete pottery vessels and numerous sherds (stone adze, pierced canine of Suid used as finery, ochre pencil, etc.) Beside this material, pottery remains have also been found in the levels above the grave.

In this paper, we aim to present the results of the first analysis of this assemblage. We will present the main features of this material and discuss its potential relative chronology. Insights concerning the comparison with other sites will finally be given.

ORAL

### 32. INTO THE ORIENTAL ZONE AND OUT OF INDIA: ASYNCHRONOUS DISPERSAL ACROSS SOUTHERN ASIA?

*Blinkhorn, James* - (Université de Bordeaux) [jblinkhorn@outlook.com](mailto:jblinkhorn@outlook.com)

A major biogeographic boundary occurs in southern Asia, between the Saharo Arabian deserts that stretch into the Thar Desert of India and the Oriental zone spanning monsoonal India and South-East Asia. Crossing this interface may have required hominins to significantly readapt to new environmental and climatic regimes. A number of physical barriers also exist in southern Asia that may have impacted human dispersals. At both the east and west sides of the Indian subcontinent major rivers (Indus/ Ganges-Brahmaputra) and mountains (e.g. Iranian Plateau & Siwaliks/Patkai Range) may have complicated eastward population expansions into and out of South Asia. In addition, and unlike either South-West or South-East Asia, *Homo sapiens* fossils appear in the South Asian record ca. 30ka, significantly after their appearance in Australia. As a result, addressing patterns of hominin adaptation and dispersal is reliant upon comparative analyses of lithic assemblages. I will present a synthesis of the most recent Palaeolithic evidence from the Thar Desert following recent fieldwork at Katoati, Buddha Pushkar and Jogpura, which will be situated within the broader context of the South and South-East Asian record. An asynchronous model for dispersals into and out of South Asia is presented, indicating that eastward dispersals into South Asia are unlikely to occur at the same time as dispersals from India into South-East Asia.

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ORAL

**33. THE WORLD'S OLDEST HOMINIDS AND THEIR ARTEFACTS FROM THE SIWALIK HILLS OF SOUTH ASIA**

*Singh, M.P. - (Department of Biochemistry Post Graduate Institute of Medical Education and Research Chandigarh -160012 India.) mpsinghchd2000@yahoo.com*

The palaeoprimatological significance of the Siwalik Hills has yielded what is perhaps the world's most ancient early hominids and their artefacts. In December 1992, I discovered hominids teeth, mandibles, post-cranials and a skull cap in association with stone and ivory tools in the Tatrot Formation of the Upper Siwalik. The discovery was made from the Tatrot Formation exposed at Khetpurali and Masol village near Chandigarh, North India. The teeth are arranged in a parabolic dental arch and the enamel ultrastructure reveals pattern -3 prisms. The P3 is malariform and single rooted. The mandibles are devoid of simian-shelf. The femurs are platymeric and have medullary stenosis like that of *Homo erectus*. The patella has an oval-shaped articular facet crossed by a vertical ridge. The ilium is low, broad with posteriorly displaced sacral articular surface. The first metatarsal head presents a convex articular surface, the plantar portion

of which extends farther proximally than the dorsal like those of sapients. The groove on the cuboid bone suggests that the peroneus longus tendon had moved across the sole of the foot. On the navicular groove for the tibialis posterior is discernible. The skull cap is devoid of nuchal crest. The associated artefacts are chopper-type. Magnetostratigraphic dating of the Tatrot Formation ranges from 2.47 mya at the top to 5.44 mya at the base. The hominid-yielding bed is dated at 3.40 mya, i.e., Middle Pliocene. Palaeoecology of the Tatrot Formation was open grasslands having grassland community like *Hipparion*, *Leptobos*, *Stegodon* and *Sivatherium*, etc. The Upper Siwalik Plio-Pleistocene is marked by the first appearance of C4 grasslands. Oxygen isotopes also exhibit a shift from the forest to grasslands favoured by the monsoonal climate in the Plio-Pleistocene of the Siwalik Hills. The discovery will cast a new light on the human origins and invoke the Siwalik Hills of South Asia as the Garden of Eden.

The Upper Siwaliks exposed near Chandigarh (Fig. 1) are potentially important for the fossil remains of *Homo erectus* and stone tools. In November 1980, I made the first discovery from the Indian subcontinent fossils of *Homo erectus* and stone tools dated at 2 myr from the Pinjor Formation exposed at Nadah village (Singh in Kennedy, 1982a), (Singh, 1982b), (Singh, 1986a), (Singh, 1986b), (Singh et al, 1988), (Singh, 1989), (Singh, 1990), (Singh, 1991). In December 1992, and to-date exploration, I discovered fossils of *Homo erectus* i.e., femurs, patella, ilium, first metatarsal, cuboid, navicular, mandibles and a skull cap, etc., dated at 3.40 myr from the Tatrot Formation exposed at Khetpurali and Masol village (Singh, 1996), (Singh, 1998), (Singh, 1999), (Singh, 2003a), (Singh, 2003b). During the last 33 years of exploration, I discovered about 80 percent fossils of *Homo erectus* from the palaeoprimatological significance of the Siwalik Hills near Chandigarh. Due to limited time only selective specimens are announced. Rest would be announced later on. All the three formations Pinjor, Tatrot and Bunder Conglomerate are exposed in the present area (Nanda and Halstead, 1975), (Gaur and Chopra, 1984).

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POSTERS

**33. RED-SLIPPED AND CORD-MARKED POTTERY FROM EAST KALIMANTAN SITES AND THE BORNEO'S POTTERY CHRONOLOGY**

*Plutniak, Sébastien - (Lisst, Ehess, Toulouse) sebastien.plutniak@ehess.fr*

*Oktaviana, Adhi Agus - (National Center for Archaeology, Jakarta, Indonesia) sambamerka@gmail.com*

*Sugiyanto, Bambang - (National Center for Archaeology, Jakarta, Indonesia) bsugiyanto67@gmail.com*

*Simanjuntak, Truman - (Pusat Arkeologi Nasional, Jakarta, Indonesia.) simanjuntaktruman@gmail.com*  
*Francois-Xavier Ricaut - (CNRS UMR 5288, Laboratoire d'Anthropobiologie Moléculaire et Imagerie de Synthèse (AMIS), Université de Toulouse (Paul Sabatier), Toulouse, France) francois-xavier.ricaut@univ-tlse3.fr*

Since 2003, a French-Indonesian archaeological research project, coordinated by the National Research Center for Archaeology (Indonesia) and the University of Toulouse (France), has been developed in the karstic region of East Kalimantan (Mangkalihat Peninsula, Indonesia) to investigate human occupation processes during prehistory. Within the context of debates about the population history of Island South-East Asia (ISEA), the Kalimantan region remains poorly documented and understood. When authors mention this region it is usually with regard to its strategic location facing the Wallace line on the edge of Sundaland, as a gateway from Sunda to Sahul during the late Pleistocene period, or as part of models of the diffusion of the Neolithic cultural complex from Taiwan and the Philippines and the Malay Peninsula.

Such discussions lead us to expect that archaeological investigation of Kalimantan will provide new data that may lead to the reappraisal of the role of this region during Holocene prehistory and the associated cultural and population diffusion processes.

Archaeological research in the Liang Abu rock shelter (East Kalimantan) led to the discovery and analysis of a pottery assemblage including red-slipped, cord-marked and incised pottery sherds, radiocarbon dated to 1672±21 BP and 1524±22 BP.

In order to discuss our findings we undertake a reappraisal of the pottery material and associated radiocarbon dates from archaeological sites on Borneo Island, which provide us with an appropriate framework for a comparative analysis. This allows us to include the inland region of Kalimantan in the technological network of Neolithic Island South East Asia.

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#### POSTERS

### **34. THAM LOD ROCKSHELTER (PANG MAPHA DISTRICT, NORTH-WESTERN THAILAND): EVOLUTION OF THE LITHIC ASSEMBLAGE DURING THE LATE PLEISTOCENE**

*Chitkament, Thanon - (University Rovira i Virgili, Tarragona) sabuyc@yahoo.com*  
*Gaillard, Claire - (Muséum national d'Histoire naturelle, UMR 7194, Paris) gaillacl@mnhn.fr*  
*Shoocongdej, Rasmi - (Silpakorn University, Bangkok) rasmi@gmail.com*

Tham Lod Rockshelter is located in northern Thailand in

a karstic context. It is facing north and widely opening to a forested landscape, approximately 200 meters from the Nam Lang River. This site was excavated under the direction of R. S. (2002-2006) and provided a rich archaeological sequence developed on 10 layers from 35 ka to about 3000 years B.P.

An abundant lithic material was recovered along with fauna, human burials and, in the upper layers, pottery. It can be considered as "Hoabinhian" since it includes typical sumatraliths and short-axes.

Analysis of lithic material from Area 2 shows that most of it comprises fragments of rocks brought to the site and artificially or thermally broken. The flakes seem to result mainly from the shaping of the large tools; cores proper are very few. In the lower layers the shaped / retouched tools are equally distributed between sumatraliths (including partial sumatraliths, not shaped all around), choppers and small tools (mainly scrapers) while in the upper layers the choppers decrease in number to the benefit of small tools and the sumatraliths reduce in size. This site allows to describe the technical changes in the late Pleistocene, across the LGM. It is especially interesting as besides the lithic assemblages, a rich faunal material helps in assessing the environmental variations and the subsistence strategies.

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#### POSTERS

### **34. TECHNOLOGICAL AND MORPHO-FUNCTIONAL RECONSIDERATION OF THE EARLY HOLOCENE LITHIC ASSEMBLAGES OF SONG TERUS (EAST JAVA, INDONESIA)**

*Borel, Antony - (MNHN) borel@mnhn.fr*  
*Forestier, Hubert - (MNHN) hubforestier@gmail.com*  
*Gaillard, Claire - (CNRS) gaillacl@mnhn.fr*  
*Simanjuntak, Truman - (Pusat Arkeologi Nasional) simanjuntaktruman@gmail.com*  
*Sémah, François - (MNHN) semahf@mnhn.fr*

Even if severe environmental and climatic changes occurred at the Pleistocene-Holocene boundary in Southeast Asia, discoveries show a relative continuity through time and space concerning lithic industries. If some lithic artifacts are well identified like for instance the Hoabinhian cobble cutting tools (chopper, chopping tool, split and uniface - sumatralithe) often associated to forest environment on the continental area or the Maros point of the Toalian industries of Sulawesi, it is difficult to set up a tool typology with well-defined geochronological references. Indeed, artifacts from East Java consist mainly in informal flakes and are delicate to characterize. Nevertheless, the significance of this large lithic archaeological record needs to be elucidated to understand human behaviors of the early Holocene.



With an innovative approach focusing on production (lithic technology), form (geometric morphometrics), functions (use-wear analysis) and their relations, we propose a reconsideration of the early Holocene lithic artifacts from Song Terus cave (Java, Indonesia). The upper layers of this site yielded an anatomically modern human burial dated to 9000 years BP, an abundant bone industry, numerous shell tools and a large collection of stone artifacts

These artifacts are mainly cortical flakes (between 50 and 70%) made of chert. The reduction sequence is simple, based on an alternative knapping of two orthogonal surfaces. A high proportion of pieces were used without being retouched and only rare artifacts show traces of resharpening. Use-wear analysis showed the importance of the activity related to vegetal processing. It is also demonstrated that retouches and use traces are not randomly located on artifacts. They are often adjacent to the smallest angle of the artifact. A tendency to use non cortical straight segments, often cutting edges ( $<75^\circ$ ) and preferentially adjacent to an angle of 65 to 96° is also noticed. Very often, the artifacts are used only on one area (angle or segment). Moreover, a specific form of artifact is not related to a particular function and vice versa.

The results show that human interest was not oriented towards artifacts of specific forms but towards the presence of active areas with a specific morphology and associated to prehensile zones permitting a better use. The debitage method involved is both simple and efficient for a quantitative production of flakes. The discussion of this assemblage regarding to these results and the other remains of the sites lead us to suggest that this material was a transitory and efficient mean to build up a toolbox with raw materials (plant and bone) better adapted and adaptable to the needs of the users in a forest environment. The technical behaviour suggested and described by this research is not anecdotal and its consistency is reinforced by the results of several ethnological studies made in the region.

# B27a

## Linking Continents: Late hunter-gatherers and early farming communities relationships across the Mediterranean and the Black Sea

Commission on Holocene Hunter-Gatherers In Southern Europe and the Mediterranean/ Pontian Basin

Organisers: Pablo Arias, Grégor Marchand, Jörg Linstädter)

Thursday 4th (14.30 to 19.30)  
Meeting Room S2



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XVII World UISPP Congress  
XVIIe Congrès Mondial de l'UISPP  
XVII Congreso Mundial de UISPP

ORAL CONTRIBUTION

ORAL

**1. NEW ARCHEOLOGICAL DATA FROM CUEVA BLANCA SITE (HELLÍN, ALBACETE): IMPLICATIONS FOR THE KNOWLEDGE OF THE LATE MESOLITHIC IN THE HINTERLAND OF SOUTHEASTERN IBERIA.**

*Mingo, Alberto (UNED) amingo@geo.uned.es*  
*Barba, Jesús (UNED) jbarba@pausanias.com*  
*Uzquiano, Paloma (UNED) p\_uzquiano@hotmail.com*  
*Casas, Manuel (Alicontrol S.A.) dp@alicontrol.com*  
*Benito, Alfonso (CENIEH) alfonso.benito@cenieh.es*  
*Yravedra, José (UCM) jyavedra@ghis.ucm.es*  
*Cubas, Miriam (Sociedad de Ciencias Aranzadi) mcubas.morera@gmail.com*  
*Galante, José Antonio (UNED) jgalant3p@yahoo.es*  
*Avezuela, Bárbara (UNED) b.avezuel@gmail.com*  
*Martín, Ignacio (Universidad de Murcia) ignacio.martin@um.es*  
*López, Francisco Javier (Museo de Hellín) javierlprecioso@yahoo.es*  
*Hernández, Javier (UAM) javier.hernandezgimenez@gmail.com*  
*Palacios, Estrella (UAM) estrella.palacios.toledo*  
*Bellardi, Matteo (Pausanias SL) mbellardi@pausanias.com*  
*Gutierrez, Carmen (UAM) carmen.gutierrez@uam.es*

The discovery of Cueva Blanca rock shelter in 2006 and the archaeological excavations and investigations that have been developed subsequently have a noticeable relevance because there is the only stratigraphical reference of human occupation for the Late Mesolithic in a broad area of the northernmost part of Betic mountains. This region houses outstanding levantine rock art sites such as Minateda but traditionally lacks of evidences of Mesolithic / Early Neolithic settlements that can link to those. Cueva Blanca has come to provide the first piece of a puzzle that in the next years is going to increase.

This work collects the results coming from the multidisciplinary investigations conducted on Cueva Blanca and the archaeological material registered there. We must remark those concerning paleoenvironment, absolute dating, lithic industry and fauna.

The recent data confirms the attribution of Cueva Blanca to the Late Mesolithic. The last excavation campaign (2013) has allowed us to increase the lithic assemblage and to ratify its consideration within the first facies of *Cocina*. The archaeobotanical analyses indicate a

Mediterranean open coniferous forest and steppe conditions around the site. Radiocarbon dates point to a contemporaneity of the human occupation with the 8.2 cal yr BP event. On the other hand, fauna analyses state the predominant consumption of lagomorphs and the scarce presence of medium-small size herbivores.

The closest geographical region where we can find well known Mesolithic sites is the area of Villena (Alicante). Examining the data we defend a similar functionality between Cueva Blanca and the archaeological site of Cueva Pequeña de la Huesa Tacaña.

Cueva Blanca was occupied during temporary and seasonal periods in the Late Mesolithic according to the different data that we have handled so far. Despite it, we believe this site has an undeniable importance to deepen in the knowledge of the settlement patterns during this period in the hinterland of southeastern Iberia. In the future new sites belonging to the transition Meso-Neolithic will be made known in this area and therefore we could contrast the possibility of a settlement by the same last hunters-gatherers groups throughout the northern Betic valleys and mountains from Villena (Alicante) to Hellín (Albacete).

ORAL

**2. WHO IS AFRAID OF CARDIAL POTTERY? GROUP IDENTITY AND POTTERY STYLES IN SOUTHWEST EUROPE AND WESTERN MAGHREB NEOLITHISATION PROCESS**

*Diniz, Mariana (Centro de Arqueologia - Faculdade de Letras da Universidade de Lisboa) m.diniz@fl.ul.pt*

Pottery styles have been a core element in defining Neolithic cultural circles during the neolithisation process of the (North shore) Mediterranean basin (eg. Guilaine 2003) and for its westwards limits Cardial ceramics diffusion was a synonym of the first agro-pastoralist spread out in the region. In recent years, the *Impresa* style has been documented in Southern France and in Eastern Iberia suggesting a pre-Cardial movement on the area but at least in Iberian Peninsula it seems more an exploratory movement than a real departure towards a neolithisation process. In this picture where groups and/or cultural movements are traced upon ceramic styles, Southern Mediterranean shoreline has an alternating role mainly due to political factors then to archaeological ones (Diniz 2007) but it is becoming clear (again) that western Mediterranean neolithisation process can only be understood if we link continents and

look for data coming from both margins. Pottery and in particular pottery styles - as a major expression of group choices, identities and communication strategies - is selected to detect similarities and/or disparities between Western Mediterranean groups and areas and to identify local responses to a global event as was the neolithisation process.

A review of published data for Western Mediterranean/Atlantic border line Early Neolithic sites from both shores will be made with a special focus on pottery styles, stratigraphic data, absolute dates and the nature of archaeological materials chosen as absolute dates samples in order to detect divergences and similitude's in both Mediterranean margins archaeological records. Particular attention will be paid to pottery decorations attending to decoration techniques and

Two major pottery groups can be identified in Western Mediterranean/Atlantic both shorelines: Cardial and Channeled pottery - and chronology is not the only explanation for that difference - in fact in both margins of Western Mediterranean basin Cardial groups seem to have less/or to lose penetration capacity in areas where previous hunter-gatherer groups are solid established and in those areas Channeled pottery appear as the most frequent decorative system. Testing this hypothesis on future data is also intendment as part of an ongoing project on Western Iberia neolithisation in order to understand how people, from different cultural and backgrounds, communicate their social identity and cultural distinctiveness trough material culture.

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ORAL

### 3. UZZO CAVE (TRAPANI-SICILY, ITALY) AND THE ISSUE OF THE CHAÎNES OPÉRATOIRES AND THE LITHIC TRADITIONS OF THE LATE MESOLITHIC AND THE EARLY NEOLITHIC IN SOUTHERN ITALY

*Collina, Carmine (Museo Civico Biagio Greco (Mondragone, Caserta-Italia) carminecollina\_1972@libero.it*

The main target of this paper is to put forward a technological and typological analysis of the lithic assemblages of Late Mesolithic and Early Neolithic concerned in the process of neolithisation in Southern Italy. The main aims of this research are to highlight the methods and the techniques of débitage and to identify the *chaînes opératoires* set up by the last hunter-gatherers and the early groups of farmers in the South of Italy and in Sicily.

The lithic series examined belong to the different horizons concerned in the process of Neolithisation of Southern Italy in the several areas of the envisaged region. Particularly, Uzzo Cave, located in Western Sicily, is one of the most important sites for the understanding of the Mesolithic-Neolithic transition process not only in Southern Italy, but also in the Western Mediterranean Basin. A long sequence of archaeological levels attests the human presence during the final phases of the Upper Palaeolithic, the Mesolithic and the Neolithic periods.

The rooting concepts are centred on the principles of the lithic technology outlined by J. Tixier, H. Roche, and M.-L. Inizan, D. Binder, C. Perlès, N. Pigeot et J. Pelegrin. The technological data derived from the analysis of the lithic series are set in a landscape perspective of management and control of raw materials. The purpose is to identify a management model of both technical behaviours and technological strategies. These last are intended as the combination of all the activities carried out since the acquisition of raw material until the abandon of the lithic objects considering the effect produced by the same activities in terms of landscape behaviours, raw materials availability and acquisition modalities.

Starting from the analysis of Uzzo cave, in a view to reconstruct the economy of débitage and the economy of raw materials and the possible formation of technical traditions, the results of this work concerns the following points:

- a) the economic and petrographical analysis of the raw materials;
- b) the analysis of the technological aspects and of the technical facts;
- c) the typometrical analysis of the different products of the *chaînes opératoires*;
- d) the typological analysis through the creation of an inventory allowing to integrate the study of the technological criteria with that of specific characters of the lithic tools.

Is it possible to recognize a techno-economic variability in the débitage systems of the Early Neolithic of Southern Italy? Is it possible to give a cultural value to the variability of technical facts? What is the rate of continuity and discontinuity among the lithic traditions of the last hunter-gatherers and the first farming societies? These questions allowed to shed lights on the whole of technical and cultural transformations between the VII and VI mill. B.C. in the South of Italy, a region that played a key role in the process of diffusion of Neolithic towards the West Mediterranean.

ORAL

**4. EMOTIONAL ASPECTS OF NEOLITHISATION: THE  
IRON GATES REGION (SERBIA, ROMANIA)**

*Lopicic, Milica (University of Belgrade, Faculty of Philosophy) milica.lopicic@fbg.ac.rs*

The Neolithic transition in the Balkan Peninsula was influenced in varying intensity and way by a demographic expansion from the Near East, during which the existing Mesolithic communities actively engaged with newcomers and neighbouring areas. Research in psychology has demonstrated that emotional factors are of great importance for human behaviour, influencing both the realization of successful contact with other people and their attitude towards material objects (later from the stand-point of a consumer). However, this remains poorly explored when archaeological record is concerned. Human remains and goods of foreign origin in local Mesolithic contexts of the Iron Gates region (Balkans, SE Europe) demonstrate that neolithisation was a process of encounters and a diverse exchange between hunter-gatherers and farmers. An approach to the phenomenon through the concept of globalization implies that emotions played a significant part in creating the conditions which readied local communities to incorporate Neolithic items as both necessities as well as desirable goods. In order to meet these criteria, changes in emotional sphere of hunter-gatherers are hypothesized to exhibit two trends: 1) showing positive emotions towards foreign people and goods, and 2) an increase in negative emotions related to own culture and the way of life.

The assessment of the expression and promotion of emotions on a group level through the perspective of a long development encompasses finds from the Mesolithic (Early, Late and Final) sites, dated to 13000-6000 cal BC. Stress is placed on symbolic, artisan and non-utilitarian items, which could have served as media in the creation of the public mood and collective action as demonstrated in the study of the core area of the neolithisation. The systematization of previous analyses of burials, ornaments, decorated objects, sculptures as well as exotic materials, including Neolithic products, in terms of their typology, spread, frequency and contexts, reveals the changes in emotional domain. They are comparable to already acknowledged shifts in ideological and social systems.

# B27c The long road to the final transition. Regional dynamics in the western Mediterranean between the end of the LGM and the 8.2 event

Commission on Holocene Hunter-Gatherers In Southern Europe and the Mediterranean/Pontian Basin

Organisers: J. Emili Aura Tortosa, Jesús F. Jordá Pardo)

Friday 5th (14:30 to 19:30)  
Meeting Room B03



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ORAL CONTRIBUTION

ORAL

**1. FROM THE HYPOTHESIS OF A CULTURAL ISOLATION TO THAT OF THE A CULTURAL CROSSROADS: NEW PERSPECTIVES ABOUT THE RECENT PALEOLITHIC IN SOUTH-EASTERN FRANCE FROM TECHNO-ECONOMIC STUDY OF THE SITE OF LA BOUVÉRIE (VAR).**

*Vadillo, Margarita (Universitat de València) margarita.vadillo@uv.es*

*Naudinot, Nicolas (Université Nice Sophia-Antipolis, CEPAM UMR 7264) nicolas.naudinot@cepam.cnrs.fr*

*Tomasso, Antonin (Université Nice Sophia-Antipolis, Università di Pisa, CEPAM UMR 7264) antonin.tomasso@cepam.cnrs.fr*

Throughout the recent Upper Paleolithic, South-eastern France has constituted a at the border of two major cultural areas of Europe: on the west the succession goes through the Solutrean, Badegoulian, Magdalenian, Azilian and post-azilian techno-complex; on the east is the Epigravettian. This particular situation makes South-eastern France a particularly relevant space to study cultural transfers and interculturalities. Neglected by researches for a long time, the first research dedicated to this area was carried out in the 60's by M.Escalon de Fonton, who established a chrono-cultural evolution model based on the definition of regional and micro-regional chrono-cultural entities (Montadien, Salpétrien, Arénien, Bouverien, Valorguien,...) on the basis of a typological analysis of the retouched artifacts.

While the archaeological reality of these entities is increasingly criticized, there have been few attempts to discuss in detail the particular features, real or supposed, of the concerned industries. Recently, new investigations are based on a more systemic approach of lithic assemblages has been carried out by French and Italian researchers. They combine review of old collections and excavations of new sites.

This communication illustrates this dynamic of study by reviewing the assemblages of the cave of la Bouverie (Var). This key site, excavated during the 60's and 70's provided several archaeological layers attributed to Gravettian, Arenian and Bouverian by Onoratini in his PhD.

The review of this lithic assemblages was associated to a critical analysis of the integrity of the collection

and the stratigraphy of the site. The techno-economic analysis of the lithic material has focused on the entire lithic technical system, and not only on the retouched artifacts. It aims the study of raw materials provisioning strategies and production objectives and methods.

According to our results, three coherent sets have been defined in the section of the sequence. They were established by comparison with other regional assemblages and can be linked with the different stages of the Epigravettian. No tangible evidence arguing for particular chrono-cultural entities in this part of Europe has been highlighted by our study.

Otherwise, important changes, both in raw material provisioning strategies and production objectives and methods can be identified when considering the entire archaeological sequence. These elements of change are keys to develop a new chrono-cultural model for the Epigravettian of South-eastern France and more broadly of Italic's and Balkan's peninsulas.

This desire of reconstruction of the recent Upper Paleolithic of South-eastern France, should associate with this effort of seriation of the Epigravettian that allow us gradually to integrate the North-west Mediterranean area in the context of the European Upper Paleolithic.

ORAL

**2. TECHNICAL DYNAMICS AND TECHNOLOGICAL ORGANIZATION AT THE END OF THE UPPER PALEOLITHIC OF THE NE IBERIA.**

*Morales Hidalgo, Juan Ignacio (IPHES - URV) jignacio.morales@gmail.com*

*Román Monroig, Dídac (UB) Didac.Roman@uv.es*

*Cebrià Escuer, Artur (UB) arturcebria@gmail.com*

*Garcia-Argüelles, Pilar (UB) garciaarguelles@ub.edu*

*Nadal Lorenzo, Jordi (UB) jnadal@uoc.edu*

*Soto Quesada, María (IPHES-URV) sotoquesadamaria@gmail.com*

*Vergès Bosch, Josep Maria (IPHES-URV) jmverges@iphes.cat*

*Fullola Pericot, Josep Maria (UB) fullola@ub.edu*

The end of the Upper Paleolithic in NE Iberia seems to be a complex cultural and adaptive scenario on which different technological traditions appears to have been present for long chronological spans. The Magdalenian decline results in both geometric and non-geometric assemblages that, based on <sup>14</sup>C dates, persist until the beginnings of the Boreal. This results in the apparent

coexistence of three techno-complexes during the earlier moments of the Holocene: Epi-Magdalenian, Sauveterrian/Geometric, and the Notches&Denticulates Mesolithic. Classical typological discretization uses the presence of certain tool-classes in order to specify the "cultural" origin of the different assemblages, but, traditionally, little or nothing is said about the whole technological organization of the prehistoric groups. Differences in site function, occupational intensity and mobility dynamics can result in very different assemblages produced by a single "cultural" group, or in similar accumulations generated by different ones.

In this work we try to test which is the influence of some of these factors in the final composition of the assemblages. The integrity of the typological classifications will be also evaluated, trying to observe if intra-tool-class differences between sites and periods are culturally-based or, on the contrary, are forced by different technological organizations.

In order to reach our objectives we analyze or re-analyze some of the most significant Late Upper Paleolithic sequences of the NE Iberia. Assemblages from *El Filador*, *Hort de la Boquera*, *La Cativera*, *Balma de la Vall*, *Cova de la Guineu*, and *Balma del Gai* has been studied under a single methodology. We focus our approach in issues like compared morphometrics, tool reduction, retouch intensity, recycling, and raw material constraints in order to isolate convergent and divergent technical dynamics. The results presented at the conference will be the first step of a longer research process that wants to go in depth in the technological, cultural and environmentally conditioned behaviors of the last hunters and gatherers who lived in the northeastern part of the Iberian Mediterranean facade during the Pleistocene - Holocene transition.

ORAL

### 3. BONE TOOLS AND PERSONAL ORNAMENTS FROM BADEGOULIAN-INITIAL MAGDALENIAN LEVEL OF EL GATO 2 CAVE (ÉPILA, ZARAGOZA)

Duarte Matías, Elsa (Universidad de Oviedo) elduarma@gmail.com

Álvarez-Fernández, Esteban (Universidad de Salamanca) epanik@usal.es

Blasco Sancho, María Fernanda (Ayuntamiento de Zaragoza)

Rodanés Vicente, José María (Universidad de Zaragoza) jro-danes@unizar.es

El Gato 2 cave (Épila, Zaragoza) was excavated in four archaeological fieldworks between 2004 and 2011 and a succession of prehistoric occupations from Upper Paleolithic to Bronze Age has been documented.

In Level II of Test II it has been identified an archaeological level attributed to Badegoulian-Initial Magdalenian. It contains five radiocarbon dates ranged between 18850±100 BP and 17700±70 BP.

Faunal and technotypological studies of lithic and osseous assemblages show important elements for the cultural characterization of this level. And so it has been possible to recognise for the first time this cultural complex in the Ebro basin, a territory placed within Mediterranean, Cantabrian and Pyrenean areas.

Regarding the osseous assemblage, the finished objects predominate over preforms or waste products. Employed blanks are antler, bone, tooth and shell. Even though the high antler quantity of pieces, cervids constitute minority species, since rabbit is the most represented animal (97%).

The hard animal toolkit is typologically formed by 10 pointed pieces (9 antler points and one natural base punch), 8 perforated pieces (7 shell and one antler suspended objects of adornment) and 2 composite pieces (needle and perforated antler point). It must be added a tine's cervid fragment and a doubtful extraction matrix. Bone points show circular and oval sections and only three of them conserve their base (2 simple beveled bases and one pointed base), highlighting within them a Placard point. On the other hand, the antler pendant contains an engraved complex motive formed by short oblique strokes which are organised in parallel bands. It remembers Magdalenian engraved short stroke series, but also pectiniform motives documented as well in other chronoculturally analogous peninsular sites. Nevertheless, these ones usually present less complex pectiniforms. Shell ornaments are made of freshwater gastropods such as 2 *Melanopsis* sp and one *Teododoxus fluviatilis*, and marine gastropods like 2 *Trivia* sp and 2 *Homalopoma sanguineum*. All of them show polished orifices as result of a fairly long use.

Cervid shortage, lack of waste products and use marks in tools and pendants show that these pieces have been brought to the site already made. They could have also been manipulated in other parts of the site currently not preserved. Despite the domestic nature of the assemblage, the most characteristic piece is the Placard point. This antler point linked with the absence of



square sections from Lower Magdalenian and Solutrean plate retouch are arguments in favor of Badegoulian-Initial Magdalenian. Furthermore, shell's origins evoke connections with Mediterranean area.

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ORAL

#### 4. AZILIAN DYNAMICS OF THE SOUTH-PYRENEES: ARE THEY RELEVANT TO ANALYZE "CLASSIC" AZILIAN?

*Martínez-Moreno, Jorge (Centre d'Estudis del Patrimoni Arqueològic de la Prehistoria -UAB) jorge.martinez@uab.cat*  
*Martzluff, Michel (Departement d'Histoire de l'Art et d'Archeologie Univ. Perpignan Via Domitia,) martzluf@univ-perp.fr*

*Mora Torcal, Rafael (Centre d'Estudis del Patrimoni Arqueològic de la Prehistoria -UAB) rafael.mora@uab.cat*  
*Roy, Miquel (Centre d'Estudis del Patrimoni Arqueològic de la Prehistoria -UAB) miquel.roy@uab.cat*

Azilian is a cultural phase originally described in the north face of Pyrenees and well documented in Cantabria. This tradition was developed during Younger Dryas, in contrast to Late Magdalenian which begins to be scarce in Late Glacial. In this chronometric interval, around 2000 years, although important changes can be detected, Late Glacial techno-typological trends are difficult to characterize.

Recently, we have suggested the presence of Azilian techno-complex in the south of the Pyrenees. We would be analyzing if Ebro Basin dynamics was involved in the configuration of this techno-typological tradition.

Techno-typological trends in knapping methods and lithic projectiles from Balma Margineda and Balma Guilanyà are compared with other sites from the Northeast of Iberia. This contextual approach allows us to define the "azilination" recognized in these south Pyrenees sites.

Current data suggests that initial apparition can correspond to the Bolling chronozone. The small assemblages cannot make an accurate diagnosis, but it permits to differentiate from Late Magdalenian. Otherwise, presence of thick backed points, straight truncated pieces, backed bladelet and the absence of geometrics have been mentioned in some sites from the Lower Ebro Basin and in the Levant coast.

During Allerod, hunting tools allow us to suggest possible influences/contacts from the Atlantic area (Cantabria and North Pyrenees). At least, we interpret the apparition of "azilian" harpoons, trihedral points, darts and backed knives. These tools coexist in the South Pyrenees with fusiform points and incipient pygmy microliths.

Along Younger Dryas, first geometric such as truncated points and microburin -similar to the Magdalenian tradition- has been recovered at Balma Margineda. These artifacts are present in the Lower Ebro Basin and it continues in the PreBoreal. In some cases these assemblages has been assigned to the Sauveterrian sphere.

Changes in weaponry tools detected along the Bolling/PreBoreal in the south of the Pyrenees are pertinent to define techno-typological trends. If these changes were produced previously, it can help us to understand the configuration of the classic Azilian. This proposition is not easy to verify in absence of detailed morphological studies on backed points and microliths, artefacts associated to very homogeneous lithic assemblages and scarce bone tools.

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ORAL

#### 5. WHY THE MESOLITHIC OF NORTHEAST OF IBERIA IS DIFFERENT IN THE EARLY HOLOCENE?

*Martzluff, Michel (Departement d'Histoire de l'Art et d'Archeologie. Univ. Perpignan Via Domitia) martzluf@univ-perp.fr*

*Mora Torcal, Rafael (Centre d'Estudis del Patrimoni Arqueològic de la Prehistoria. UAB) rafael.mora@uab.cat*

*Martínez Moreno, Jorge (Centre d'Estudis del Patrimoni Arqueològic de la Prehistoria. UAB) jorge.martinez@uab.cat*

*Roda Gilabert, Xavier (Centre d'Estudis del Patrimoni Arqueològic de la Prehistoria. UAB) javier.roda@uab.cat*

A new phase in the Postglacial lithic assemblages was defined in the Vitoria workshop. This techno-complex named *Mesolítico de muescas y denticulados* -MSD- (notch and denticulate Mesolithic) is located around the Ebro Basin and temporarily ascribed to the Preboreal (PB) and Boreal (B) chronozones.

These assemblages share a number of common trends such as the management of local resources, application of expedient knapping methods to obtain flakes, low diversity of retouched tools, important number

of notches and pieces with clactonian retouch and identification of knapped or unknapped cobbles like used artifacts.

This diagnosis deserves to be analyzed in the context of the techno-typological trends detected in both sides of the Pyrenees.

Analysis of Balma Margineda, Balma Guilanyà and Font del Ros assemblages combined with contextual data obtained from other sites of the Ebro Basin, highlight spatio-temporal breaks in the PB and B techno-complexes. Throughout these two thousand years it is not easy to identify internal changes, due to the importance achieved by the *fond-commun* tools in these assemblages.

Main characteristics that define the MSD can be recognized in other contemporary assemblages of Western Europe. Alternatively, we sustain that radical difference is the virtual absence of geometric and backed pieces. This attribute allows a better identification of this phase in the south Pyrenees. This absence of weaponry tools is challenging and it can be correlated with the disappearance of bladelet knapping methods.

This trend can not correspond with dynamics observed in adjacent areas such as the North Pyrenees in the PB and B, and it seems exclusive of the MSD, or as we prefer to refer: Ageometric Mesolithic (or Mesolithic without armatures).

This Ageometric Mesolithic differs from the previous Sauveterrian and post-Boreal techno-complexes. Post-Boreal techno-complexes are recognized for the reappearance of laminar knapping methods carried out by indirect percussion with a punch, technical trait associated with the elaboration of trapezes and others armatures.

The Ageometric Mesolithic detected in the South Pyrenees differs from the techno-typological trajectory developed in the same period in the North Pyrenees. This is the different trend that characterized the Boreal assemblages at the Southern Pyrenees and the Ebro Basin. Guilanyà, Margineda and Font del Ros derive key arguments to typify the evolution of this postglacial techno-complex.

ORAL

## 6. EARLY AND MIDDLE HOLOCENE OPEN-AIR OCCUPATIONS IN THE UPPER VINALOPÓ VALLEY (SE SPAIN): CHRONOLOGICAL FRAMEWORK, SUBSISTENCE AND LAND USE PATTERNS

*Fernández-López de Pablo, Javier (Institut Català de Paleoecologia Humana i Evolució Social (IPHES) jfernandez@iphes.cat*

*Gómez Puche, Magdalena mgomez.puc@gmail.com*

*Ferrer García, Carles (Museu de Prehistòria de València i Servei d'Investigació Prehistòrica de la Diputació Provincial de València) carlos.ferrer@dival.es*

Over the past 8 years, the Upper Vinalopó Valley -located in the contact fringe between the central Mediterranean region of Spain and the Southern Meseta- has provided a fresh archaeological record of open-air sites dated between the Younger Dryas and the 8.2 kyr cal BP event. Arenal de la Virgen and Casa Corona sites have produced new data on human paleoecology, subsistence patterns, habitation features and funerary behaviour during the Early and Late Mesolithic periods.

In this contribution we present a synthesis of ongoing multi-disciplinary research at both sites. We will focus on the chronological framework of the open-air occupations to further discuss patterns of habitat selection and land use at local and regional scales.

POSTER

POSTER

## 7. LATE MESOLITHIC / EARLY NEOLITHIC OCCUPATIONS IN THE "CAMPOS DE HELLÍN" REGION (ALBACETE, SE SPAIN): VEGETATION, CLIMATE AND HUMAN INTERACTIONS.

*Uzquiano Ollero, Paloma (UNED) p\_uzquiano@hotmail.com*

*Casas Gallego, Manuel (Alicontrol SA) dp@alicontrol.com*

*Mingo Álvarez, Alberto (UNED) amingo@geo.uned.es*

*Barba Rey, Jesús (UNED) barba@yahoo.es*

*Yravedra Sainz de los Terreros, José (UCM) joyravedra@hotmail.com*

The new archaeological research carried out in the Campos de Hellín region focused on the Mesolithic to Neolithic transition, specially on the interactions between the human settlement patterns and the Holocene climatic instability, has revealed Late Mesolithic and

Early Neolithic occupations in a geographical area traditionally considered as empty of human settlement for these periods. We present the archeobotanical results conducted mainly on the Mesolithic site of Cueva Blanca rock shelter as well as some preliminary archeobotanical data obtained in the close Early Neolithic site of Pico Tienda III.

Archaeobotanical analyses (pollen and charcoal) have provided relevant information about vegetal landscape and woodland exploitation performed by late Mesolithic groups. Radiocarbon dates obtained  $7610 \pm 40$  BP (8450-8370 cal BP) and  $6730 \pm 40$  BP (7660-7560 cal BP) at Cueva Blanca indicate the contemporaneity of this human occupation with the 8.2 cal yr BP cooling event and subsequent arid conditions.

A Mediterranean open coniferous forest with *Pinus* and *Juniperus* was inferred around Cueva Blanca where *Pinus halepensis* and *Rhamnus lycioides* were the main sources of woodfire managed by late Mesolithic inhabitants. Steppic conditions were also noticed by the abundance of *Ephedra* and Asteraceae. Other environmental factors are suggested to explain the fluctuations of the main woody taxa, especially those of *Pinus* in accordance with the palynological and anthracological information available for the western Mediterranean area.

The early Neolithic occupation of Pico Tienda III seems to have been developed under similar paleoecological conditions according to archeobotanical analysis implemented by now.

In conclusion, the Mesolithic / Neolithic transition in the "Campos de Hellín" has been developed under steppic conditions inherited from the 8.2 cooling climatic event.

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#### ORAL

### 8. GENERAL RECONSTRUCTION OF PALAEOGEOGRAPHY, PALAEOTEMPERATURE AND PALAEOENVIRONMENT IN THE SOUTHERN COAST OF IBERIA BETWEEN THE LAST GLACIAL MAXIMUM AND THE 8.2 EVENT

Jordá Pardo, Jesús F. (UNED, Madrid) [jjorda@geo.uned.es](mailto:jjorda@geo.uned.es)  
Maestro González, Adolfo (IGME) [a.maestro@igme.es](mailto:a.maestro@igme.es)  
Aura Tortosa, J. Emili (Universidad de Valencia) [emilio.aura@uv.es](mailto:emilio.aura@uv.es)  
Carrión Marco, Yolanda (Universidad de Valencia) [yolanda.carrion@uv.es](mailto:yolanda.carrion@uv.es)

*Badal García, Ernestina (Universidad de Valencia) [ernestina.badal@uv.es](mailto:ernestina.badal@uv.es)*

The aim of this paper is to present a general reconstruction of the palaeogeography of the coastline of southern Iberia and the sea surface palaeotemperatures both the Alboran Sea and the Gulf of Cadiz, from the beginning of the Last Glacial Maximum (Upper Pleistocene) to the event 8.2 (Lower Holocene), as well as a reconstruction of the vegetal landscapes of southern Iberia. From this reconstruction we can have an idea of the configuration of the coast that was inhabited by the prehistoric peoples of southern Iberia in the moments of the transformation Mode 4-Mode 5.

For this we used different sources of information from which we can mention:

- Bathymetric and topographic data from the GEBCO database (IOC, IHO y BODC, 2003).
- High-resolution sea-level variations curve of the last 250,000 years adjusted to the SPECMAP timeline and isometrically calibrated (Thompson & Goldstein, 2006)
- High-resolution curves of the variations of sea surface temperature (SST) obtained from the study of alkenones of the MD95-2043 (Alboran Sea) and M39-008 cores (Gulf of Cádiz) (Cacho et al., 2001).
- Anthracological sequences of southern and eastern Iberia.

The analysis of the cited proxies allows recognizing a progressive rise of sea level that began in the second half of the LGM and having small oscillations over time. In the case of SST is remarkable an important rise of its values at the start of the Tardiglacial (GI1) followed by an abrupt decline during the Younger Dryas (GS1). An abrupt increase in the temperature is observed at the beginning of the Holocene followed by a period of stability that continues to the small temperature decrease at 8.2 event.

During the LGM the southern coastline of Iberia has an increased amplitude that varies depending on the area. On the Mediterranean coast this increase exceeds 5 km due to the narrowness of the continental shelf, while the Atlantic coast suffers a largest increase because the continental shelf has a greater extent. From the Tardiglacial the coastal strip begins to decline with the advance of the marine transgression up to the current situation. On the other hand, variations of sea temperatures condition the arrival of cold Atlantic faunas in the Alborán Sea at times of low thermal. Regarding the continental vegetation, the dynamics observed from the Tardiglacial indicates a progressive reduction of pioneer species (junipers basically) and

the establishment of mesophile or thermo-mediterranean formations in each of the areas. In relation with the 8.2 event, local sequences do not reflect significant changes in the presence of vegetal species.

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ORAL

### 9. EXPLOITATION OF MARINE RESOURCES AT THE UPPER PALAEOLITHIC AND MESOLITHIC OF NERJA CAVE (MÁLAGA, SPAIN)

*Salazar García, Domingo Carlos (University of Cape Town / Max-Planck Institute for Evolutionary Anthropology) domingo\_carlos@eva.mpg.de*

*Jordá Pardo, Jesús Francisco (Universidad Nacional de Educación a Distancia)*

*Álvarez Fernández Esteban (Universidad de Salamanca)*

*Avezuela Aristu, Bárbara (Universidad Nacional de Educación a Distancia)*

*Pérez Ripoll, Manuel (Universitat de València)*

*Vicente Morales, Juan (Universitat de València)*

*Richards, Michael P. (University of British Columbia / Max-Planck Institute for Evolutionary Anthropology / University of Durham)*

Palaeolithic and Mesolithic archaeological sites from southern Iberia (along the coast of the Alborán Sea) have ample zooarchaeological and archaeological evidence for the use of marine foods by humans. In addition there are artistic representations of marine fauna representations in Palaeolithic art from this region. However, until now, there has been no direct evidence for the importance of marine foods in human diets. We here present carbon and nitrogen isotopic results carried out on human and animal remains from Upper Palaeolithic and Mesolithic remains from the site of Cueva de Nerja (Málaga, Spain). Our results clearly show that marine foods were not only intensively exploited, but also intensively consumed, by humans dating to the Upper Palaeolithic and Mesolithic periods from this site. This contrasts to the Neolithic period at the site, as the isotope evidence instead shows that the diets became then mainly terrestrial.

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ORAL

### 10. ON FISHING AND BOATS IN ALBORAN SEA, SOUTHERN IBERIA (14 - 8 KY BP)

*Aura Tortosa, J Emili (Universitat de València) jeaura@uv.es*  
*Pérez Herrero, Clara I. (D'Arqueo) claraperez@darqueo.com*

*Marlasca Marin, Ricard - ricard.marlasca@hotmail.com*

*Rodrigo García, María J.*

*Jardón Pérez, Paula (Universitat de València) Paula.Jardon@uv.es*

Southern Iberia is a peripheral region of Europe, overturned in North Africa and well connected to the Atlantic coast. In the early twentieth century were identified representations of marine fauna (fishes and a probable seal) in the Palaeolithic parietal art (La Pileta and Ardales). Also were excavated shell-middens cave sites near Malaga city. Nowadays, here are located some of the oldest evidence on the use of marine fish in the European Palaeolithic, dated between OIS 5/4 and 1 is preserved.

Coastal sites prior to the last interstadial are preserved here thanks to morphology of the continental profile. Its sudden drop, resulting in deep waters close to the coast, has allowed the preservation of many caves and shelters. However, open air sites on the low beaches were flooded from the Late Glacial Maximum.

The first part of this presentation summarizes data on marine fishes from Southern Iberia region. These data have allowed to raise an analysis of fish species diversity and diachronic changes. The second part deals with an evidence of fishing methods which require fishing gear use. We study the use-wear traces of toolkits found in archaeological contexts that containing marine fishes (macrolithic tools made on pebbles and bone gorges from Nerja).

Our knowledge of marine fish remains and Palaeolithic fish catching methods is biased by data from old excavations.

The available data from Southern Iberia show that Neanderthals and firsts modern humans exploited marine fish. This situation did not change until after the LGM, although some increase in the exploitation of marine resources is appreciated.

At the end of the Upper Palaeolithic marine economies orientation existed in Southern Iberia and is possible to identify fishing equipments. Also may be appropriate to hypothesize about the use of macrolithic tools (skin-boats making?) at sites located on the Iberian coasts of Alborán Sea.

# A28 Prehistoric Archaeology of China: Technology, Cognition, Culture and Environment

Commission on Palaeolithic Technology and adaptation in Asia and its context for  
Human evolution

(Organisers: Yamei Hou, Marcel Otte, Ethel Allue)

Thursday 4th (90:00 to 13:30)  
Meeting Room A01



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ORAL CONTRIBUTION

ORAL

## 1. ARCHAEOLOGICAL THEORY EXPLORATION BY CHINESE SCHOLARS

*Xiyuun Yu (Department of Archaeology, School of History, Wuhan University) yuxiyun@aliyun.com*

Chinese archaeology began in 1920s. Johan Gunnar Andersson used Diffusion Theory as an explanation for the Painted Pottery Culture? Yangshao Culture? when it was first found in China. Then? in 1940s, Cultural Evolution Theory was accepted by some scholars. In this period, although Chinese archaeology was mainly influenced by Western archaeology, it also had some characteristic in Stratigraphy and Typology. In 1950s, Chinese archaeology was deeply influenced by Soviet Union archaeology, Marxism was used to explain the archaeological remains. In the middle of 1970s, Su Bingqi opposed to treat Marxism and Chinese traditional history as dogma, he proposed the genealogy (regional systems and local culture series) theory in order to systematically construct the Temporal and Spatial Frame of archaeological culture, set up different culture regions and their cultural sequence, and begin to investigate the origin and development of culture. After that, Zhang Zhongpei proposed the cultural lineages theory to reveal cultural internal structure and the process and reasons of cultural change in mid-1980's. In 2011, I proposed Agency theory which stress that the agency of ideology? art? religion and cultural identity is the internal dynamic of cultural change. Chinese archaeologists insisted on inducting experience in the base of research practice, then sublimating into new theory. They have their own particular cultural theory and research norms while refuse to copy the existing theory of western archaeology? simply fill the chinese archaeological data into the box of western archaeological theory?.

ORAL

## 2. LA COUCHE CII2 "DU SITE DE LONGGUPO" CHINE : UN NIVEAU D'OCCUPATION ANTHROPIQUE D'ANTANT DU PLÉISTOCÈNE ANCIEN.

*Boëda, Eric (Université Paris Ouest) boeda.eric@gmail.com*  
*Griggo, Christophe (Université de Grenoble)*  
*Christophe.Griggo@ujf-grenoble.fr*  
*Hou Yamei (IVPP) houyamei@ivpp.ac.cn*

*Wanbo-B. Huang (Chongqing Three Gorges Institute of Paleoanthropology)*

Le site de Longgupo est localisé au sud de la traversée des Trois Gorges du Yangtsé, à l'est de la province du Chongqing. Il présente une importante séquence stratigraphique du Plio-Pléistocène, datée entre 1,8 et 2,5 millions d'années. La couche CII2?, fouillée sur environ 7 m<sup>2</sup>, renferme une importante accumulation osseuse, associée à une industrie lithique taillée dans le calcaire triasique local. L'analyse pluridisciplinaire a montré que cette accumulation osseuse est bien le fait d'hominidés qui ont fréquentés la grotte de façon répétitive, en apportant sur le site les parties alimentaires les plus riches d'animaux, tels que *Bos (Bibos) sp.*, *Cervus sp.* et *Metacervulus sp.*, qu'ils avaient chassés et/ou charognés de façon active. Par ailleurs, la morphologie et la disposition des cassures, ainsi que la présence de traces sur certains ossements, indiquent un travail de boucherie secondaire important dans le site, ce que prouvent les données techniques des artefacts lithiques.

The site of Longgupo is located south of the crossing of the Three Gorges of the Yangtze River, in the eastern part of the Chongqing province. It presents an important stratigraphic sequence of Plio-Pleistocene, dated between 1.8 and 2.5 million years ago. The layer CII2a, excavated about 7 m<sup>2</sup>, contains significant bone accumulation, associated with lithic artefact knapped in the local Triassic limestone. The multidisciplinary analysis showed that this bone accumulation is the fact of hominids who visited the cave repeatedly by bringing in the site the richest body parts of animals such as *Bos (Bibos) sp.*, *Cervus sp.* and *Metacervulus sp.*, that they had hunted and/or scavenged actively. In addition, the morphology and arrangement of fractures and the presence of traces on some bones indicate a significant secondary butchery work in the site, what demonstrate the technical data of lithic artifacts.

ORAL

## 3. A SPANISH-CHINESE COLLABORATION PROJECT FOR THE STUDY OF THE ASIAN PALAEO LITHIC

*Allué, Ethel (1 IPHES. Institut Català de Paleoecologia Humana i Evolució Social, C/ Marcel·lí Domingo s/n Campus Sescelades URV (Edifici W3), 43007-Tarragona, Spain. 2 Àrea de Prehistòria, Universitat Rovira i Virgili (URV), Av. Catalunya 35, 43002- Tarragona, Spain.) eallue@iphes.cat*  
*Asryan, Lena (IPHES. Institut Català de Paleoecologia Humana i Evolució Social, C/ Marcel·lí Domingo s/n Campus*

*Sescelades URV (Edifici W3), 43007-Tarragona, Spain.)*

*lasryan@iphes.cat*

*Carbonell, Eudald (1 IPHES. Institut Català de Paleoecologia Humana i Evolució Social, C/ Marcel·lí Domingo s/n Campus Sescelades URV (Edifici W3), 43007-Tarragona, Spain.*

*2 Àrea de Prehistòria, Universitat Rovira i Virgili (URV), Av. Catalunya 35, 43002- Tarragona, Spain.)*

*ecarbonell@iphes.cat*

*Yamei Hou (Laboratory of Vertebrate Evolution and Human Origin of Chinese Academy of Sciences, Institute of Vertebrate Paleontology and Paleoanthropology, Chinese Academy of Sciences 100044 Beijing ) houyamei@ivpp.ac.cn*

*de Lombera, Arturo (IPHES. Institut Català de Paleoecologia Humana i Evolució Social, C/ Marcel·lí Domingo s/n Campus Sescelades URV (Edifici W3), 43007-Tarragona, Spain.) artulomb@gmail.com*

*Mosquera, Marina (1 IPHES. Institut Català de Paleoecologia Humana i Evolució Social, C/ Marcel·lí Domingo s/n Campus Sescelades URV (Edifici W3), 43007-Tarragona, Spain. 2 Àrea de Prehistòria, Universitat Rovira i Virgili (URV), Av. Catalunya 35, 43002- Tarragona, Spain.)*

*marina.mosquera@urv.cat*

*Ollé, Andreu (1 IPHES. Institut Català de Paleoecologia Humana i Evolució Social, C/ Marcel·lí Domingo s/n Campus Sescelades URV (Edifici W3), 43007-Tarragona, Spain. 2 Àrea de Prehistòria, Universitat Rovira i Virgili (URV), Av. Catalunya 35, 43002- Tarragona, Spain.) aolle@iphes.cat*

*Picin, Andrea (NEANDERTHAL MUSEUM-IPHES)*

*picin@neanderthal.de*

*Rodríguez, Xose Pedro (1 IPHES. Institut Català de Paleoecologia Humana i Evolució Social, C/ Marcel·lí Domingo s/n Campus Sescelades URV (Edifici W3), 43007-Tarragona, Spain. 2 Àrea de Prehistòria, Universitat Rovira i Virgili (URV), Av. Catalunya 35, 43002- Tarragona, Spain.)*

*xrodriguez@iphes.cat*

*Solé, Alex (IPHES. Institut Català de Paleoecologia Humana i Evolució Social, C/ Marcel·lí Domingo s/n Campus Sescelades URV (Edifici W3), 43007-Tarragona, Spain.)*

*alexsole1@gmail.com*

*Shuzhi Wang (Institute of Archaeology, ICASS)*

*shuzhiwang@163.com*

*Yang Liu - liuyang.ivpp.cn@gmail.com (Ordos Antiquity & Archaeology Institution. ), Shixia Yang - yangshixia122@gmail.com (Laboratory of Vertebrate Evolution and Human Origin of Chinese Academy of Sciences, Institute of Vertebrate Paleontology and Paleoanthropology, Chinese Academy of Sciences 100044 Beijing ), Yue Hu - hy.ivpp@gmail.com (Laboratory of Vertebrate Evolution and Human Origin of Chinese Academy of Sciences, Institute of Vertebrate Paleontology and Paleoanthropology, Chinese Academy of Sciences 100044 Beijing)*

Scientific members from the Institut Català de Paleoec-

ologia humana i Evolució Social (IPHES, Spain) and the Institute of Vertebrate Paleontology and Paleoanthropology (IVPP, Chinese Academy of Sciences, China) have a long record of scientific relationship regarding different aspects of the research focused mainly on Palaeolithic lithic technology. This collaboration has been developed in form of various research visits in both directions, the incorporation of Professor Eudald Carbonell as visiting Professor of the IVPP since 2009, and the organization of an International meeting held in Shanghai in 2010. At 2010 funding was obtained from the Catalan Government in order to establish and to consolidate a scientific exchange among researchers from both institutions. These exchanges have the objective of encouraging the collaboration between researchers and institutions for the study of archaeological materials, training of young researchers in the frame of their doctoral thesis and the development of postdoctoral carriers. The scientific scope of the research was based on 3 objectives: the study of lithic technology Palaeolithic assemblages, the start up of an experimental project on bamboo and the study of archaeobotanical remains from Palaeolithic deposits. Firstly, the Sierra de Atapuerca sequence includes assemblages from the late Early Pleistocene to the late Middle Pleistocene; they are clearly framed in the general Western Europe context. As a consequence of the analyses of the evolutionary trends of the technological factors in the Atapuerca sequence, and discussed until which point these trends can be extrapolated to the other European sites, our aim was to collect data to improve our vision of the technical evolution in a really broad scale, in order to be able to compare the technological evolutionary trends identified at both ends of Eurasia along the Early and Middle Pleistocene.

Secondly, our project aimed to develop an experimental project regarding the use of bamboo as a raw material for manufacturing tools. This research has provided new insights in relation to the manufacture and use of bamboo.

Thirdly, this project was focused in starting up the study of charcoal remains from Palaeolithic sites in collaboration with the Institute of Archaeology (ICASS). Anthracology is an archaeobotanical discipline devoted to charcoal analyses which is well recognized in Europe. This discipline has provided data on palaeoenvironment and plant resource uses among early hunter-gatherers. In China, this discipline is at present in its starting point regarding Palaeolithic data that will provide elements for comparison to the results from Palaeolithic sites from Europe.

Our perspectives for the future will be focused in the application of European methodologies (usewear analyses, anthracology, and experimental archaeology) for the study of Asian Palaeolithic assemblages that would improve our knowledge on Palaeolithic human groups regarding different aspects.

ORAL

#### 4. PANXIAN DADONG, LITHIC IMPLEMENTS OF A MIDDLE PLEISTOCENE SITE IN SOUTHWEST CHINA

Otte, Marcel (*Université de Liège*) [Marcel.Otte@ulg.ac.be](mailto:Marcel.Otte@ulg.ac.be)  
Weiwen Huang (*Institute of Vertebrate Paleontology and Paleoanthropology, Chinese Academy of Sciences*)  
[huangweiwen@ivpp.ac.cn](mailto:huangweiwen@ivpp.ac.cn)  
Yue Hu (*Institute of Vertebrate Paleontology and Paleoanthropology, Chinese Academy of Sciences*) [hy.ivpp@gmail.com](mailto:hy.ivpp@gmail.com)  
Ya-Mei Hou (*Institute of Vertebrate Paleontology and Paleoanthropology, Chinese Academy of Sciences*)  
[hoyamei@ivpp.ac.cn](mailto:hoyamei@ivpp.ac.cn)

Around three hundreds thousands years, the Panxian Cave has been filled and fully occupied until 100.000 years. The main humans implements were consisting of prepared cores and flakes on the Levalloisian kind of preparation. This is one of the oldest known in both in both Africa and Asia.

The core preparation has been fully shaped by convergent flaking techniques with a high degree of shaping both on platforms and usage of convergent techniques. The fully shaping of both surface and butts prepares a high degree of refinement that should fully look like the middle Paleolithic technique both in Europe and Africa. Different methods of shaping show a high refinement technology that only comes elsewhere much later. Several other sites show this high refinement technologies already obtained in China much earlier than in different parts of the world.

ORAL

#### 5. HALLAM MOVIVUS AND THE LINE THAT NEVER WAS

Dennell, Robin (*University of Sheffield*) [r.dennell@sheffield.ac.uk](mailto:r.dennell@sheffield.ac.uk)

The "Movius Line" is one of the most fundamental concepts in studies of the Asian Palaeolithic. Despite its importance in contrasting the Acheulean, biface-using in-

habitants of west and south Asia with the core and flake using inhabitants of East and SE Asia, there has been almost no discussion of the validity of the field data that Movius collected in Myanmar in 1938 and which underpinned his 1948 synthesis, or of the Pleistocene chronological framework of Helmut de Terra that was used by Movius. Here, I show that the geological sequence of de Terra is almost certainly invalid; that Movius was unable to demonstrate that any of his "Anyathian" artefacts could be correlated with de Terra's alleged Pleistocene terraces; or that the lithic assemblages that he considered from Southeast Asia were Early or Middle Pleistocene in age. Overall, the "Movius Line" was a house built on sand, and is best forgotten.

ORAL

#### 6. THE PALEOLITHIC IN CENTRAL CHINA: CHRONOLOGY, TECHNOLOGY AND COGNITION

Youping Wang (*School of Archaeology and Meseology, Peking University*) [ypwang@pku.edu.cn](mailto:ypwang@pku.edu.cn)

Through the analysis of Dingcun light duty tools and the cores of Dingcun, the basic characteristics of Dingcun industry are shown more comprehensively.

This paper will focus on the chronology, technology, cognition and related issues in Middle to Upper Paleolithic in Central China. Since 2000, several Paleolithic sites near Zhengzhou, the capital city of Henan Province, Central China such as Zhijidong Cave at Xingyang, Zhaozhuang at Xinzheng, Xishi at Dengfeng and Lijiagou at Xinmi were excavated. Much more new information related chronology, technology and cognition were collected from those sites. The preliminary research result on new discoveries indicates that the pebble tool industry occupied the leading position when early human came to the Zhijidong cave. However, the flake tool industry apparently succeed and developed from the pebble tool tradition since about 40000BP both in the cave and open air sites, and then were blade industry at Xishi site about 25000BP. The microlithic assemblages were found from Lijiagou, an early Holocene site around 10500 to 9000 BP. The process from pebble tool to flake, blade and microlithic tools is not only the change of lithic technology in the Late Pleistocene Central China, but also related with the developments of modern human cognition and so on.



ORAL

## 7. THE TECHNO-ECONOMIC BEHAVIOR OF DINGCUN LITHIC INDUSTRY

*Shi-Xia Yang (IVPP, Chinese Academy of Sciences)*

*yangshixia122@gmail.com*

*Ya-Mei Hou (IVPP, Chinese Academy of Sciences)*

*houyamei@ivpp.ac.cn*

*Wei-Wen Huang (IVPP, Chinese Academy of Sciences)*

*huangweiw@ivpp.ac.cn*

Dingcun, excavated in 1954 and 1955, was the first properly-excavated paleolithic site after the foundation of P. R. China in 1949. It is a famous Paleolithic site in North China that lies in the rift zone of the Fenhe Graben, which is located in the eastern Chinese Loess Plateau in Shanxi Province. Although Pei (1958) stated that Dingcun was Late Pleistocene in age, according to the cultural layer is below the first paleosol (S1) which is dated to 73~128 ka (Ding et al., 1991, 1994; Wu and Liu; 2002), and the U-series dating results is 160 ~210 ka (Chen et al., 1984), so in recent work, the Dingcun assemblage dates to the Late Middle Pleistocene (Yang et al., 2014).

This re-studies, which includes the whole assemblage, will focus on using the technological and typological analytic methods to define the techno-economic behaviors of Dingcun lithic industry. Aiming to have a whole perspective of the lithic industry, we also applied the geological mapping and the geochemical test to establish the source of the hornfels used in the Dingcun industry. Study of the chaîne opératoire shows that in the Dingcun industry the two product processes (or production line) are paralleled, and the residents had a clear knowledge of both. Since the by-products of heavy duty tool production were saved to work as the supplement blanks of the light duty tools production. Through the analysis of Dingcun light duty tools and the cores of Dingcun, the basic characteristics of Dingcun industry are shown more comprehensively. Compared to the other sites in north China and other sites in Africa or Europe, the transitional traits of Dingcun can be identified. At present, it is hard to state conclusively that the Dingcun industry is a Lower to Middle transition site, although progress on producing light duty tools should be acknowledged and the new traits that are in keeping with an MP should be highlighted. The Paleolithic transition in China did not appear abruptly in the Late Middle Pleistocene, instead the progress was made step by step.

ORAL

## 8. MODERN HUMAN BEHAVIOR EMERGENCE IN LONGQUAN CAVE, LUOYANG, CHINA

*Shuisheng Du (School of History, Beijing Normal University)*

*ssdu@bnu.edu.cn*

The Longquan cave site in Luanchuan county, Luoyang of China is about 26-36kya. In 2011, the joint archeological team have excavated 512 stone artifacts and a large number debitage fragments and chippings which was knapping by simple core-flake technology, hearth and a polished bone awl. These findings suggest that residents of Longquan cave were able to division their living areas by different functions with different landscape conditions. A constructed hearth and barbecue stone to to bank energy is also an important finding. Which means modern human behavior emergence in China, and there are a different adaptation model exist in China.

ORAL

## 9. USE-WEAR EVIDENCE AND FUNCTIONAL INFORMATION ON LITHIC TOOLS AT WULANMULUN SITE, INNER MONGOLIA, CHINA

*Hong Chen (Department of Cultural Heritage and Museology, Zhejiang University) hollychen@zju.edu.cn*

*Ya-Mei Hou (Key Laboratory of Vertebrate Evolution and Human Origin of Chinese Academy of Sciences, Institute of Vertebrate Paleontology and Paleoanthropology, Chinese Academy of Sciences) houyamei@ivpp.ac.cn*

*Zemeng Yang (Ordos Antiquity & Archaeology Institution)*

*Ziming Zhen (Ordos Antiquity & Archaeology Institution)*

*Huiru Lian (Department of Cultural Heritage and Museology, Zhejiang University) lhr336@126.com*

*Yang Liu (Ordos Antiquity & Archaeology Institution)*

The Wulanmulun site was discovered on the left bank of the Wulanmulun River in Ordos, Inner Mongolia, North China. It is considered as another new important discovery of paleolithic culture in Ordos region beyond the sites of Salawusu and Shuidonggou. Up to the end of 2012, about 4200 stone artifacts and 3400 fossils mammal and abundant evidence of hominid use of fire were excavated from Locality 1. In order to explore tool function and human behavior at Wulanmulun during the Middle to Late Pleistocene, we have selected 283 specimens excavated from Locality 1 in 2010 for use-wear analysis. Many stone artifacts display used wear, and several show wear from hafting. The working motion was dominated by de-

fleshing and slicing, and the main contact material were animal substances.

Since the amount of stone artifacts is huge, and the commonest raw material is quartzite, we employ the low power technique with an Olympus SZX16 stereo microscope at magnifications ranging from 8.75 to 143.75 diameters. All wear patterns were photographed using a Nikon EOS 600D digital camera, and measured by Olysim Basic software.

The concept of Functional Unit (FU) is used to count the number of use-wear indications, including traces of prehensile use and hafting. The analytic results suggest that 134 specimens retain use-wear, accounting for 47.4% in the observed samples. As 17 specimens were found with more than one segment of FU, a total of 154 FUs are therefore found at different locations.

Six types of working motions are identified, including defleshing (slicing), cutting (sawing), piercing, drilling, scraping and engraving. The contact materials were mainly identified as animal substances, including flesh, fresh hide, dried hide, and fresh bone with a slight difference in hardness. From a cross-tabulation of working motion and contact material, many use-wears exhibit the possibility of contacting both flesh and bone at the same time.

Hafting wear refers to micro-fracture and abrasion traces caused by either the pressures of handling or binding as a way of making a composite tool. Compared to our experimental data, at least three specimens are identified as bearing both used wear and hafting wear, indicating that some tools might have been used as composite tools at Wulanmulun site.

The preliminary results reveal direct evidence of tool function and human behavior, indicating that most stone artifacts were used as tools, and some might have been used as composite tools.

It is suggested that animal-processing, including skinning and defleshing, is a main working task at Locality 1. Palaeozoological and palaeoecological research also provides us with evidence that animal substances were utilized in this site since fossil animal remains, burnt stones and combustion features were discovered in situ. Some bones also showed cut marks at anatomical parts. The results suggest that some lithic artifacts from Locality 1 might have been made and used as composite tools, which maybe currently the earliest ones identified in China. This study sheds light on the emergence and

subsequent success of composite tools during Middle Paleolithic in North China.

ORAL

## 10. THE SOCIETY OF PRE-YANGSHAO PERIOD IN CHINA(7000BC?5000BC)

*Jinying Cai (School of History and Museology, Anyang Normal University) caijinying12@hotmail.com*

Pre-Yangshao period belongs to the early Neolithic age in China. Its radiocarbon dates range is 7000BC-5000BC. During this period, there were many cultures in China. The Peiligang culture, the Cishan culture, the Laoguantai culture and the Houli culture were distributed in the Yellow River Valley. The Pengtoushan culture and the Kuahuqiao culture were distributed in the Yangtse River Valley. The Xinglongwa culture was located in the northern region of China. Among those cultures, the Peiligang culture appeared to be the strongest. And the society began to be complicate at this time.

There were many sites and cemeteries excavated in every culture. In this paper, the author mainly uses these materials which had already published. Like Peiligang Neolithic site in Xinzheng, Henan (1978). Excavation of Peiligang site in 1978(1979). Wuyang Jiahu(1999). Excavation report of Peiligang cultural relics in Tanghu site, Xinzheng City, Henan in 2007(2010). Excavation of Cishan Neolithic site in Hebei(1977). Cishan site in Wu'an, Hebei(1981). Beifudi—prehistoric site in Yi River valley(2007). The first and second excavation report of Houli site in Linzi, Shandong(1992). The third and fourth excavation report of Houli site in Linzi, Shandong(1994). Excavation report of Xiamengcun site in Bin County, Shaanxi(1960). Lijiacun Neolithic site in Xixiang, Shaanxi(1961). Pengtoushan and Bashidang(2006). Excavation report of Xinglongwa Site in Aohanqi, Neimenggu(1985). Excavation report of Baiyinchanghan Neolithic site in Linxi County, Neimenggu(1993). The research methods are mainly stratigraphy analysis, typology analysis and pedigree analysis. By using the stratigraphy analysis and typology analysis, we can understand the spatial and temporal distribution of each culture. And by using the pedigree analysis, we can analyze the relationships among those cultures.

The analysis shows that the Peiligang culture is the strongest among those cultures in Pre-yangshao period. Combination of the stratigraphy and typology analysis, the Peiligang culture was divided into three phases. By using the pedigree analysis, the Peiligang culture

originated from the Jiahu culture. Because of the early Cishan culture, the Jiahu culture transferred into the Peiligang culture. The Peiligang culture was influenced by the Houli culture in phase?. It affected the Houli culture, the Cishan culture, the Xinglongwa culture, the Pengtoushan culture and the Laoguantai culture with varying degrees in Phase?. It had less control in phase ?.

During Pre-Yangshao period, the Peiligang culture played a very important role. It was the strongest among those cultures and It had a great impact on surrounding contemporary cultures with different degrees, especially on phase?. The Peiligang culture were mainly distributed in the central plains region. It played an important role in the foundation of the Chinese Civilization development. Judging from the development of the Peiligang culture, we can say that the society began to be complicate at Pre-Yangshao period. Pre-Yangshao period, especially the Peiligang culture was a key step in the process of social complexity.

POSTER

POSTER

### 11. ISOTOPIC EVIDENCE OF ANIMAL DOMESTICATION IN CHINA

*Yaowu Hu (University of Chinese Academy of Sciences)  
ywhu@ucas.ac.cn*

The animal domestication is a great focus in the archaeological and anthropological field. However, Due to the uncertainty of discerning the domesticated animals from the wild during the early stage of animal domesticated, it is quite difficult to reveal the occurrence of the animal domestication and the mechanism on animal domestication.

In this poster, we tried to analyze the stable isotope ratios in the human and animal bones to find out the dietary difference among animal species and the influence of human feeding behaviour on animal foods.

Based on the above methodology, we succeeded in the identification of the domestic pigs from pig bones around 8500 years ago and the commensal and mutual relationship between cats and humans around 5300 BP, which shed fresh light to the evidence of animal domestication in China.

POSTER

POSTER

### 11. THE EARLIEST EVIDENCE OF HOMINID SETTLEMENT IN CHINA - COMBINED ELECTRON SPIN RESONANCE AND URANIUM SERIES DATING OF FOSSIL TEETH FROM LONGGUPO CAVE

*Fei, Han (State Key Laboratory of Earthquake Dynamics, Institute of Geology, China Earthquake Administration, Beijing 100029, China) hanfei@ies.ac.cn*

*Bahain, Jean-Jacques (Département de Préhistoire Muséum National d'Histoire Naturelle, UMR7194 du CNRS, 1, rue René Panhard 75013, Paris, France) bahain@mnhn.fr*

*Boëda, Éric (UMR 7041 CNRS ArSCAN, équipe AnTET, université Paris Ouest-Nanterre La Défense, 21, allée de l'Université, 92023 Nanterre cedex, France, Laboratory of Human Evolution, Institute of Vertebrate Paleontology and Paleoanthropology, Chinese Academy of Sciences, Beijing 100044, China, Institute of Vertebrate Paleontology and Paleoanthropology, Chinese Academy of Sciences, No. 142, Xizhimenwai Street, Beijing 100044, PR China) boeda.eric@gmail.com*

*Hou, Yamei (Laboratory of Human Evolution, Institute of Vertebrate Paleontology and Paleoanthropology, Chinese Academy of Sciences, Beijing 100044, China) houyamei@ivpp.ac.cn*

*Wei, Guangbiao (Chongqing Three Gorges Institute of Paleoanthropology, China Three Gorges Museum, Chongqing 400015, PR China) weiguangbiao2010@sina.cn*

*Huang, Wanbo (Institute of Vertebrate Paleontology and Paleoanthropology, Chinese Academy of Sciences, No. 142, Xizhimenwai Street, Beijing 100044, PR China, Chongqing Three Gorges Institute of Paleoanthropology, China Three Gorges Museum, Chongqing 400015, PR China) weiguangbiao2010@sina.cn*

*Rasse, Michel (Department of Geography, University of Rouen, UMR 6266 CNRS IDEES, 76821 Mont St Aignan cedex, France) michel-rasse@univ-rouen.fr*

*Chenglong, Deng (Institute of Geology and Geophysics, Chinese Academy of Sciences, Beijing 100029, China) cldeng@mail.iggcas.ac.cn*

*Garcia, Tristan (CEA, LIST, Laboratoire National Henri Becquerel, 91191 Gif-sur-Yvette Cedex, France) tristan.garcia@cea.fr*

*Shao, Qingfeng (College of Geography Science, Nanjing Normal University, Nanjing 210023, China) qingfengshao@hotmail.com*

*Falguères, Christophe ((Département de Préhistoire Muséum National d'Histoire Naturelle, UMR7194 du CNRS, 1, rue René Panhard 75013, Paris, France) falguere@mnhn.fr*

*Voinchet, Pierre (Département de Préhistoire Muséum National d'Histoire Naturelle, UMR7194 du CNRS, 1, rue René Panhard 75013, Paris, France) pvoinch@mnhn.fr*

*Yin, Gongming (State Key Laboratory of Earthquake Dynamics, Institute of Geology, China Earthquake Administration, Beijing 100029, China)*

Longgupo cave, located in Chongqing Municipality, was discovered in 1984. A number of mammalian fossils and stone artifacts were unearthed from the site, fourteen Gigantopithecus teeth and two hominid fossils (one frag-

mental mandible with two teeth and an upper incisor) distinguished the site as one of the earliest evidences of hominid settlement in China. Previous paleomagnetic and electron spin resonance (ESR) dating studies place the site as early as 1.9 Ma (Huang et al., 1995). However, this result is questioned because of the complexity of deposition history. During the Sino-Franco joint excavation between 2003 and 2006, the stratigraphy of Longgupo was reinvestigated in detail (Boëda et al., 2011; Rasse et al., 2011), and mammalian fossil teeth were collected systematically from different layers for dating study. In this paper, we present our dating work on these fossils by combined ESR and uranium series analysis, and the new results suggest that the chronology of hominid settlement in Longgupo site as old as 2.5 Ma.

Seventeen fossil teeth were analyzed in this study, including seven teeth from layer C II 2 to C III 8 of south wall, and ten from layer C III' 2 to C III' 6 of north wall of Longgupo site. All the samples are mammalian teeth and well preserved with enamel and dentine tissues. In this dating work, we applied combined ESR and U-series methods with US-ESR model (p-value model) to calculate the fossil age, this combined method could reconstruct the internal dose of fossil teeth with measured U-Th data, instead of artificial assumption (EU and LU models) of uranium uptake history for dose rate determination which used in previous study. The paleodose of enamel samples were determined by ESR method with double saturation exponential fitting function. The external dose rate were determined by in situ dose rate measured in 2012 with NaI portable gamma spectrometer and laboratory analysis of surrounding sediments by high-purity Ge gamma spectrometer in low temperature.

Uranium-series analysis shows that  $^{230}\text{Th}/^{234}\text{U}$  activity ratios of all the samples are not beyond equilibrium, which indicate no obvious uranium leaching occurred and US-ESR model could be applied for fossil age calculation. The p-values of the dental tissues in all the samples are beyond zero, which represent a recent uranium uptake history, except one from layer C III 3 of south wall, which also gives a much younger age than others. For the north wall, ten teeth from unit C III' show consistent ages in general, about 2.3 Ma in average; for the south wall, the sample ages distribution are not in accordance with the stratigraphic order, three teeth are much younger than the other four, probably because of the relative higher uranium concentration and U/Th ratio in the dental tissues, and significant higher in situ gamma dose rate, respectively. Nevertheless, the three teeth from C III give the age of  $\sim 2.5$  Ma in average. This result is older than our preliminary results (Han et al., 2012) since in situ dose rate measurement was not available for some layers in the previous study. This updated results based on

detailed in situ dose measurement in 2012 agrees with the paleontological evidences of Longgupo, which the co-occurrence of *Sinomastodon*, *Nestoritherium*, *Equus yunnanensis*, *Ailuropoda microta* and the rodent *Miomys peii* suggest a time range of late Pliocene to early Pleistocene (Huang et al., 1995), and could also explain the new paleomagnetic analysis which all the samples show negative magnetic polarity except the upmost ones collected from layer C II-2. The result in this study places Longgupo site between the end of Gauss chron and onset of Olduvai subchron.

This study date the fossil teeth systematically from different layers of south and north wall of Longgupo site according to the new stratigraphic division and updated in situ gamma dose rate measurement by Sino-Franco team. The age results of both wall unambiguously reach to  $\sim 2.5$  Ma, which place Longgupo site at the very beginning of Early Pleistocene. Although the creators of "Longgupo culture" is still a mystery (Wei et al., in press), comparing with other convincing evidences of early hominid settlement in China, such as Majuangou III Paleolithic site in Nihewan Basin ( $\sim 1.7$  Ma, Zhu et al., 2003) and Xihoudu Paleolithic site in Shaanxi Province ( $\sim 1.4$  Ma, Kong et al., 2013), Longgupo site is undoubtedly the oldest hominid sites in China and East Asia so far.

# B1

## Task distribution in pre- and proto-historic societies

(Organisers : Sophie A. de Beaune, Haris Procopiou, François Sigaut )

Friday 5th (9:00 to 13:30 15:00 to 19:30)  
A11 Meeting Room



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ORAL CONTRIBUTIONS

ORAL

**1. A CRITICAL ANALYSIS OF THE EVIDENCE FOR TECHNICAL SPECIALISATION IN THE UPPER PALEOLITHIC**

*de Beaune, Sophie (Université Jean Moulin Lyon 3 - UMR Ar-ScAn Nanterre) sophie.de-beaune@mae.cnrs.fr*

In this paper, I propose a critical analysis of the evidence for technical activity specialization in the Upper Paleolithic according to age and sex. Some hypotheses are based on suppositions generated by ethnographic comparisons, while others rely on direct or indirect indices including task diversification, activity zone locations, the identification of different skill levels, the diversity of grave goods, and even evidence from the body, such as hand prints. Three types of explanations have been proposed for this subject:

- 1, simple suppositions based on ethnographic comparisons, particularly concerning the sexual division of tasks, through reference to what is most often observed among living or recent populations;
- 2, explanations based on indirect archaeological evidence;
- 3, explanations based on direct evidence, which, as we will see, is rare and difficult to interpret.

Based on the analyzed information, as well as simple common sense, I propose that there was a reasoned distribution of activities within groups, accompanied by an emerging social hierarchy.

I will conclude by insisting that we must be cautious in our interpretations since what we seek to understand is the identity of our Paleolithic actors, while this identity forcibly evolved throughout the millennia of prehistory and was subject to the ebbs and flows that shaped the history of Paleolithic societies.

ORAL

**2. COGNITIVE AND NEUROPSYCHOLOGICAL PRE-REQUISITES OF TASK DISTRIBUTION IN PREHISTORIC SOCIETIES COOLIDGE, FREDERICK (UNIVERSITY OF COLORADO, COLORADO SPRINGS) FCOOLIDG@UCCS.EDU**

*Wynn, Thomas (University of Colorado, Colorado Springs) twynn@uccs.edu*

Kuhn and Stiner (2006) proposed that sex and age divisions of labor are unique to *Homo sapiens*. We agree but have further argued (e.g., Coolidge & Wynn, 2001; Wynn & Coolidge, 2008) that this division of labor, whether hunting, gathering, or technical, is characteristic of a particular *pattern of thinking* based on species-specific neurological characteristics that evolved within the last 200,000 years. These neurological characteristics appear to be linked to an expansion of the superior parietal lobe in *Homo sapiens* (Bruner, 2004; Bruner, 2010; Bruner, Rangel de Lazaro, Cuetara, Martin-Loeches, Colom, & Jacobs, 2014). One social phenomenon that appeared late in human evolution, and which was arguably related to division of labor and other forms of social specialization, was the planning and execution of long-distance trade with acquaintances and strangers (Ambrose 2008). The present paper explores this neglected aspect of *Homo sapiens* thinking, and proposes that two cognitive developments were critical: enhanced executive functions (or enhanced working memory [Baddeley 2002; Coolidge & Wynn, 2005; Wynn & Coolidge, 2010]), and Theory of Mind, the ability to read the intentions, attitudes, and feelings of others.

ORAL

**3. ASTURIAN PICKS AND MAINTENANCE ACTIVITIES IN LA RIERA CAVE (ASTURIAS, SPAIN)**

*de Juana Ortín, Cristina (Universidad de Alcalá (Madrid, España) cristina.juana@uah.es*

Based on the study of the Asturian Picks of La Riera, we propose the following: firstly, to relate them to maintenance activities (M.A.) and secondly, to use them as a basis to justify the distribution hypothesis of these tasks by gender or age.

The pieces in question, are characteristically found in low numbers on archaeological sites. Furthermore, some of the Asturian Picks in La Riera cave have other residues. Like in other industries, as quartzite, in them, it's possible to differentiate "variety of their traces of use" (Beaune 1994:64).

The Asturian Picks in La Riera cave were in domestic environments and if we associate this picks with maintenance activities, the result it is convincing. We want

to study the specific site of the Asturian Picks in different jobs.

Our intention is to reflect on the involvement of individuals, by gender and age, within the M.A. associated with these production cycles in The Finiglacial period.

To do so, we selected "the Asturian Picks" of La Riera deposited at the Museum of Natural Science of Madrid.

Our methodology consisted of the following steps: 1. Standardize information about the pieces in order to compare them. 2. Use parallels in experimental archeology that allow us to define the M.A. in which they could have been used, and specify their possible uses. 3. Search for studies in ethnoarchaeology linking our production cycles with the division of labour, without losing sight of the fact that we are referring to hunter-gatherer people. They are multifunctional objects, which allows us to relate them to a greater or lesser extent to women and different ages, as ethnographic comparisons suggest. The operational chains that we have identified would have been closely related to maintenance activities (M.A.) given that "the cycles of the various materials are never completely separate from each other. By way of analogy, not only can you transfer certain phases of the production of one material to another, a cycle can also reuse discards from another production otherwise the success of one activity may mean the failure of others." (Mannoni and Giannichedda 2004:79).

That said, the domestic arena is presented as a social nucleus of hunter-gatherers, where individuals of all ages and both sexes converge, and where the Asturian Picks become "invisible" witnesses to everyday life.

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ORAL

#### **4. THE EVOLUTION OF INSTITUTIONALISED DIVISION OF LABOUR? LITHIC TECHNOLOGY IN STONE AGE SCANDINAVIA**

*Apel, Jan (Lund University) jan.apel@ark.lu.se*

The ability to accumulate culture over time separates humans from other species. A unique form of knowledge-transfer allows individuals to stand on the shoulders of earlier generations and increase the rate of cultural development and change. It has been suggested that important requisites for cumulative culture are evolved brains that allow for shared cultural representations, and an innate human pedagogical ability. Humans have a

natural tendency to be able to create enriched learning environments in which complex technological information and know-how is transmitted to future generation. Among mobile hunter-gatherers such information seem to be reproduced within basic sex and age groups and is more or less freely available for group members. However, in more sedentary societies, an increased dynamic density seems to lead to lineage-based technological specialisation and to the breakdown of segmentary social structures. Such a scenario is discussed in this paper with an example from Late Neolithic southern Scandinavia.

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ORAL

#### **5. DISTRIBUTION OF TASKS WITHIN A NEOLITHIC COMMUNITY: METHODOLOGY, RESULTS, CHALLENGES AND LIMITATIONS**

*Duboscq, Stéphanie (Universitat Autònoma de Barcelona) duboscqstephanie@gmail.com*

*Gibaja, Juan (CSIC) jfgibaja@gmail.com*

*Piqué, Raquel (Universitat Autònoma de Barcelona) raquel.pique@uab.cat*

The goal of this paper is analyzing the sexual division of labor in the Neolithic (VI-III millennium BC) in the NE of the Iberian Peninsula (now Catalonia and Andorra). The main objective of this research is to try to improve our knowledge of the social organization of Neolithic populations, especially the relations between men and women. In history and still today the woman has often been a "victim" of the sexual division of labor, becoming this the cause of the inequality among men and women. The question is when this situation starts and, particularly, if it happened in the Neolithic of NE of Iberian Peninsula. The starting point of this research is the analysis of graves of the Neolithic sites in Catalonia. One of the ways to document the division of labor in this period is to observe the burials, the deceased associated equipment (which can tell us about the activities or social status of the person when living) and bone diseases, when the state of conservation of the skeleton allows it.

But the information obtained from funerary contexts must be handled with care, because of its subjectivity, and here appear the first difficulties. The definition of a specific theoretical framework is essential; some basic notions must be carefully reflected (funeral ritual, work and activities, sex and gender, equality and inequality). Other problems may occur and make our task more difficult: the state of conservation of the site and its remains;

the antiquity of the excavation; possible looting and other taphonomic dislocations; dating problems, etc.

Through the analysis of these funerary contexts, we will see that certain types of objects are more often associated with men, other with women and other with children. This preliminary analysis already enables us to speak about some differences between men and women concerning the activities they are linked with.

It seems that each sex is linked to well-differentiated types of tasks. Women may have been more involved into activities to maintain the community and which can be made without leaving the settlement (like the work of the skin, the couture, etc.). From what we find in the graves, men would be more linked to activities like fleshing, hunting and working hard materials like wood.

The preliminary data resulting from early research on the subject of the sexual division of labor during the Neolithic Catalan show that at certain times, especially during the middle Neolithic, there are differences in the grave goods of the buried people. The differences in what is represented in the burials can provide elements for reflection on the social value of objects/tools, activities and consequently of the individuals who performed them.

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ORAL

## 6. WOMEN'S WORK? FINDINGS FROM THE NEOLITHIC CHERT MINES IN THE "KRUMLOVSKÝ LES", MORAVIA

*Oliva, Martin (Moravian Museum) moliva@mzm.cz*  
*Jarosova, Ivana (Moravian Museum) ivanajar@gmail.com*  
*Nyvltova, Miriam (Archaeological Institute, Brno) miriam@iabrno.cz*  
*Serý, Omar (Masaryk University) osery@elisabeth.cz*  
*Tvrdy, Zdenek (Moravian Museum) ztvrdy@mzm.cz*

In the "Krumlovský les" (Krumlov Forest) in South Moravia the outcrops of the Jurassic chert are located, redeposited in the Miocene sands. Although their quality was only mediocre, they were mined from the Mesolithic to the Hallstatt Age. had caused intensive settlement in this area already since the Middle Palaeolithic. It's obvious that latest since the Early Bronze Age, when the mining culminated, the importance of this old extraction landscape no longer consisted in its lithic resources, but in its past.

Nearly all Late Lengyel dated situations were discovered in trench VI-9-1 into the rather steep slope below a 1 m high chert-breccia boulder, undoubtedly placed here arteficially. The circular cross section of the 100-120 cm wide shaft Nr. 4 continued straight down to the depth of 6 m, where a complete human skeleton (H1) was found. A second skeleton (H2) with a new-born (H2b) was found 60 cm deeper.

Female H1 died at the age of 30-35, individual H2a was aged 35-40. Both females were gracile but with distinct muscle topography. Their statures were estimated at 148.8 and 146.1 cm, respectively; both females were the shortest of all examined individuals from the Moravian LgK period. Both women have delivered. Enamel hypoplasia and Harris lines show evidence of stress experienced by both individuals during growth and development. The health condition of woman H2a was poorer than that of female H1. She suffered from iron deficiency and her left ulna had been broken and healed with pseudoarthrosis. Both skeletons show evidence of hard physical activity (distinct muscle topography, Schmorl nodes, osteophytes).

According to the carbon, nitrogen and strontium isotopic analysis, the women were well alimented during the last year of their lives. They have eaten animal proteins, as well as plant food including berries rich in minerals and vitamins. The results of the DNA analysis (O. Šerý) proved that the skeletal remains of females H1 and H2a are related, and may represent a mother and a daughter, or two sisters.

The unusual physical characteristics of the females buried in the shaft 4 raise suspicion that for the exhausting work in mining shafts (also) weak individuals of small stature were misused, who had starved in their youth. From the ergonomic angle, the small stature in the miners would be advantageous, since they would more easily fit into the narrow shafts. In the Krumlovský les, however, the shafts are wider than e.g. in Abensberg-Arnshofen, where it is assumed that mining was done by youngsters. Another reason may be based in the sphere of religious ideas – in the Dark Continent women allegedly work in the mines because they are more easily accepted by the Earth, since it is of female gender like them. The third explanation results from simple human ruthlessness: the hardest work is not carried out by the strongest, but by those who can be coerced into it most easily. Therefore, the paper demonstrates that the linkage of some facts with the topic of division of labour can be only apparent.



ORAL

## 7. GENDER ACTIVITIES AND SOCIAL ROLES IN SOUTHERN CENTRAL ASIA DURING THE BRONZE AGE

*Luneau, Elise (DAI-Eurasien Abteilung) elise.luneau@dainst.de*

The Oxus civilization – a proto-urban and sedentary culture spread across southern central Asia during the second half of the 3<sup>rd</sup> and the first half of the 2<sup>nd</sup> millennium BCE – counts among those societies with strong social differentiation, which is particularly visible in the burial practices. Graves of deceased females are viewed as richer than graves of males, because they are better furnished in the quantity and/or quality of items, especially in precious materials. Older studies perceived the wealth of the female burials dichotomously: either as the symbol of female power over society (matriarchy), or, oppositely, the reflection of male wealth (husband, father, etc.). Also, according to previous research activities of men and women differ considerably, women tending to be limited to the domestic sector.

However, the precise study of the distribution of funerary gifts in five necropolises attributed to the Oxus civilization has revealed more about preferential dispersal of items according to sexual identity, and enables questions about gender activities and social status.

The inaccuracy of older perceptions of activities based on gender can be posited. The analysis provides a more balanced division of tasks between both than previously asserted.

Different functions of artefacts seem to fit with different high status correlated with specific social roles of men and women in this society.

ORAL

## 8. POTTERY TO IRON: GENDERED TRANSITIONS OF VALUE WITH THE COMING OF IRON IN THE LAKE CHAD BASIN, CENTRAL AFRICA

*MacEachern, Scott (Bowdoin College) smaceach@bowdoin.edu*

During the mid-first millennium BC, agricultural communities in the southern Lake Chad Basin of Nigeria, Cameroon and Chad progressively adopted iron tech-

nologies. The technological and economic implications of that adoption have been widely discussed, but rather less attention has been paid to their social consequences. Historically, as in many areas of Africa, iron smelting was a spectacular and highly gendered activity, often involving images of male potency and the fecundity of a furnace gendered as female. Ceramic production, on the other hand, is undertaken by women and has far less cultural prestige. The characteristics of pre-iron-working ceramic traditions suggest that pottery had earlier occupied a more prestigious role, probably associated with the serving of food and drink in more mobile communities. This paper will discuss probable changes in the values assigned to gendered artefact production before and after the introduction of iron in this region, as well as the implication for archaeological interpretations of an archaeological heritage dominated over the last two millennia by the material remains of tasks undertaken by women.

ORAL

## 9. SEXUAL DIVISION OF LABOR AND SOCIAL VALUE IN SUB-PRESENT HUNTER-FISHER-GATHERER SOCIETIES: AN OBJECTIVE WAY TO MEASURE INEQUALITY IN PREHISTORY

*García Piquer, Albert (Universitat Autònoma de Barcelona) alberto.garcia.piquer@uab.cat*

Ethnography describes most Hunter-Fisher-Gatherer (H-F-G) as egalitarian societies in which sexual division of labor is an unavoidable consequence of the biological features of both sexes or a technical strategy based on the complementarity of male and female features that produces the most successful adaptation. Due to the archaeological invisibility of social relationships through methodological issues available nowadays in prehistoric archaeology, it is commonly assumed that Prehistoric H-F-G societies were egalitarian in the same way and for the same reasons as the former. However, a non-biased, complete and objective analysis of the ethnographic information shows that actually there are two main basic universal features in the organization of H-F-G social relationships: sexual division of tasks (labor) and social inequality between males and females. Despite their universal appearance, the large variability in the morphology and in the intensity of the different cases demonstrates that these relationships are not caused directly by the biology of men and women. They are clearly a social option.

Inequality is materialized in the different effort invested by men and women in the labors related to subsistence and reproduction. This difference is measurable through the consequences of labor and can be retraced considering the work effort invested in the products. It can be objectively evaluated for every product through the calculation of the labor (time\*effort) invested with the available technology.

We have tried to demonstrate this approach with Tierra del Fuego H-F-G societies. We have proposed a system for evaluating, in an objective way, the real value (the effort invested by men and women) via an Ethnographic example as well as its application to an ethnoarchaeological context. We have considered (1) the main environmental features and conditions, (2) the ethnographic information contrasted with experimental and archaeological data and (3) we have replicated almost all working procedures, to gain a more objective and quantitative perspective.

Considering all this information we can succeed in calculating archaeologically the value produced by every social segment in Tierra del Fuego H-F-G societies. Even without considering the effort invested in reproduction, the differences in the working effort between men and women are well documented both in the ethnographic and the potential archaeological record.

The greater contribution of women to the daily subsistence (more labor – more provision of objective value) does not correspond with their social role. Men are considered more socially important, they take decisions and they set up the rules. To explain this situation we suggest a direct link between: (1) division of labor based on sex, (2) devaluation of women (by the devaluation of their contribution) and (3) control of the sexuality of women (fundamentally) in order to regulate the reproduction of the group. Finding archaeological indicators of the sexual division would be a first step to find out when and why started this social organization. Experimental Ethnoarchaeology provides a powerful tool to conduct research on this field.

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ORAL

## 10. MASCULINITY AND FEMININITY VERSUS GENDER SPECIFICITY IN CORPORAL ART

*Bouvry, Florence (ARSCAN UMR 7041), Maison de l'Archéologie et de l'Ethnologie, Nanterre (92) [florence.bouvry@gmail.com](mailto:florence.bouvry@gmail.com)*

In traditional functioning contemporary societies, one's body image has a major part in the way men and women are acknowledged within a community.

Scarification, body painting, as well as ornaments contribute to establishing a « territory » directly on one's skin as an identity mark referring to a specific society or community. Marks and subdivision signs are never a goal but take their purpose in initiations and collective ceremonies. They represent a step forward taken in personal development, the step to manhood and towards a new social status, an acceptance in a specific group, etc.

Depending on the society, male and female gender each have their specific place in taking part in corporal art's production or personal structuring. This task distribution takes place throughout the initiation path and is passed on by the word of the elders as well as traditional ways and customs. Members of a same community exhibit very specific corporal marks, referring to either masculinity or femininity.

Troughout this communication, I intend to analyse how gender specificities take part in the task distribution and more specifically, how those will be assigned either to men or women according to their place in body's identity structuring. This will be based on ethnographic data and observations concerning African and Amazonian societies or communities.

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ORAL

## 11. TASK NETWORKS IN CAVE RITUAL CONTEXTS AND ASSOCIATED FEASTING

*Villeneuve, Suzanne (Simon Fraser University) [suzanne\\_villeneuve@sfu.ca](mailto:suzanne_villeneuve@sfu.ca)*

Ritual activity in tribal or village-level (transegalitarian) societies has been implicated in the creation of socioeconomic inequalities and political power. However, the motivations for creating various forms of ritual and the means by which they promote inequalities are poorly understood for transegalitarian societies. There is as yet little ethnographic or archaeological information on how such activities can be identified at transegalitarian levels. Understanding task division and task networks through ethnographic and ethnoarchaeological investigation of various rituals can provide critical insights into the social groups involved, their organization and

motivations with implications for archaeological material and landscape patterning.

When narrowing the focus to restricted ritual spaces such as caves and remote ritual structures, secret societies and cults emerge as a potential key group behind the early use of and elaboration of these spaces in transegalitarian societies. Cults are important aspects of many societies, from relatively egalitarian hunter-gatherers to far more complex state level societies and they potentially play unusually important roles in early cultural developments. Yet, under what conditions secret societies emerge, the extent of their power and influence, their impact on the surrounding community, the specific strategies they employ, the benefits or advantages their members obtain, as well as many other aspects are not well understood in part due to the paucity of ethnographic examples and since very few studies have been conducted to address these issues specifically. Of particular importance for archaeologists who wish to be able to identify such organizations in the past and their influence on early cultural developments, there has been virtually no systematic.

Through an ethnographic and ethnoarchaeological lens examining task division and task networks involved in secret society organizations in a broader cultural context surrounding cave rituals, a number of insights are gained to aid in modeling potential associated archaeological expectations. This paper will focus on key components of an ethnographic ritual pattern associated with caves, including community, small group and individual or private ritual and feasting.

By understanding task division and task networks involved in these scales of connected ritual activity, a broader picture of the social and cultural context surrounding caves emerges. This has archaeological implications for understanding the potential social groups and individuals associated with certain landscape locations, activity areas, materials and special paraphernalia, the elaboration of or investment in spaces including specially prepared walls or floors, special food remains and many other aspects of the material record associated. These implications are also explored in an archaeological case study dealing with remote ritual structures in transegalitarian societies on the Canadian Plateau.

We should expect to see indications of these ritual organizations early in the archaeological record in many contexts where visible socioeconomic inequalities later emerge. Better understanding of these ritual spaces and their broader social and cultural context can provide critical insight into the pathways or trajectories to the

emergence of inequality and centralized power, and the timing of the emergence of inequality in some cases.

ORAL

## 12. LA RÉPARTITION DES ACTIVITÉS ET LA RÉPARTITION DES TÂCHES SELON LES SEXES : L'EXEMPLE DE LA MOUTURE

*Procopiou, Haris (Université de Paris 1 (Panthéon-Sorbonne), CNRS UMR 7041 (ArScAn) haris.procopiou@univ-paris1.fr.*

La mouture a été, depuis le 19<sup>ème</sup> siècle, associée à la femme et à la maisonnée, la meule l'attribut féminin par excellence. Mais le registre ethnographique révèle que la mouture peut, dans certains contextes non-domestiques, être pratiquée par les hommes. Considérer la transformation des grains durant la protohistoire, comme une tâche exclusivement féminine, serait-il une vision anachronique, intimement liée à nos représentations collectives? Pour reconstituer la répartition des tâches entre hommes et femmes, *il faut identifier les tâches sur la base d'analyses technographiques précises, et non à partir des catégories générales ou artificielles dont on se contente trop souvent.* Quel type de mouture, quels outils, quels gestes, quelles postures corporelles, dans quel cadre et dans quelle finalité? Le registre ethnographique montre que la mouture des céréales, lorsqu'elle se fait dans le cadre de l'économie domestique, est une tâche exclusivement féminine.

Les premières attestations archéologiques remontent au mésolithique. Les lésions ostéologiques, identifiées sur des squelettes féminins à Abu Hureyra ont été associées à une activité de mouture prolongée. Les chants qui accompagnent la mouture, montrent que cette action est considérée comme rude, laborieuse, associée à la condition féminine. Des servantes de Pénélope aux chants des meules en Inde les femmes expriment la douleur de leur condition. Les femmes moulent accompagnées le plus souvent de leur fille, les petites filles jouent sur la meule tandis que l'imitation de la mouture, avec des outils miniatures, fabriqués par les enfants, est un jeu courant en Afrique du Nord. La mouture assurée par une main d'œuvre masculine est, par contre, toujours liée à des contextes spécifiques. En l'absence d'une main d'œuvre féminine, la mouture est assurée par des hommes en voyage ou en guerre. Obliger un homme à assurer une activité féminine est aussi une punition sévère, le pire des déshonneurs. Cette pratique, remonte au moins à la période paléobabylonienne (2<sup>ème</sup> millénaire) comme l'attestent plusieurs textes cunéiformes et l'iconographie. La mouture peut

aussi être assurée par une main d'œuvre masculine, mais dans ce cas, comme en Égypte pharaonique et au Proche-Orient sumérien, il s'agit d'une main d'œuvre servile au sein de minoteries dépendant d'une autorité. L'apparition du moulin d'Olynthe à la fin du VI<sup>ème</sup> siècle av. J.C a conduit à la mise en place d'ateliers mobilisant des esclaves, pratique généralisée à la période romaine.

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ORAL

### 13. AN ETHNOARCHAEOLOGICAL PERSPECTIVE ON GENDER DISTRIBUTION OF HARVESTING AND PLANT WORKING ACTIVITIES IN NORTHERN AND CENTRAL TUNISIA: A PRELIMINARY CASE STUDY

*Anderson, Patricia Chabot (CEPAM, CNRS, Nice, France) patriciacanderson@hotmail.fr*

We observed and recorded subsistence agricultural practices, crafts using plants, and tool making in North-western Tunisia between 2005 and 2010, essentially from a technical standpoint. Some of these findings were compared to earlier observations from Syria, and gender division of activities in these regions contrasts with those published earlier for many other regions, particularly European.

Although both women and men knew how to carry out most activities, where agriculture was concerned, plowing, sowing, harvesting and threshing were essentially masculine activities, as well as shepherding, although women sometimes participated in certain of these activities. However, selection of sowing grain, collection of spices and other food plants and food preparation activities, and tending to animals at home were essentially carried out by women. On the other hand, wild plants were collected for fodder and for basketry by men, and basketry to make various objects corresponding to specific nomadic and sedentary activities, was an exclusively masculine domain, with making of these objects carried out alongside other daily activities by certain expert community members or family members, for the family or community. Transmission of skills in all cases occurred through imitation, with children accompanying relatives into the field or working alongside them at home.

Today, in the Northwest much know-how is being lost as young people leave home or prefer other, lucrative activities. Another form of change is occurring with professionalization of some of these activities in central Tunisia, and in particular basketry, although seldom done by men in families and villages today, is being increasingly carried out

by artisans, particularly women, and innovation in forms and decorations of objects is occurring in response to the tourist trade. Although traditional patterns are being broken, the arrival of artisans contributes to preservation of many traditional objects and associated know-how.

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ORAL

### 14. LE RÔLE DU JEU PENDANT L'ENFANCE SUR L'APPRENTISSAGE DE TÂCHES LE CAS DE L'AFRIQUE DU NORD

*Fassoulas, Argyris (Université de Paris 1 (Panthéon-Sorbonne), CNRS UMR 7041 (ArScAn) saluosaf@hotmail.com*  
*Rossie, Jean- Pierre (International Toy Research Association (ITRA) sanatoypplay@gmail.com*  
*Procopiou, Hara (Université de Paris 1 (Panthéon-Sorbonne), CNRS UMR 7041 (ArScAn) Haris.Procopiou@univ-paris1.fr*

Le jeu est une activité multidimensionnelle : joyeuse et ludique elle joue à son tour un rôle majeur dans l'apprentissage social des tâches. Nous considérons l'activité du jeu dans un sens large en incluant aussi le processus de fabrication des jouets par les enfants. La fabrication d'un jouet n'est pas une activité standardisée et formalisée, mais fait partie intégrante du jeu ; dans certains cas, la fabrication du jouet est le jeu.

La différenciation sexuelle est primordiale dans le développement et la socialisation de l'enfant. Des études de cas issus des enquêtes de terrain (Tunisie, Maroc) nous permettent d'aborder les modalités de la transmission de la répartition sexuelle des tâches à travers le jeu. On verra à quel point les enfants reproduisent les normes sociales mais aussi comment le jeu refaçonne et intervient à ces normes.

En parallèle, les enfants en créant leurs propres jouets apprennent les qualités de la matière et les propriétés des matériaux. La fabrication des jouets exige une compétence technique et un savoir-faire parfois assez complexe. À travers le jeu, les enfants apprennent à fabriquer leurs jouets, mais aussi apprennent à *fabriquer*. Ils entrent dans l'univers technique de la société ; en jouant, ils nous dévoilent leur propre perception du monde des adultes qu'ils imitent.

Enfin, l'importance de la création de jouets pour la transmission du savoir par les enfants plus âgés aux enfants plus jeunes est un aspect peu exploré, qu'on essaiera d'éclairer. En effet, si les adultes jouent un rôle dans la transmission du savoir et du savoir-faire, le rôle des enfants plus âgés est primordial dans cette transmission.

# B2

## Biochronology, biostratigraphy and palaeoecology of the European Quaternary (B2POUE)

(Organizers: Gloria Cuenca-Bescós, Juan Rofes, Juan Manuel López, Hugues-A. Blain)

Tuesday 2nd (9:00 to 13:30)  
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XVII World UISPP Congress  
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ORAL CONTRIBUTIONS

ORAL

## 1. PLEISTOCENE BIOSTRATIGRAPHY OF WESTERN EUROPE BASED ON THE GUADIX-BAZA RODENT SUCCESSION

Agustí, Jordi (IPHES) [jordi.agusti@icrea.cat](mailto:jordi.agusti@icrea.cat)  
Lozano-Fernández, Ivan (IPHES) [ilozano@iphes.cat](mailto:ilozano@iphes.cat)  
Piñero, Pedro (IPHES) [ppinero@iphes.cat](mailto:ppinero@iphes.cat)  
Furió, Marc (ICP) [marc.furio@icp.cat](mailto:marc.furio@icp.cat)

The Guadix-Baza Basin (Granada, SE Spain) is composed of a sequence of fluvial and lacustrine sediments that ranges from the latest Miocene to the late middle Pleistocene and which have yielded dozens of large and small vertebrate fossiliferous levels.

Apparently, there are not equivalent levels of the same age than The Georgian site of Dmanisi in the Guadix-Baza Basin. The closest site would be Barranco Conejos, provided its basal upper Matuyama position, as in the case of Dmanisi. Even so, there is no any evidence of human presence at this time in this part of Western Europe. This is also the case in the forthcoming level of Venta Micena, despite the more than 15.000 bones that have been recovered from this rich paleontological site.

However, the situation changes abruptly at the level of Barranco León D (sites of Barranco León D and Fuente Nueva 3), where thousands of Mode 1 lithic artefacts have been recovered in the last years. The delay of close to 400 kyrs between the Southern Caucasus and the Iberian Peninsula can be explained on the basis of the hard environmental conditions that predominated in the latter region during the first part of the early Pleistocene.

ORAL

## 2. SMALL MAMMALS ASSOCIATIONS DISTRIBUTION AND EVOLUTION FROM ITALIAN PENINSULA DURING THE LATE PLEISTOCENE

Berto, Claudio (Univeristà degli Studi di Ferrara, Dipartimento di Studi Umanistici, sezione di Scienze Preistoriche e Antropologiche, C.so Ercole I d'Este, 32, 44121 Ferrara (Italy) [claudio.berto@unife.it](mailto:claudio.berto@unife.it)  
Valle, Chiara Dalla (Univeristà degli Studi di Ferrara, Dipartimento di Studi Umanistici, sezione di Scienze Preistoriche e Antropologiche, C.so Ercole I d'Este, 32, 44121 Ferrara (Italy) [dallavallechiara86@gmail.com](mailto:dallavallechiara86@gmail.com)

Luzi, Elisa (Univeristà degli Studi di Ferrara, Dipartimento di Studi Umanistici, sezione di Scienze Preistoriche e Antropologiche, C.so Ercole I d'Este, 32, 44121 Ferrara (Italy) [elisa.luzi@student.unife.it](mailto:elisa.luzi@student.unife.it)

Sala, Benedetto (Univeristà degli Studi di Ferrara, Dipartimento di Studi Umanistici, sezione di Scienze Preistoriche e Antropologiche, C.so Ercole I d'Este, 32, 44121 Ferrara (Italy) [slb@unife.it](mailto:slb@unife.it)

The Italian Peninsula is characterized by several types of environments. Its peculiar position and geomorphology favour the presence of diversified climates which have influenced the small mammals assemblages during the past.

The study of materials coming from Late Pleistocene sites - such as Caverna degli Orsi (San Dorligo della Valle, Dolina, Trieste), Ciota Ciara (Borgosesia, Vercelli), Riparo Mochi (Ventimiglia, Imperia), Grotta Paglicci (Rignano Garganico, Foggia) and Riparo Tagliente (Stallavena di Grezzana, Verona) - and the review of up to 40 Italian sites previously published allow to make general remarks on environmental changes occurring in this period and on biochronology.

The analysis of small mammals shows that Italian Peninsula can be divided into "geographic zones" presenting distinctive landscapes and biodiversity grades. Specifically, in Northern Adriatic zone, Valpadana and piedmont bend, species coming from Eastern Europe, such as *Microtus oeconomus* and *Sicista betulina*, are signaled; Southern Adriatic zone is characterized by marked aridity and low biodiversity degree while Southern Tyrrhenian zone displays richer assemblages normally associated with wooden environments.

Finally, all the results have been processed in order to suggest a biochronological model as detailed as possible, in which the most important Late Pleistocene sequences of Italian Peninsula have been positioned and linked to the NGRIP isotopic curve.

ORAL

## 3. GEOGRAPHICAL AND CHRONOLOGICAL PATTERN OF THE HERPETOFAUNAL PLEISTOCENE EXTINCTIONS IN THE IBERIAN PENINSULA: A BIOCHRONOLOGICAL TOOL?

Blain, Hugues-Alexandre (IPHES, Institut Català de Paleoecologia Humana i Evolució Social, c/ Escorxador s/n, 43003 Tarragona, Spain; Àrea de Prehistòria, Universitat Rovira i Virgili (URV), Avinguda de Catalunya 35, 43002 Tarragona, Spain.) [hablain@iphes.cat](mailto:hablain@iphes.cat)

Amphibian and Squamate faunas from Western Europe are known to become progressively impoverished during the Pliocene and the beginning of the Pleistocene, probably associated with the intensification of glaciation pulses in the northern hemisphere.

At the end of the Ruscinian stage (ca. 3.2 Ma) the tropical families Varanidae, Aniliidae s.l. and Elapidae disappeared. At the end of the early Villanyian (the current boundary between Pliocene and Pleistocene, at ca. 2.6 Ma) some Gekkonidae, the scincid *Trachylepis* (formerly *Mabuya*), scolecophidian snakes, Erycinae and oriental vipers disappeared from Western Europe, whereas during the same period other thermophilous groups (Agamidae, Blanidae, some Anguinae and some Colubridae) underwent a southward withdrawal. At the same time, some species (*Hierophis viridiflavus*, *Zanemis* aff. *longissimus*, *Coronella* cf. *austriaca* and *Vipera "berus"*) coming from Central Europe arrived in France, as registered at the Montoussé 5 locality. The last "exotic squamates" supposed to have disappeared from Western Europe were the Agamidae and the anguid *Dopasia* (at the end of the Early Pleistocene; ca. 1.1 Ma). As far as amphibians are concerned only a green toad (*Bufo viridis* sensu lato) disappeared from Western Europe also at the end of the Early Pleistocene (ca. 1.1 Ma).

The geographical and temporal pattern of these progressive southward withdrawals and extinction is analyzed in order to establish a framework that can be used as complement of the biochronological zonation of the early Pleistocene in Western Europe.

ORAL

#### 4. BIOSTRATIGRAPHY OF THE PALAEOANTHROPOLOGICAL ATAPUERCA CAVE SITES (PLEISTOCENE, SPAIN)

Cuenca-Bescos, Gloria (Universtiy of Zaragoza) cuencag@unizar.es

Blain, Hugues-Alexandre (IPHES) hablain@iphes.cat

Lopez-García, Juan Manuel (Università degli Studi di Ferrara) lpzjmn@unife.it

Lozano-Fernández, Ivan (IPHES) lpzjmn@unife.it

Rofes, Juan (UPV) juan.rofes@ehu.es

The palaeoanthropological sites of Atapuerca contain the most extraordinary accumulation of evidences of nearly continuous human occupation in Europe, ranging from the Early to the Late Pleistocene. This is evidenced upon the study of the paleontological and archaeo-

logical content in the key six Atapuerca stratigraphic sequences. The biostratigraphy has been the timeframe for understanding the human evolution and culture of the first inhabitants of Western Europe during the Early to the Middle Pleistocene.

On the other hand, the Biostratigraphy of the Pleistocene in Europe has made substantial progress during recent decades, though there are but few stratigraphic sequences that are in the same geographic area such as the Atapuerca Hill. Also, few are close to being complete or are calibrated with chronological data, and therefore most Biostratigraphic proposals are based on isolated sites representing short time-intervals.

The biostratigraphy based on the stratigraphic distribution of the fossil vertebrates found in the cave-infilling sequences of Gran Dolina, Zarpazos, Galería, Sima del Elefante, Sima de los Huesos, and Portalón in the Atapuerca Hill are thus of the utmost importance because they provide a local biostratigraphy and for the first time allow the knowledge of the evolution of species such as *Mimomys*, *Arvicola*, *Iberomys*, *Allocricetus*, among others; as well as the succession of faunal events (First and Last Appearance Data, FAD, LAD) pertaining to important fossil markers, to be calibrated with magnetostratigraphy and radiometric data. In this way they will provide valuable linking points with the numerical ages of the Quaternary continental Biochronology in Europe.

In this way they will provide valuable linking points with the numerical ages of the Quaternary continental Biochronology in Europe.

ORAL

#### 5. REVISITING THE CHRONOLOGY OF SOME LATE EARLY PLEISTOCENE TO EARLY MIDDLE PLEISTOCENE EUROPEAN LOCALITIES: BIOCHRONOLOGICAL IMPLICATIONS.

Duval, Mathieu (Centro nacional de investigación sobre la evolución humana (CENIEH) mathieu.duval@cenieh.es

Arnold, Lee (School of Earth and Environmental Sciences, the Environment Institute, and Institute for Photonics and Advanced Sensing (IPAS) lee.arnold@adelaide.edu.au

Demuro, Martina (Institute for Photonics and Advanced Sensing (IPAS) martina.demuro@adelaide.edu.au

Parés, Josep M. (Centro nacional de investigación sobre la evolución humana (CENIEH) josep.pares@cenieh.es

Cuenca-Bescos, Gloria (Aragosaurus-IUCA-EIA, Dpt. Ciencias Tierra, Universidad de Zaragoza) cuencag@unizar.es

The Spanish Quaternary small vertebrate faunal record is usually divided into five main biozones: *Allophaiomys pliocaenicus*, *Allophaiomys lavocati*, *Allophaiomys chalinei* (*A. chalinei* has recently reassigned to the new genus *Victoriamys*), *Iberomys brecciensis* and *Iberomys cabreræ*. Among them, the *V. chalinei* biozone is usually considered as the last biozone of the Early Pleistocene, and covers an approximated time range from the Jaramillo suchron to the early Middle Pleistocene. This biozone includes several sites in Spain, like Huescar-1, El Chaparral, Cal Guardiola D5, Vallparadís EVT7 and Gran Dolina TD3-8a.

The chronology of some of these localities has been recently updated by a series of works based on magnetostratigraphy and/or numerical dating such as extended-range luminescence (supergrain OSL, TT-OSL, post-IR IRSL) or Electron Spin Resonance (ESR) methods. A synthesis of these results will be presented, which may lead to some new biochronological interpretations, in particular regarding the chronological boundaries of this biozone. In addition, the chronology of other sites of supposedly Jaramillo age that would potentially fit within the time range of this biozone, such as Le Vallonet (France) and Untermassfeld (Germany), will be also discussed.

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#### ORAL

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### 6. THE FOSSIL BAT ASSEMBLAGE OF SIMA DEL ELEFANTE LOWER RED UNIT (ATAPUERCA, SPAIN): FIRST RESULTS AND CONTRIBUTION TO THE PALAEOENVIRONMENTAL APPROACH OF THE SITE.

Galán García, Julia (Universidad de Zaragoza) galanj@unizar.es

Cuenca Bescós, Gloria (Universidad de Zaragoza) cuencag@unizar.es

López García, Juan Manuel (Università degli Studi di Ferrara) lpzjmn@unife.it

The Sierra de Atapuerca (Burgos, Spain) is well known as some of the oldest European hominine remains have been found there. It is a set of quaternary localities containing a very complete stratigraphic and paleontological record. The deposits are cave filling sediments from a complex karst system which has been precisely studied and dated. Here we describe the fossil bat assemblage from the fossiliferous levels of Sima del Elefante Lower Red Unit (TELRU, TE7-TE14). They belong to the *Allophaiomys lavocati* biozone, with an age estimated ca. 1.5-1.1 Ma. Since bat assemblages are not necessarily

originated by the same processes as other small mammal assemblages, they provide a valuable independent source of palaeoenvironmental information.

The studied material consists of disarticulated cranial and postcranial bat remains collected by water-screening the rock matrix with a tower of superimposed sieves. The sediments were excavated at the Sima del Elefante TELRU from 1996 to 2007. Each level has been studied as an independent assemblage so we can compare the evolution of the fossil bat assemblages from the bottom to the top of the TELRU stratigraphic sequence.

The taphonomic study indicates that the accumulation were due to natural death in the cave of the individuals of a bat colony, according to the high representation of different anatomical parts, low fragmentation, lack of digestion evidences and age-sorting. The identified bat taxa from TELRU are: *Myotis* gr. *myotis/blythii*, *Miniopterus schreibersii*, *Rhinolophus ferrumequinum*, *Rhinolophus* gr. *euryale/mehelyi*, *Pipistrellus* sp. and Chiroptera indet. *Myotis* gr. *myotis/blythii* is the dominant taxon, followed by *Miniopterus schreibersii*; the remaining taxa have a scarce, very low presence. Here we have typically Mediterranean species of which *M. schreibersii* and *R. gr. euryale/mehelyi* are markedly thermophilic. Our preliminary landscape approach with bats shows little variation through TELRU and indicates that woodland and open-woodland areas alternated with open lands and to a lesser extent with rocky surfaces.

Other proxies previously analyzed on TELRU (herpetofauna and small mammals) indicate that it was deposited during a warm and humid period as our bat assemblage also does. Regarding the landscape approach, open lands appear somehow underrepresented in our results with bats in comparison with those previous studies based on other small vertebrate groups, though. We were not able to compare data from basal levels (TE7-TE8) as no published reports are available yet concerning detailed studies of their small vertebrate assemblage. Further results are expected.



ORAL

**7. THE SMALL VERTEBRATES FROM THE STRATIGRAPHIC SEQUENCE OF LEZETXIKI II CAVE (GIPUZKOA, IBERIAN PENINSULA): PALAEOENVIRONMENTAL RECONSTRUCTION.**

García-Ibaibarriaga, Naroa (EHU-UPV) [naroa.garcia@ehu.es](mailto:naroa.garcia@ehu.es)  
Rofes, Juan (MNHN) [juan.rofes@ehu.es](mailto:juan.rofes@ehu.es)  
Salvador Bailon (MNHN) [salvador.bailon@mnhn.fr](mailto:salvador.bailon@mnhn.fr)  
Arrizabalaga, Álvaro (EHU-UPV) [alvaro.arrizabalaga@ehu.es](mailto:alvaro.arrizabalaga@ehu.es)  
Iriarte-Chiapusso, María-José (EHU-UPV) [mariajose.iriarte@ehu.es](mailto:mariajose.iriarte@ehu.es)  
Villaluenga, Aritza (Monrepos) [villaluenga@rgzm.de](mailto:villaluenga@rgzm.de)  
Murelaga, Xabier (EHU-UPV) [xabier.murelaga@ehu.es](mailto:xabier.murelaga@ehu.es)

The cave of Lezetxiki II, located in the upper valley of the Deba River and near the eastern end of the Bay of Biscay, is an archaeological site physically connected to the classical site of Lezetxiki.

Both cavities are well known due to the important archaeological and paleontological discoveries that have been made there. In the deposit of Lezetxiki three human fossil remains were recorded, while evidences of human activities have been detected in both caves. The infilling of Lezetxiki II has provided the first record of *Sicista betulina* from the Iberian Peninsula, which also happens to be the south-westernmost representative of the genus in the Eurasian continent, and also the first records of *Cricetulus (Allocricetus) bursae* and *Macaca sylvannus* in the Cantabrian Region.

The study of microvertebrate remains has been proved as a rich source of information on the paleoenvironmental and paleoclimatic reconstruction. During 2011 excavation campaign, a test trench was conducted near the entrance of the cave, on which a total of 52 samples of sediment were taken along all the stratigraphic units.

Preliminary studies suggests the presence of at least eleven different small mammals taxa, nine belonging to the Order Rodentia (*Arvicola sapidus*, *Microtus (Microtus) agrestis*, *Microtus (Microtus) arvalis*, *Microtus (Alexandromys) oeconomicus*, *Microtus (Terricola) sp.*, *Pliomys lenki*, *Cricetulus (Allocricetus) bursae*, *Apodemus sylvaticus-flavicolis* and *Sicista betulina*) and two to the Order Eulipotyphla (*Sorex araneus-coronatus* and *Talpa sp.*)

We present for the first time, a palaeoenvironmental and palaeoclimatic reconstruction on the basis of the small vertebrate assemblages from Lezetxiki II Cave, showing the diverse habitat and climatic changes that occurred from the end of the Middle Pleistocene to the early Holocene.

ORAL

**8. COLD-CLIMATE SMALL MAMMAL ASSEMBLAGES IN THE LATE PLEISTOCENE OF CENTRAL IBERIA: NEW DATA FROM THE CUEVA DE LA BUENA PINTA SITE (PINILLA DEL VALLE, MADRID REGION, SPAIN) LAPLANA, CÉSAR (MUSEO ARQUEOLÓGICO REGIONAL DE LA COMUNIDAD DE MADRID) CESAR. LAPLANA@GMAIL.COM**

Sevilla, Paloma (Universidad Complutense de Madrid) [psevilla@geo.ucm.es](mailto:psevilla@geo.ucm.es)  
Blain, Hugues-Alexandre (Institut Català de Paleoeologia Humana i Evolució Social) [hablain@iphes.cat](mailto:hablain@iphes.cat)  
Arriaza, Mari Carmen (Museo Arqueológico Regional de la Comunidad de Madrid) [maricarmen.arriaza@gmail.com](mailto:maricarmen.arriaza@gmail.com)  
Arsuaga, Juan Luis (Centro Mixto UCM-ISCIII de Evolución y Comportamiento Humanos) [jlarsuaga@isciii.es](mailto:jlarsuaga@isciii.es)  
Baquedano, Enrique (Museo Arqueológico Regional de la Comunidad de Madrid) [enrique.baquedano@madrid.org](mailto:enrique.baquedano@madrid.org)

Pérez-González, Alfredo (Centro Nacional e Investigación sobre Evolución Humana) [alfredo.perez@cenieh.es](mailto:alfredo.perez@cenieh.es)

The Pleistocene record of small mammals adapted to cold climates in the Iberian Peninsula concentrates mainly in two groups of sites found on either side of the Pyrenees. The species involved are *Microtus oeconomicus*, *Microtus gregalis*, *Chionomys nivalis*, *Spermophilus sp.*, *Marmota marmota* and *Sicista betulina*. More recently, assemblages from sites found in the centre of the Iberian Peninsula have yielded some of these taxa. The aim of this presentation is to describe a cold-climate small mammal assemblage recorded in the Cueva de la Buena Pinta site.

The Cueva de la Buena Pinta is a site located in the Sierra de Guadarrama, in the Central System. It consists of a small cave at 1100 m altitude in the Lozoya Valley, surrounded by mountains over 2000m high. Digging campaigns in the cave have taken place every summer since 2003. Absolute datings performed on levels 2 to 5 in this site place these levels within the Late Pleistocene, at the limit of C14 use or slightly further. Sieve-washing and picking of the small fossils contained in the sediments excavated during these years has yielded several thousands of small mammal teeth and other remains, providing a representative sample of the small vertebrate fauna preserved in these levels.

The Late Pleistocene levels of the Cueva de la Buena Pinta contain an assemblage of small mammals where *Microtus arvalis* dominates. Smaller numbers of other

cold-climate taxa have been identified, such as *Microtus oeconomicus*, *Chionomys nivalis*, *Marmota marmota*, *Ochotona pusilla* and, possibly, *Microtus gregalis*. This faunal composition resembles the Late Pleistocene assemblages found in the Cantabrian region, but differs from them in the presence of *Ochotona*, presently the single record of this taxon in the Iberian Peninsula.

Thus, the small mammal record of the Cueva de la Buena Pinta site provides evidence that cold-climate adapted species reached the centre of the Iberian Peninsula during the mid-Late Pleistocene, distinctly earlier than the LGM. Furthermore, most of them are, to the moment, the southernmost records these taxa attained in the Iberian Peninsula, and even some of them, in Europe.

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ORAL

## 9. EXTINCTION OF SELECTED MICROMAMMAL TAXA DURING THE MIDDLE PLEISTOCENE OF EUROPE

Maul, Lutz Christian (Senckenberg Research Institute) lmaul@senckenberg.de

Heinrich, Wolf-Dieter (Museum für Naturkunde Berlin) wolf-dieter.heinrich@mfn-berlin.de

Horacek, Ivan (Charles University Prague) ivan.horacek@natur.cuni.cz

Masini, Federico (University of Palermo) federico.masini@unipa.it

Parfitt, Simon A. (University College London, Natural History Museum London) s.parfitt@nhm.ac.uk

The Middle Pleistocene (c. 780-130ka) is a period that is characterised by significant climatic oscillations, which can be correlated with faunal changes. The small mammal biostratigraphic subdivision of this time period relies primarily on the extinction of several key taxa, such as *Talpa minor*, *Drepanosorex*, *Macroneomys*, *Beremendia*, *Hypolagus*, *Petauria*, *Trogotherium* and *Pliomys*. This paper examines changes in the spatio-temporal distribution of these micromammals during the Middle Pleistocene and discusses the possible extinction mode for each taxon. Prior to becoming extinct, several of the taxa exhibited a marked contraction of their geographical ranges, whereas in others retardation effects have to

be taken in account, and thus some taxa survived much longer in some areas than in others. The survival of populations in restricted geographical areas has important biostratigraphical implications. The second portion of the paper compares the Middle Pleistocene extinctions with the faunal situation within the late Quaternary.

ORAL

## 10. EVOLUTION OF SMALL MAMMAL COMMUNITIES DURING THE LATEGLACIAL IN THE SOUTH-WESTERN FRANCE

Royer, Aurélien (Laboratoire d'Anthropologie des Populations du Passé, UMR CNRS 5199) aurelien\_royer@hotmail.com

The Lateglacial is a slow gradual warming associated with cold short events that occurred between 18.0 and 11.7 ky cal. BP. Pollen analyses from deep-sea and lacustrine cores have well documented the evolution of floral communities in West Europe and have suggested that climatic fluctuations have influenced the evolution of terrestrial ecosystems. However, the exact impact of these climatic changes on small faunal communities in Southwestern France is still poorly documented.

Peyrazet Cave is an archaeological site located in Lot (France) excavated since 2008, that has delivered a Lateglacial sequence dated between 15.5 and 11.1 ky cal. BP. Thousands of small faunal remains resulting from a natural accumulation were recovered. Investigation of this material reveals the presence of at least 4 insectivores and 9 rodents and more surprisingly the northern birch mouse (*Sicista betulina*) that had been never documented in this region before.

The occurrence of this migrant taxa coming from the east is most likely related to climatic fluctuations of Lateglacial and complexify traditional scenarios developed to explain the evolution of small faunal communities between Last Glacial Maximum and Holocene.

ORAL

## 11. EAST-WEST BAT DIVERSITY DIFFERENCES IN THE LATE PLIOCENE AND PLEISTOCENE OF EUROPE: FACT OR ARTIFACT?

Sevilla, Paloma (Dpto. Paleontología Fac. Geología. Universidad Complutense de Madrid) psevilla@ucm.es

Horacek, Ivan (Dpt. Zoology. Charles University. Prague) horacek@natur.cuni.cz

Latitudinal and longitudinal differences are observed in current bat species richness in Europe that may be easily explained on the basis of ecological factors. The most evident gradient is latitudinal, with a distinct decrease in the number of species towards northern regions, clearly showing the influence of food availability and stationality in the pattern of distribution of European bats. Within the same latitude, an East-West pattern of species richness is observed, the eastern region of Europe being slightly richer than western Europe. This pattern is probably the consequence of both ecological and historical factors. Apparently, this east-west gradient of bat species richness was stronger in Europe during the late Pliocene and early Pleistocene, gradually decreasing during the Pleistocene and Holocene until the present situation. According to the available literature, eastern European countries such as Poland, the Czech Republic or Hungary had a particularly high species richness in the late Pliocene and Early Pleistocene that comprised both recent and extant bat species. At the same time, during this same period western European countries such as Spain or France have a record of a considerably lower number of species. But, to what extent these differences in gradient values are real, or are a consequence of factors that are biasing our appreciation of bat species richness through the Quaternary of Europe?

Here we analyse this issue by checking the available data of fossil bats from late Pliocene and Pleistocene sites in Europe. European countries have been grouped to compare number of species recorded in east, central and western Europe during the Late Pliocene, Lower, Middle and Late Pleistocene and compared with recent values. Data such as number of localities per region and age vs. number of species have been analysed in an attempt to establish whether these differences are real or artificial. Results are discussed from different points of view.

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#### ORAL

### 12. BIOCHRONOLOGY OF NORTH AFRICAN MICRO-MAMMALS

*Stoetzel, Emmanuelle (Muséum national d'Histoire naturelle, Département Systématique et Evolution - CNRS UMR 7205 ISYEB, Paris, France) stoetzel@mnhn.fr*

Throughout the late Cenozoic, climatic changes have strongly influenced the evolution of landscapes and faunas, especially terrestrial small vertebrates such as rodents and shrews. Compared to other regions, notably western Europe, few studies have been specifically dedi-

cated to fossil small vertebrates in North Africa. However, several Neogene and Quaternary archaeological and paleontological sites from North Africa have yielded small vertebrate remains, allowing us to attempt a correlation between the evolution of small faunas and the global and more local environmental changes. The present paper aims to give a global synthesis on the biochronology and paleoecology of the North African small mammals, punctuated by specific examples. The North African faunas are of several origins, and display both African and Eurasian affinities, together with endemic taxa. The climatic changes and the opening or interruption of migration routes (through the Sahara, via the Straits of Gibraltar and Sicily or via the eastern Mediterranean), have highly influenced the arrival of new species or the isolation of local taxa leading to their extinction or adaptation, with different adaptive and time responses to environmental changes depending on the considered taxa.

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#### POSTERS

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#### POSTERS

### 1. CLIMATIC AND ENVIRONMENTAL CONDITIONS FROM THE NEOLITHIC TO THE BRONZE AGE (7000-3000 BP) IN THE IBERIAN PENINSULA.

*Bañuls Cardona, Sandra (Università di Ferrara) sandra.banulscardona@unife.it*

*López-García, Juan Manuel (Università di Ferrara) lpzjmn@unife.it*

*Cuenca-Bescós, Gloria (Universidad de Zaragoza) cuencag@unizar.es*

On the basis of the small-mammal assemblages, we have analyzed the palaeoenvironmental and palaeoclimatic approach to the Holocene in the Iberian Peninsula.

This period has been characterized by a multi proxy, but in this paper, we have used the small mammal studies of the five sites within the geography of the Iberian Peninsula: Valdavara-1 (Becerreá, Lugo), El Mirón cave (Ramales de la Victoria, Cantabria), Colomera cave (Lleida), Mirador cave (Sierra de Atapuerca, Burgos) and Cendres cave (Teulada-Moraira, Alicante).

In the studied sites we have emphasised a major number of species associated with Mediterranean requirements (*Terricola duodecimcostatus*, *Iberomys cabreræ*, *Crocidura russula*) in the greater part of the sites. In only one studied site, el Mirón cave, there are more taxa with Mid-European requirements (*Chionomys nivalis* y *Microtus oeconomus*).

These assemblages allow us to observe that the climate was more humid than today in the different sites under study, and an environment dominated by woodland and woodland margin in all the studied levels. We have found more taxa with this kind of the environment requirements as *Apodemus sylvaticus*. Moreover, we have seen that *Terricola duodecimcostatus* or *Terricola lusitanicus* are abundant in these assemblages. These species don't live in the eroded or cultivated soil. In this case, these results have indicated the lowest human impact in the studied areas.

Finally all our data have been compared with other environmental and climatic proxies, and we have seen that, the human activities have not had any important influence in the palaeoenvironmental conditions that occurred from 7000 to 3000 BP, in the Iberian Peninsula.

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POSTER

## 2. THE HOMINIDS ENVIRONMENT OF SIMA DEL ELEFANTE (SIERRA DE ATAPUERCA, SPAIN) THROUGH THE TAPHONOMY OF SMALL MAMMALS

Bennàsar, Maria Lluç (Area de Prehistòria, Universitat Rovira i Virgili (URV), Avinguda de Catalunya 35, 43002 Tarragona, Spain. [bennasar.maria1@gmail.com](mailto:bennasar.maria1@gmail.com))

Cáceres, Isabel (IPHES, Institut Català de Paleoeologia Humana i Evolució Social, Carrer Marcel·lí Domingo, s/n (Edif), Area de Prehistòria, Universitat Rovira i Virgili (URV), Avinguda de Catalunya 35, 43002 Tarragona, Spain.) [icaceres@iphes.cat](mailto:icaceres@iphes.cat)

Cuenca-Bescós, Gloria (Aragosaurus-IUCA, Ciencias de la Tierra, Facultad de Ciencias, Universidad de Zaragoza, 50009 Zaragoza, Spain.) [cuenca@unizar.es](mailto:cuenca@unizar.es)

Paleoecological studies of a specific area permit to know the habitat where within are carried out human activities and their changes. In the Iberian Peninsula, there are a few Pleistocene sites with human presence, although one of the most significant is the Sima del Elefante, in the Sierra de Atapuerca (Burgos, Spain) (Carbonell et al. 2008; Cuenca-Bescós et al. 2013; *inter alia*).

In this paper we present paleoecological conditions of the lower sequence of the Sima del Elefante (TE9-TE14, also known as Lower Red Unit or TELRU), which has a chronology to 1.3 Ma (Carbonell et al. 2008; Cuenca-Bescós et al. 2013), from taphonomic study of small mammals remains. The main objectives are to identify and to describe the paleoecological features of the Sierra de Atapuerca and its evolution. In addition, to describe

the microenvironment features of the cavity, contributing to the definition of karts taphosystem of the Sierra de Atapuerca and delimiting the habitability of the levels studied by human groups.

The results indicate, by one hand the existence of a large semi-open forests biome consisting of watershed and open areas nearby the Sierra de Atapuerca. By the other hand, in lower levels of Sima del Elefante, the environment was characterized for high humidity, it would make difficult the use of cave by hominids groups for developing long-time occupations.

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POSTER

## 3. PALEOECOLOGICAL AND MICROENVIRONMENTAL ASPECTS OF TD5 AND TD6 LEVELS FROM GRAN DOLINA SITE (EARLY PLEISTOCENE, SIERRA DE ATAPUERCA, BURGOS, SPAIN)

Bennàsar, Maria Lluç (Area de Prehistòria, Universitat Rovira i Virgili (URV), Avinguda de Catalunya 35, 43002 Tarragona, Spain. [bennasar.maria1@gmail.com](mailto:bennasar.maria1@gmail.com))

Cáceres, I. (IPHES, Institut Català de Paleoeologia Humana i Evolució Social, Area de Prehistòria, Universitat Rovira i Virgili (URV), Avinguda de Catalunya 35, 43002 Tarragona, Spain.) [icaceres@iphes.cat](mailto:icaceres@iphes.cat)

Cuenca-Bescós, Gloria (Aragosaurus-IUCA, Ciencias de la Tierra, Facultad de Ciencias, Universidad de Zaragoza, 50009 Zaragoza, Spain.) [cuenca@unizar.es](mailto:cuenca@unizar.es)

Gran Dolina site contain, in addition to a rich and extensive archaeological and paleontological assemblage, the human fossils of *H. antecessor* in TD6 level that contributed to the paradigm shift in the appearance of the genus *Homo* in Europe. This fossil assemblage provides a unique opportunity to know the paleoecological features where is carried out the first human activities and their changes in Europe.

The main objectives of this study are identify and describe the paleoecological features of the Sierra de Atapuerca around 900 ka. when *H. antecessor* lived (Bermúdez de Castro *et al.*, 2008), from data extracted to TD5 and TD6 Early Pleistocene levels. In addition, contribute to the knowledge about the microenvironment of the cavity where human groups developed their activities, contributing to the definition of taphosystem of the Sierra de Atapuerca.

The environment of fossilization is different in the two levels studied. While fossilized remains of TD5 was car-

ried out in a cave environment (high humidity and low light), TD6 (especially sublevel TD6-2) has been associated with a decrease in humidity, which means better habitability conditions.

According to results extracted, the Sierra de Atapuerca was framed within semi-open forests with open and watershed areas. This scenario is similar to the results obtained for small mammal taphonomy of lower levels of Sima del Elefante site (Sierra de Atapuerca) (Bennàsar, 2010).

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POSTER

#### 4. PALEOECOLOGICAL IMPLICATIONS FOR THE LATE PLEISTOCENE-HOLOCENE ENVIRONMENTAL AND CLIMATIC CHANGES IN NORTHEASTERN IBERIA USING RODENTS AS A STATISTICAL TOOL

*Fernández-García, Mónica (Universitat Rovira i Virgili) monica.fernandez.garcia.90@gmail.com*

*López-García, Juan Manuel (Sezione di Scienze Preistoriche e Antropologiche, Dipartimento di Studi Umanistici, Università degli Studi di Ferrara) lpzjmn@unife.it*

Rodents are one of the most significant groups of mammals in the European Quaternary and had become one of the most useful tools to reconstruct the ecology and the environment of the past. This work take into account a compilation of fossil rodent assemblages from Northeastern Iberia in the Late Pleistocene (ca. 128-11 ka BP) and the beginning of the Holocene (< 11 ka BP). A statistic analysis of the occurrence of the species along the prefix chronology, allows to reach a better knowledge about the species involved during these periods and about its paleoecology implications.

Both as a descriptive statistic methods like through more complex statistical methods – Principal Components Analysis has been applied –, appears clearly evident that there are three dominant species during the studied chronology : *Microtus arvalis*, *Microtus agrestis* and *Apodemus sylvaticus*. *M.arvalis* and *M.agrestis* are species related to mid-European requirements and had been especially dominant in the end of the Late Pleistocene (ca. 30-11 ka BP); while *A. sylvaticus*, a generalist species but mainly related with wooded areas and temperate environments, dominated during the beginning of the Late Pleistocene (ca. 128-30 ka BP) and regained importance with the arrival of the Holocene. So, from a statistic point of view, the beginning of the Late Pleistocene and the Holocene show similarities among them

and differed clearly from the end of the Late Pleistocene. This phenomenon shows the singularity of the environment related with the end of the Pleistocene in the Northeast of the Iberian Peninsula.

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POSTER

#### 5. STABLE ISOTOPE VALUES FROM PARQUE DEL HOSQUILLO (CUENCA, SPAIN) PROVIDE A MODERN FRAMEWORK FOR UNDERSTANDING ECOLOGY IN C3-DOMINATED PALEOECOSYSTEMS DURING THE PLEISTOCENE OF EUROPE

*Garcia Garcia, Nuria (Universidad Complutense De Madrid/ Centro (Ucm-Isciii( De Evolución Y Comportamiento Humanos) ngarcia@isciii.es*

*Feranec, Robert S. (Research And Collections, Ny State Museum) rferanec@mail.nysed.gov*

*Gómez, Alvaro (Universidad Complutense De Madrid/ Centro (Ucm-Isciii( De Evolución Y Comportamiento Humanos) alvarogg1986@gmail.com*

*Virgós, Emilio (Universidad Rey Juan Carlos, Madrid) emilio.virgos@urjc.es*

*Valenciano, Javier (Consejería De Agricultura, Castilla-La Mancha, Cuenca,) jvalenciano@jccm.es*

Stable isotope analysis has proven to be a powerful analytical tool for understanding paleoecology in both modern and ancient ecosystems. Many studies concentrate on determining ecology in (paleo) ecosystems that contain both C3 and C4 plants due to the large differences in <sup>13</sup>C/<sup>12</sup>C incorporated into plant tissues as the results of their utilizing different photosynthetic pathways, and the subsequent incorporation of these values up the food chain. Studies concentrating on ecosystems that are dominated by C3 plants are rarer. However, C3-dominated ecosystems are typical today as well as in the past. In fact, ecosystems with a measurable abundance of C4 plants only become apparent after about 7 million years ago worldwide. Because of the climate changes related to glacial-interglacial cycles and the presence of humans in many, but not all, localities, the C3 dominated Pleistocene ecosystems in Europe, are ideal for studying mammalian evolution, including humans, and the evolutionary implications of the effects of climate change. Although there have been many isotopic studies on Pleistocene European sites, there has been a limited isotopic framework for understanding this data within Europe during this time period.

Here we present isotopic data from mammals collected in Parque de El Hosquillo (Cuenca, Spain) with the aim

of providing a framework for understanding the isotopic values of more ancient mammals in Europe. Samples of scat, hair, bone apatite, bone collagen and tooth enamel were collected from over 100 individuals and were sampled for  $\delta^{13}\text{C}$ ,  $\delta^{15}\text{N}$ , and  $\delta^{18}\text{O}$  values, depending on the type of tissue sampled. Species sampled within the park include: *Cervus elaphus*, *Dama dama*, *Ovis musimon*, and *Sus scrofa*. For each species, isotopic discrimination factors were determined for each sampled tissue type (i.e., scat, hair, collagen, bone apatite, and tooth enamel). Once calculated, these species specific discrimination factors were then utilized to better understand the isotopic values obtained from mammals within more ancient Pleistocene-aged sites.

The data obtained from the modern samples within Parque del Hosquillo permit a more accurate understanding of more ancient samples from the Pleistocene of Europe. The carbon isotope values from Hosquillo from all sampled tissue types reflect a C3-dominated ecosystem. The carbon isotopic pattern remains consistent among sampled species among the different tissue types. Significant differences are observed in  $\delta^{13}\text{C}$  values between *Cervus* and *Ovis* in all sampled tissue types. Additionally, carbon isotope discrimination factors ( $13\text{C}$ ) are similar for all taxa, and are comparable to previously published values for different tissue types. In contrast to the carbon isotope values, the nitrogen isotope values do not follow a pattern among taxa between scat and hair, different taxa show higher and lower nitrogen isotope values. Thus, the nitrogen isotope discrimination factors ( $13\text{N}$ ) vary among taxa.

These results provide a framework for studying and understanding the ecology of mammals in more ancient ecosystems, particularly those that contain the same taxa, such as the C3 dominated ecosystems of the Pleistocene.

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POSTER

## 6. LATE PLEISTOCENE BIOTIC REGIONS IN SOUTHWESTERN EUROPE: INFERRED FROM THE SMALL MAMMALS ASSEMBLAGES

López-García, Juan Manuel (Università degli Studi di Ferrara) [lpzjmn@unife.it](mailto:lpzjmn@unife.it)

The small mammals (insectivores, bats and rodents) assemblages from the late Pleistocene of the Iberian Peninsula are characterized by the presence of taxa with nowadays representation, that allow us to observe the

biogeographically changes produced. In this work we present more than 70 late Pleistocene sites from Iberia with micromammal studies.

Five zones have been identified in relation with the excavations scientific tradition and have been grouped by the affinity in small mammal associations. Thereby three groups have been identified: Group 1 (G1) that correspond to the northern-northeastern Iberia and is characterized by the presence of *Microtus oeconomus* and *Chionomys nivalis*; Group 2 (G2) that correspond to eastern and southern Iberia and is characterized by the presence of *Allocricetus bursae*; Group 3 (G3) that corresponds to the center of Iberia where converge several kind of habitats and climates and the three species mentioned above (*M. oeconomus*, *C. nivalis* and *A. bursae*) were present. The G1 and G2 corresponds to the currently biotic regions (R1 and R2) based on mammal assemblages.

An important factor which determine these biotic regions in the late Pleistocene is the orography of the Iberian Peninsula. G1 includes the sites located in the Cantabrian range, the Pyrenees and the Ebro basin; G2 includes the sites located in the Betic range; G3 is a mixed group that includes the sites located in the Central System and the transit areas of Tajo, Duero and Ebro basins.

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POSTER

## 7. EVOLUTIONARY TRENDS AS A CHRONOLOGICAL TOOL: THE CASE OF MIMOMYS SAVINI (VOLE) IN THE IBERIAN PENINSULA DURING THE EARLY PLEISTOCENE.

Lozano-Fernández, Iván (IPHES) [Ivanlozanof@gmail.com](mailto:Ivanlozanof@gmail.com)  
Blain, Hugues-Alexandre (IPHES) [hablain@iphes.cat](mailto:hablain@iphes.cat)  
López-García, Juan Manuel (UNIFE) [lpzjmn@unife.it](mailto:lpzjmn@unife.it)  
Cuenca-Bescós, Gloria (Universidad de Zaragoza) [cuenca@unizar.es](mailto:cuenca@unizar.es)  
Agusti, Jordi (IPHES) [jordi.agusti@icrea.cat](mailto:jordi.agusti@icrea.cat)

An evolutionary trend is essentially a directional change within a single lineage or parallel changes in several lineages. To be considered an evolutionary trend, this directional change has to be maintained over time and may affect one or more taxa within the lineages in which it occurs. Evolutionary trends have been observed in almost all animals groups. If we can determine the rate of change, these evolutionary trends can be a valid tool for biochronological estimations. In the Quaternary, the vertebrate taxonomical group that gives the best results as biochronological tool is Rodentia. This is due to their

higher taxa of reproduction and their rapid expansion. Of course rodents are not free of evolutionary trends, and with their higher taxa of reproduction we can study and accurately determine their evolutionary rates (the speed of these evolutionary trends).

The case of *Mimomys savini* (vole) is especially important for two questions. For one side, it has a marked evolutionary trend in size increase and lost ancient characters. And for another side, its chronological range covers the first human

occupations of Western Europe (Early Pleistocene). The study of populations of *M. savini* from different sites within the Iberian Peninsula allows to estimate their relative chronology. In this work we present a chronological synthesis in base of *M. savini* population of five of the ancient sites with human presence in Europe: Barranco León D, Fuente Nueva 3, La Boella, Vallparadis and levels TD4-TD6 from Gran Dolina.

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POSTER

**8. BIOCHRONOLOGY OF THE PLEISTOCENE AND PALAEOENVIRONMENTAL CONDITIONS IN THE NORTH CENTRAL EUROPE (POLAND) INFERRED FROM SMALL MAMMAL ASSEMBLAGES.**

*Nadachowski, Adam (Institute of Systematics and Evolution of Animals, Polish Academy of Sciences, Slawkowska 17, 31-016 Krakow, Poland) nadachowski@isez.pan.krakow.pl*  
*Socha, Pawel (Department of Palaeozoology, Institute of Environmental Biology, Wrocław University, Sienkiewicza 21, 50-335 Wrocław, Poland) sochap@biol.uni.wroc.pl*

The effects of large-scale climate fluctuations in Pleistocene on dispersal of land mammal species are better visible in the North European Plain than in the Mediterranean area. The lack of important geographical barriers favored periodic east-west migrations of mammal species and in consequence turnover of the whole communities along with changing climate and environment. This phenomenon is relatively well documented by abundant records of small mammal communities in the area north of the Carpathians and Sudetes Mountains. Altogether ca. 20 key sites were analyzed. The Early Pleistocene assemblages (e.g. Kadzielnia, Kamyk, Kielniki, Zabia, Zalesiaki) were compared with Middle Pleistocene (e.g. Kozi Grzbiet, Bisnik, Deszczowa) and early Late Pleistocene (MIS 5 - MIS 3) (e.g. Bisnik, Raj, Oblazowa, Stajnia, Komarowa) small mammal communities. The reconstruction of climate conditions in the environs of the studied sites was

based on models of bioclimatic analyses applied to the small mammal assemblages. Most of the important climatic and environmental changes in north Central Europe resulted in the appearance of "waves" of newcomers from the east. Successive faunas consisted either of the new species assemblage or species composition was the same but representatives of particular phyletic lineages differed morphologically from both previous and later forms. This regularity is well documented e.g. by Arvicolinae rodents for instance in *Allophaiomys* – *Microtus* and *Mimomys* – *Arvicola* lineages. Morphological, and thus measurable, differences create a basis of biochronological and biostratigraphic correlations.

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POSTER

**9. BIOSTRATIGRAPHY OF LATE MIDDLE AND EARLY LATE PLEISTOCENE OF CENTRAL AND WESTERN EUROPE BASED ON SMALL MAMMAL SPECIES.**

*Nadachowski, Adam (Institute of Systematics and Evolution of Animals, Polish Academy of Sciences, Slawkowska 17, 31-016 Krakow, Poland) nadachowski@isez.pan.krakow.pl*  
*Socha, Pawel (Department of Palaeozoology, Institute of Environmental Biology, Wrocław University, Sienkiewicza 21, 50-335 Wrocław, Poland) sochap@biol.uni.wroc.pl*  
*Lemanik, Anna (Department of Palaeozoology, Institute of Environmental Biology, Wrocław University, Sienkiewicza 21, 50-335 Wrocław, Poland) anna.lemanik@wp.pl*  
*Klimowicz, Malgorzata (Department of Palaeozoology, Institute of Environmental Biology, Wrocław University, Sienkiewicza 21, 50-335 Wrocław, Poland) ogrady@klimowicz.com.pl*

Some species of rodents (for instance *Arvicola*, *Microtus oeconomus* and *Dicrostonyx*) have distinctly changed their dental morphological features between MIS 6 and MIS 3. This phenomenon creates a basis for biostratigraphic subdivisions in Central and Western Europe. Morphological differences are observed in enamel tooth thickness changes of the water vole (*Arvicola amphibius*) expressed by the enamel SDQ quotient. The mean values of SDQ in Central Europe changed in the species from ~ 110 to ~ 70 during last ca. 150 ka. In spite of the criticism of the usefulness of this method, our results suggested that this index can roughly be used as biostratigraphic tool at the regional scale. In the root vole (*Microtus oeconomus*) the morphological change can be expressed by difference in the frequency of so-called "male" morphotypes characteristic for Saalian and early Weichselian populations for instance in France, England and Poland. Recent studies indicate that higher fre-

quency of “malei” morphotypes (~ 30-60%) occur in *M. oeconomus* from penultimate glaciation (Saalian). During Eemian (MIS 5e) and early Weichselian (MIS 5d-a) this morphological type is found in ~ 10-30 % of the *M. oeconomus* analyzed specimens. In collared lemmings (*Dicrostonyx*) morphological changes concern mainly upper molars and are expressed by gradual increase of more complicated morphological patterns from MIS 6 to MIS 3. The mentioned parameters were analyzed in over a dozen of sites for biostratigraphic purposes.

#### POSTER

### 10. BIOSTRATIGRAPHY OF THE PLEISTOCENE OF UKRAINE ON THE BASIS OF ARVICOLIDAE.

*Rekovets, Leonid (University of Environmental and Life Sciences of Wrocław, Wrocław, Poland) leonid.rekovets@up.wroc.pl*

*Krokhmal, Alexey (Institute of Geology Academy of Sciences of the Ukraine, Kiev, Ukraine) krokhmal1959@ukr.net*

*Nadachowski, Adam (Department of Palaeozoology, Institute of Environmental Biology, Wrocław University, Sienkiewicza 21, 50-335 Wrocław, Poland) nadachowski@isez.pan.krakow.pl*

Pleistocene biostratigraphy of the Ukraine on the basis of small mammals was established at the end of 20<sup>th</sup> century. The main biostratigraphic criteria used at that time were based on changes of faunal composition in time and percentage differences of tooth morphotypes in Arvicolidae. These criteria were at present supplemented by several indices e.g. SDQ, A/L, B/W and C/W, and sometimes SDQH, HH and M/L as well as details of enamel structure. The obtained numerical indices allowed to establish evolutionary changes for particular taxa of Arvicolidae in the Pleistocene. Directions and trends of morphological changes in time of particular phyletic lineages (*Miomys-Arvicola*, *Allophaiomys-Microtus* with division to subgenera, *Pliomys-Clethrionomys*, *Prolagurus-Lagurus*, *Dicrostonyx*, and partly *Chionomys* and *Lemmus*) were analyzed. On the basis of old and new criteria and also taking into account cyclic climatic changes the chronological succession of almost 200 Pleistocene sites of Ukraine was described. Moreover, boundaries of different stratigraphic ranks were established, e.g. boundaries between faunistic complexes and correlation of particular assemblages. The correlation of continental and marine sediments of Pleistocene were also possible because some marine sediments in the Ukraine contain remains of Arvicolidae.

#### POSTER

### 11. THE LONG SMALL VERTEBRATE RECORD OF ANTOLIÑAKO Koba (BIZKAIA, SPAIN; UPPER PLEISTOCENE): A PALAEOENVIRONMENTAL RECONSTRUCTION FROM THE AURIGNACIAN TO THE AZILIAN PERIODS.

*Rofes, Juan (UMR 7209, CNRS-MNHN, Paris) juan.rofes@ehu.es*

*García-Ibaibarriaga, Naroa (Universidad del País Vasco UPV-EHU) naroa.garcia@ehu.es*

*Aguirre, Mikel (UNED, Bergara, Gipuzkoa) maguirre@bergara.uned.es*

*Murelaga, Xabier (Universidad del País Vasco UPV-EHU) xabier.murelaga@ehu.es*

*Martínez-García, Blanca (Universidad del País Vasco UPV-EHU) blancamaria.martinez@ehu.es*

*Salvador, Bailon (UMR 7209-UMR 7149, CNRS-MNHN, Paris) salvador.bailon@mnhn.fr*

*Ortega, Luis Ángel (Universidad del País Vasco UPV-EHU) luis.ortega@ehu.es*

*Zuluaga, María Cruz (Universidad del País Vasco UPV-EHU) mcruz.zuluaga@ehu.es*

*Alonso-Olazabal, Ainhoa (Universidad del País Vasco UPV-EHU) ainhoa.alonso@ehu.es*

*Castaños, Jone (Universidad del País Vasco UPV-EHU) jcastanosdlf@yahoo.es*

Antoliñako Koba (Gautegiz-Arteaga, Bizkaia, Spain) is a prehistoric deposit located in a karstic cavity 285 m above sea level, in the eastern margin of the estuary of the Oka river (Urdaibai biosphere reserve). In the stratigraphic sequence, excavated between 1995 and 2008, eight Upper Pleistocene levels (MIS 2-3) have been described covering nearly 25.000 years cal. This long deposit comprises six chrono-cultural units: Aurignacian, Gravettian, upper Solutrean, lower and upper Magdalenian, and Aazilian.

The sample of small vertebrates is constituted by some 31.400 remains, of which 2.470 elements were identified either to the family, genus and/or species levels and divided into 20 taxa: 13 species of mammals, 4 of reptiles and 3 of amphibians. Small vertebrates are used for palaeoenvironmental reconstructions since they are very sensitive to climatic conditions and their distributions over time, measured in terms of relative abundance, serve as reliable proxies of habitat and climatic change.

The results are contrasted to those obtained from the large mammal and geochemical records. Many radiocarbon dates obtained for Antoliñako's sequence also allow us to compare our proposal to other palaeoenvironmental reconstructions (both marine and continental) from



north Iberia on the regional scale; and the oxygen isotopic curve of an ice core from Greenland on the global scale.

The small vertebrate associations together with the radiocarbon dates from Antoliñako Koba define climatic and habitat changes along the sequence, from roughly the beginning of the Würm III glaciation to the Holocene. Alternating cooling and warming events are recorded which coincide with the climatic changes of the Upper Pleistocene.

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POSTER

**12. NEW DATA ON LATE PLEISTOCENE SMALL VERTEBRATES FROM NORTHERN FRANCE**

*Stoetzel, Emmanuelle (Muséum national d'Histoire naturelle, Département Systématique et Evolution - CNRS UMR 7205 ISYEB, Paris, France) stoetzel@mnhn.fr*

*Koehler, Héloïse (Pôle d'Archéologie Interdépartemental Rhénan (PAIR), Sélestat, France & CNRS UMR 7041 ArScAn, Paris, France) heloise.koehler@pair-archeologie.fr*

*Cliquet, Dominique (Service régional de l'Archéologie de Basse-Normandie, Caen, France) dominique.cliquet@culture.gouv.fr*

*Seveque, Noémie (Université Lille 3 CNRS UMR 8164 Halma-lpel & Université Lille 1 CNRS UMR 8217 Géosystèmes, Villeneuve d'Ascq, France) noemie.seveque@etu.univ-lille3.fr*

*Auguste, Patrick (Université Lille 1 CNRS UMR 8217 Géosystèmes, Villeneuve d'Ascq, France) patrick.auguste@univ-lille1.fr*

Quaternary small vertebrate assemblages from southern France, and more generally meridional and mediterranean regions, are today well known and well studied. In comparison, septentrional areas of Europe remain poorly considered, as they have yielded relatively few sites with microfaunal remains. However, important sites of human occupation were discovered in these areas, with important issues related to the occupation of these sites by Neanderthals and previous humans, as well as faunal dynamics under climatic pressure. In the present work, we consider new unpublished results from two Late Pleistocene sites of northern France: Le Rozel (Normandy) and Mutzig (Alsace). Both are rock shelter subject of recent archaeological excavations, but in very different contexts: Le Rozel is located in a coastal area of north-western France, while Mutzig is located at the foot of the Vosges mountains in northeastern France. Similarities and differences in faunal composition are discussed, in relation to the geographic and climatic contexts, and with biochronological and archaeological implications.

# B3

## Monumental earthen architecture in early societies: technology and power display

Organiser: Annick Daneels)

Tuesday 2nd (14:00 to 19:30)  
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ORAL CONTRIBUTIONS

ORAL

**1. NEW DATA FROM RESEARCHES ON THE NEOLITHIC DITCHES OF THE TAVOLIÈRE AREA (APULIA, SOUTH ITALY).**

*Tunzi, Annamaria (Soprintendenza Puglia) annamaria.tunzi@beniculturali.it*

*Quero, Tania (University of Trieste) taniaquero82@gmail.com*

Thanks to a long tradition of studies on the Neolithic settlements of the Tavoliere area (Apulia, South Italy), starting with Bradford and Tiné, it was possible to discover at least one thousand sites ascribable to different chronological periods. These sites are characterized by monumental ditches (up to 4m deep and over 5m wide), that is hypogeal structures excavated in the bedrock by means calcareous picks or big pebbles. There are some small stairs carved in the rock and stone walls in the inner space. These constructions required a significant work organisation and involved several communities.

Often, it's possible to note an integration of large external enclosure ditches and internal C-compounds, which divided the internal spaces of the settlements.

The sites are located at a distance of at least 2km from each other and occupy a wide area that appears to be functionally organized. Possibly, there was a kind of hierarchization among these sites.

In this discussion, we would present some data from the most recent researches in the Tavoliere region. In 2013, the first complete excavation of an enclosure ditch was carried out at the Amendola Airport (Foggia). The ditch, elliptically shaped, lies on the top of a low hill (55m of altitude) on the Amendola Plan, covering an area of 8311m<sup>2</sup>, near the Candelaro river and not far from the coast.

Neither internal nor external structures were found, during the excavation works. The site is dated to the first centuries of the VI millennium BC (LTL13341A: 6937 ± 50 BP; LTL13340A: 6856 ± 45 BP).

After, we explored a village in the high Tavoliere region near Troia district, partially visible from the aerial photographs, only by little trenches. This village endowed with four enclosure ditches, along an axis of 722m, and other five internal structures at least, two of which could be C-compounds. All ditches lie on a 250m high hill and are

open to a nearby stream. The site is close to other ones that have been recently discovered in the same area and it is dated to the same period, that is to the second half of the VI millennium BC (LTL14034A: 6622 ± 45 BP; LTL14028A: 6012 ± 45 BP).

The function of these structures is still uncertain: probably, they were meant for draining marshy areas, isolating cattle, fields and huts or for demarcating and enclosing a community's land.

They could have also a symbolic and ritual value, attending to enhance the membership and avoid conflicts.

But, the peculiar pits, found on the bottom of the single-ditch from the Amendola Airport, have suggested an use as quarries for the clay that lies in the lower geological levels (Pleistocene "Amendola sands").

Instead, the Troia village could reveals a structural organization similar to the close villages and the different settlement system in the hills and in the coastal plain.

We cannot solve the problem about these structures, but we believe that new data added to the older studies may help to provide further ideas for the researches on the Neolithic villages of the Tavoliere region.

ORAL

**2. ACTIVITY AREAS IN TWO CEREMONIAL CENTRES OF THE SOUTHERN BRAZILIAN HIGHLANDS: RELATIONS BETWEEN ARCHITECTURE AND FUNCTION**

*De Souza, Jonas Gregorio (University of Exeter) jonas.gregorio@yahoo.com.br*

I present the analysis of the features and artefact assemblages of two funerary mound and enclosure sites of the Taquara/Itarare Tradition of the Southern Brazilian Highlands: sites RS-PE-31 and Posto Fiscal. Both sites are similar in that they exhibit rectangular annexes in their architecture, in addition to the most common circular enclosures. They are also differentiated by having a large amount of lithics and pottery, whereas other ceremonial sites are usually clear of debris.

The lithic and pottery materials were analysed in terms of technology and function, and distribution maps were created in order to identify activity areas. These were then compared to other funerary and domestic sites in the same area, so as to ascertain the function of sites

RS-PE-31 and Posto Fiscal. It was found that, unlike other burial grounds which were short lived and kept clean, the two sites in question had a complex sequence of activities and construction events. The artefact assemblage of sites RS-PE-31 and Posto Fiscal is very similar to domestic contexts of the Taquara/Itarare Tradition, and may be related to feasting events during and after the burial rites. Dates for site Posto Fiscal suggest that these events are related to the architectural elaboration of the site, with the addition of a rectangular enclosure, in a late period.

It can be suggested that the architectural complexity and activity areas evidenced in the sites RS-PE-31 and Posto Fiscal point to a greater elaboration in mortuary ritual associated with greater architectural complexity in later periods, immediately before the European conquest. Those distinctions for the burial of a few individuals may be related to the emergence of chiefdoms, as was reported for the groups that inhabited the area in the colonial period.

ORAL

### 3. BUILDING POWER: EARTHEN MONUMENTS AND THE CONSTRUCTION OF ELITE IDENTITIES IN PRE-COLUMBIAN NORTH AMERICA

*Baltus, Melissa (University of Illinois at Urbana-Champaign) mbaltus2@illinois.edu*

According to documents recorded at the time of European contact, earthen platform mounds in the southeast United States were the domain of indigenous political and religious leaders. Direct historical projection of this connection has often led previous archaeological research to focus on these constructions as places of elite status and associations. Rather than assuming *a priori* that these were elite spaces, current research into the earthen mounds of the late pre-Columbian period (A.D. 1000-1400) of the American Midcontinent suggests these mounds were monuments of *empowerment*. Incorporating indigenous ontologies into the study of mound construction suggests that the gathering together of naturally powerful elements (earth, water, fire) along with narrations of deep history (i.e. creation stories and ancestor-deity traditions) is itself an empowering act through which elite statuses were (re)constructed and maintained. Current research into earthen mounds of the Midcontinent is refocusing on how these monuments were experienced.

ORAL

### 4. ON THE THRESHOLD OF EGYPTIAN MUDBRICK ARCHITECTURE.

*Rosinska-Balik, Karolina (Institute of Archaeology, Jagiellonian University in Krakow, Poland) k.rosinska.balik@gmail.com*

The aim of this paper is to characterize the development of the Nile Delta architecture at the era of Egyptian unification. The attempt will be made on the basis on interpretation of archaeological material. Excavation result indicate that, in the period decisive for the ulterior Lower and Upper Kingdoms, Egyptian architecture was profoundly transformed. The transformation was not only viewable in the form of constructed architectural layouts. The execution manner of spacious structures was evolving as well, and building material changed and was adapted to new needs. At this point, new issue, worth further studies, appears. The issue concern mud bricks' application. The main question is the origin of the material. The answer is specially important, when facing the fact that the opinion on Naqadan descent of mud bricks should be strongly verified. Another question is the manufacturing economy. The preparation process of this type of common material must have been simplified and fasted, but the question how simplified and how fasted remains. How much workload it required? How many ingredients were needed and in what quantity? How much time the preparation process, from bath bricks to ready-to-use, required? And the final question we will trying to answer, what area was necessary to produce and prepare sufficient amount of bricks?

ORAL

### 5. FIRST TEST FOR LUMINESCENCE DATING OF ANCIENT ADOBE BUILDINGS FROM MESOPOTAMIA

*Sanjurjo Sánchez, Jorge (Universidad de A Coruña) jsanjurjo@udc.es*

*Montero Fenollós, Juan Luis (Universidad de A Coruña) fenollos@udc*

Raw earth has been even used continuously from Prehistory to get sun-dried adobe bricks (or mud bricks). Mud bricks are unfired bricks made of a mixture of mud, sand, and water mixed with a binding material such as rice husks or straw, dried under the sun. Since not all the soils are adequate for raw earth building the evaluation and characterization of the soils and the sediments for con-

structive purposes has become of important to define the application contexts of unfired Earth. As occurs with most sediments mud bricks contain abundant silicate and minerals. Among them, quartz and feldspars are ubiquitous. They are specially interesting as they are typically used for luminescence dating. Luminescence allows dating the last daylight exposure of minerals before burial in a sedimentary body. However, this technique has not been testes on mud bricks or earthen structures of buildings. As other materials present in mud bricks are scarce or not preserved after a lapse of some centuries or thousands or years, it could be very interesting to apply luminescence dating on this kind of building materials. This also would allow dating the construction period of important urban structures in several parts of the World. This is still more interesting in the case of Mesopotamia as most buildings were constructed with mud. A wide knowledge on the use of adobe and earth raw materials for the construction of buildings existed in Mesopotamia, where adobe was used for the construction of houses, temples and defensive walls of ancient cities. In this work we have performed the first luminescence tests on adobe bricks from two archaeological sites of Ancient Mesopotamia and compared results with chronological pictures of the studied sites. Results show that adobe bricks are reliable targets for luminescence dating.

ORAL

## 6. MIXED ARCHITECTURAL COMPLEXITY IN NORTHERN CENTRAL MEXICO.

*Fernández Martínez, Gerardo (Universidad Autónoma de Zacatecas) gerardo2001@hotmail.com*

Recent investigations in the southeast region of the state of Zacatecas, in the central portion of Mexico, have shown that the prehispanic populations which developed in this territory used a mixed system for the construction of their buildings. These architectural works are very complex and were built using, as fundamental constructive materials, rocks and adobe (earth bricks).

Nowadays the research of all this architectural features confront diverse problems as a result of the agency of natural deterioration processes and diverse human destructive activities.

Despite the conservation problems that this archaeological and architectural heritage faces all the time, the investigations at the Buenavista archaeological site allowed to infer, due to the location and characteristics

observed in some architectural compounds, that this constructive system has been used to built the most important ceremonial spaces of the site.

ORAL

## 7. THE MONUMENTAL EARTHEN ARCHITECTURE OF LA JOYA, ON THE HUMID TROPICAL GULF COAST OF MEXICO: POLITICAL AND TECHNOLOGICAL SIGNIFICANCE.

*Jo Elvire Daneels, Annick (IIA-UNAM MEXICO) annickdaneels@hotmail.com*

Recent investigations at one of the thousands of pre-Columbian mounded sites along the southern Gulf coast of Mexico revealed that earth was used as sole building material to create monumental architecture identical to contemporaneous Late Preclassic to Classic period civilizations like Teotihuacan, Monte Albán and the Maya region. These supposedly "simple mounds" resulted to be pyramids, palaces, monumental tombs and shrines, as well as ball-courts, that were part of an urban layout, with a building sequence spanning more than 1 millennium (200 BC-AD 1000). These findings are novel in two aspects: first, they oblige to reevaluate what was up to now considered a secondary and peripheral cultural development during the Mesoamerican Classic period, second, they prove the existence of a particular technology that made raw earth viable as primary building material in extremely adverse wet tropical climatic conditions.

Settlement pattern studies in the 1990's indicate the existence of small state level entities along the Central Gulf coast in the Classic period, supported in some cases by intensive agriculture and hydraulic management. Extensive excavations since 2004 at the site of La Joya, one of such state capitals, allowed to understand the building sequence of the urban layout, that transforms from a feasting center associated to an early palace compound in the Late Preclassic, to a formal ritual administrative closed plaza in the Early Classic, with a 4 staircase pyramid, a shrine and an acropolis-like administrative palace, all lavishly consecrated with offerings including human sacrifice. By 300 AD, contemporary with Teotihuacan contacts, a major modification enlarges the plaza sector to support a second palace compound, probably meant for the religious leader, requiring a major labor input of moving and terracing several million cubic meters of fill. The borrow-pits from which the fill is obtained, become an inverted U shaped water reservoir encircling and effectively differentiating the central monumental com-

pound from the residential and domestic areas outside. The compound has three more building stages spanning AD 300-1000, that significantly enlarge the component buildings but not their layout, suggesting a strong stability during the rest of the Classic period.

The excavations also show a gradual improvement of the building techniques to allow better contention of internal pressures of fills, although some strategies appear to have their origins in the Preclassic Olmec culture: clay facings and use of asphalt as construction sealant. Advanced chemical analysis of construction samples (through FTIR, NMR, and MS) show the presence of hydrocarbons and triglycerides, interpreted as dissolved asphalt. Petroleum seeps occur along the Gulf coast, so the material was available, but this would be the first archaeological case worldwide of the use of dissolved asphalt as an earth construction consolidant.

Thus, the La Joya case demonstrates the development of monumental urban architecture coupled with innovative building technology, sustaining the emergence of a state level capital that will gradually increase its differentiation until it ideologically and literally dominates the surrounding settlement, a trajectory that closely parallels the contemporary "high cultures" of Mesoamerica.

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## ORAL

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### 8. TRADITIONAL ARCHITECTURE AT FIGUIG OASIS, MOROCCO.

*Ultramar Ramírez, Florencia Tatiana Azul (Escuela Nacional de Antropología e Historia) azulramirez108@gmail.com*

The Figuig Oasis is located at Eastern Morocco. The settlement, whose size is about 600 to 700 hectare, has around 15000 inhabitants and is located at a distance of about 400 km. from the Mediterranean coast of the meridian that crosses the city of Oujda, two kilometers closer from the Algerian border.

In this region, the climate is classified as a Saharan climate, with an average of low temperature in January of 38 ° C and in July, a maximum average of 41.3 ° C. In this conditions, earthen architecture result the best strategy to create an artificial environment to human survival.

However, the human inventiveness is not the same everywhere, what mean, that traditional architecture is not only circumscribed by regional weather, but to the cultural particularities of its builders.

Following the parameters of UNESCO, "traditional architecture" is defined here as a cultural heritage that has a concrete (or tangible) and intangible (or subjective) dimension.

Therefore, the traditional architecture is a cultural heritage, whose social, political and/or religious significance, can only be decrypted and well understood when analysis includes intangible and tangible dimension of it. Thus, the analysis presented here, includes not only the technical dimension of Figuig earthen architecture, but the particular social, cultural and historical dimension of its builders, the amazigh/berber ethnic group who inhabit this oasis.

Concerning historical dimension, it is important to mention that architecture is one of the best witness of cultural and socio-political change, and in this sense, the Figuig oasis architecture provide us of many examples of how different changes take place in different periods of Moroccan history.

# B4

## Climate change and social change during the Late Holocene in arid and semiarid environments: archaeological and historical perspectives

(Organisers: Rafael A. Goñi & Diego D. Rindel)

Thursday 4th (14:00 to 19:30)  
B28 Meeting Room



2014 burgos  
1-7 sept.

**uispp**

Union International  
de Sciences Préhistoriques  
et Protohistoriques



XVII World UISPP Congress  
XVIIe Congrès Mondial de l'UISPP  
XVII Congreso Mundial de UISPP

ORAL CONTRIBUTIONS

ORAL

### 1. THE CALEROS EROSION SIMULATION PILOT.

*van Leusen, Martijn (Groningen Institute of Archaeology) p.m.van.leusen@rug.nl*

*van Beek, Rens (University of Utrecht) r.e.van.beek@uu.nl*  
*Feiken, Hendrik (Rijksdienst Cultureel Erfgoed) h.feiken@gmail.com*

As part of the recent (2014) PhD research of one of us (Feiken) at the University of Groningen (NL), the well-known PC-RASTER erosion simulation software developed at the University of Utrecht (NL) has been adapted to include interactions between human and natural processes, and a pilot project has been run to demonstrate its functionality and the issues that still need to be resolved in future work. The study area for the pilot is the hydrological basin of the Maddalena stream, part of the Raganello River basin in northern Calabria (Italy), and the simulation has been run in 60 timesteps for the period 4000 BC - present. This paper will outline the model underlying the simulation and highlight some results and problems. It will be argued that, despite the current limited realism of such simulations, there are good prospects for improvement.

ORAL

### 2. GEOARCHAEOLOGY FROM SEMI-ARID MASUDPUR: GLIMPSES OF BRONZE AGE LIFE AND RECONSTRUCTION OF MID-HOLOCENE ENVIRONMENTAL CONDITIONS IN NW INDIA.

*Neogi, Sayantani (University of Cambridge) neogi.sayantani09@gmail.com*

As a part of the *Land, Water and Settlement* project, geoarchaeological investigations carried out in and around two Indus sites of Masudpur I (Sampolia Khera) and Masudpur VII (Bhimwada Jodha) near the village of Masudpur in Haryana, India have revealed interesting information about the activities and behaviour of the inhabitants of these settlements.

In particular, within the sampled sequences from the trenches, several activity areas have been identified, such as open spaces used for crop-processing or general floor build-ups interrupted by occasional disturbed layers, all filled with settlement-derived debris and with

evident periods of abandonments. Off-site soil samples have revealed bedded sand deposits beneath Masudpur I whereas Masudpur VII was built on a dune system indicating a symbiotic relationship with the prevalent environmental system.

This paper will highlight the nature of human activities, prevalent environmental conditions and site-formation processes of these sites as depicted through the techniques of thin-section analysis and geochemical studies.

ORAL

### 3. CORRELATING ENVIRONMENTAL EVENTS WITH HUMAN TRENDS: A LATE BRONZE AGE SITE AND FLUVIAL CONTEXT IN THE MIDDLE EUPHRATES VALLEY (NORTHEAST SYRIA).

*Sanjurjo Sánchez, Jorge (Universidad de A Coruña) jsanjurjo@udc.es*

*Montero Fenollós, Juan Luis (Universidad de A Coruña) fenollos@udc*

Early civilisations were born on Mesopotamian floodplains approximately 6 ka BP. Thus, Holocene alluvial sediments provide archaeological remains and coetaneous records of environmental changes. We have studied a Bronze Age archaeological site in the Middle Euphrates Valley located beside an ancient river channel. The site was definitively abandoned in the Late Bronze Age II. In such river stretch, a single meandering channel existed, but it was moved and the palaeochannel filled with flash flood sediments from a *wadi*, due to either natural or human-induced environmental changes. We have studied the palaeochannel infill and used optically stimulated luminescence (OSL) for dating the alluvial sediments. OSL allows direct dating of alluvial sediments towards inorganic materials. However, the technique has been little tested in this area, while both radiocarbon and pottery style dating have been preferred. When OSL, radiocarbon and stylistic dates were compared there have been significant disagreements, but OSL is the only technique that allows dating sediments if organic materials and pottery remains are absent. The obtained ages allowed making a correlation between the palaeochannel infill process and significant environmental events recorded in other nearby palaeoenvironmental sequences. The results show that meandering is a highly probable cause of the lack of reoccupation of the site.



ORAL

#### 4. LANDSCAPE AND HUMAN BEHAVIOR IN HOLOCENE: AN ISOTOPIC STUDY.

*Campos, Luana (Doutoranda em "Quaternário, Materiais e Culturas". Universidade de Trás-os-Montes e Alto Douro/Portugal. Bolseira CAPES/Brasil) lcampos.ms@gmail.com*  
*Pessenda, Luiz (Laboratório 14C CENA/USP/Brasil.) pessenda@cena.usp.br*

*Rodrigues, Ana Isabel (Instituto Português do Mar e da Atmosfera, DivGM/Portugal) ana.rodrigues@ipma.pt*  
*Teixeira, Rui (Universidade de Trás-os-Montes e Alto Douro, UTAD, Quinta de Prados, 5000-801 Vila Real, Portugal e Centro de Geociências) rteixeir@utad.pt*

The relationship between the changes in landscape and human behavior during the Holocene has been the subject of several studies over the years.

In this work, we present the results of carbon isotopes ( $\delta^{13}\text{C}$ ) analyses of soil samples from two drills carried out in colluvium deposits from Parque Nacional da Serra da Capivara, Piauí, Northeastern Brazil, near the archaeological sites "Toca do Sítio do Ema do Brás I (Ema I)" and "Toca do Baixão do Perna I (Perna I)". The results of these analyses suggest two distinct paleoenvironmental scenarios for those sites.

On one hand, the values of  $\delta^{13}\text{C}$  of organic matter from soil samples collected in the drill located near Ema I (300 cm depth) show an isotopic enrichment of 1.5 ‰ (from -24.8 to -26.3) from medium Holocene (ca. 6220 cal. years BP) to the present day. This variation in  $\delta^{13}\text{C}$  may be associated with the decomposition of soil organic matter and/or a possible influence of C4 plants (grasses) in the past.

On the other hand, the drill on the slopes of the valley where is located Perna I site (250 cm depth), that distant about 6 km from Ema I, show  $\delta^{13}\text{C}$  values that range from -21.6 ‰, indicative of a mixture of C3 and C4 (grass) plants, at the base, to -25.9 ‰ (predominance of C3 plants, trees) on the top. This variation of 4.3 ‰ may be related to the expansion of C3 plants in this location, from a period of at least 6250 cal. years BP, where there is an influence of C4 (grass) plants with values of ~ -21 ‰. These facts may be related to a climate change from a less wet/dry period, in the middle Holocene to a more humid period in the present.

The analytical results and studies, carried out in archaeological remains found in the two sites, allow us to infer a

relationship between environmental changes and the behavior of prehistoric groups that inhabited the region. In fact, the dates obtained on the site "Toca do Sítio do Ema do Brás I", show an occupation of the region until about 8000 years BP, followed by a hiatus and subsequent reoccupation around 4700 years BP. This differentiated strategy in the occupation of this territory, supported by the material culture found there, would have been conditioned, in part, by the paleoenvironmental changes previously reported for this location. On the other hand, in the drill carried out at about 2600 m from the archaeological site "Toca do Baixão do Perna I (Perna I)" there were not found any traces of human occupation. This may be explained by the geomorphological characteristics of the site, which provided a greater exposure to climate variations.

ORAL

#### 5. HOLOCENE CLIMATE CHANGE AND PREHISTORIC HUMAN SETTLEMENTS IN CHILE'S ATACAMA DESERT.

*A Rivera, Mario (Universidad de Magallanes) marivera41@gmail.com*

*Dodd, Justin (Northern Illinois University) jdodd@niu.edu*

*Olson, Elizabeth (Northern Illinois University) ejolson@niu.edu*

The Atacama Desert is among the driest regions on Earth, and accessibility to water is critical to the settlement of humans. Regional scale climate variations such as the strength of the South American Seasonal Monsoon (SAMS) and El Niño (ENSO) intensity drive precipitation variations in the adjacent Andean highlands, and, therefore, recharge of aquifer systems. Numerous paleoclimate proxies from the region identify changes in ENSO variability in the mid- to late Holocene (~6 ka to present). Drought resistant trees such as *Prosopis tama-rugo* indicate fluctuations in regional moisture availability over the past 10ka.

Oxygen isotope data from fragments of *Prosopis tama-rugo* wood record sub-seasonal variations in moisture availability/water source at La Tirana Refresco (modern), Ramaditas (2615 Cal BP), and Llamara (9130 and 7910/7870 Cal BP). These data provide critical information about how water availability and land-use in Pampa del Tamarugal affected the development of fundamental aspects of Prehispanic economy, political organization, and power relations.

Based on a dendrochronological sequence from Ramaditas, a formative archeological village site in the Pampa

del Tamarugal, Oxygen isotope data was recorded and compared with that obtained from La Tirana Refresco and Llamara. This site contains *Prosopis tamarugo* stumps and logs with a much greater range of  $\delta^{18}\text{O}$  values from 22.8 to 39.4‰ and greater seasonal variability (avg. 3.3‰,  $2\sigma=2.4\%$ ). The greater range in interannual and seasonal  $\delta^{18}\text{O}$  values at Ramaditas most likely reflects a period with highly variable fluxes of runoff/recharge water and increased evaporation. An extensive network of irrigation canals, artisan wells, and over 10 has of agricultural fields at Ramaditas indicate that water was readily available from 2.5 – 2.0 ka when the site was occupied. *Prosopis tamarugo* was the main fuel source for activities such as copper smelting and building construction yet at present, vegetation is completely absent from the Ramaditas site.

Significant changes in water availability and anthropogenic alteration of the landscape may have been a critical factor in the eventual abandonment of the archaeological site. These episodic changes in water availability during the mid-Holocene on the Pampa del Tamarugal can be linked to broader scale shifts in Pacific and Atlantic moisture sources.

The northern Atacama Desert is therefore an ideal location to investigate the variations in the intensity of ENSO/SAMS precipitation throughout the Holocene.

ORAL

## 6. CLIMATIC CHANGE AND SOCIAL CHANGE IN ARCHAEOLOGY. METHODOLOGICAL ASPECTS OF A STUDY CASE IN PATAGONIA.

*Goñi, Rafael (INAPL/UBA) rafaellagustingoni@gmail.com*

This presentation discuss the variable conditions of climate and environment explain important aspects of social organizational systems of the past, in particular hunter-gatherers. It is understood that the climatic and environmental changes occurred during the Holocene in Southern Patagonia, played a very important role to understand what factors varied in the organization of human populations that allow a more truthful explanation of the variability observed in the archaeological record.

Methodologically, it is postulated that the climate is not the determinant of social/cultural change but the behavior or strategy to lead and produce the change. The effect is on human decisions to establish new social strate-

gies and not on the events itself. These are breakpoints to establish new the new human strategies. Because some of the most deep climatic events can occur in very short periods (Mayewski et al. 2004; Taylor 1999), they could be into the direct perception of actors in a single generation; not necessarily all great changes must have been undetectable for hunters in the past. Therefore, our perspectives is focused on social change more than in "cultural" change, the last understood as the material record. A model of human colonization during the Late Holocene has been proposed for the region under analysis (Southern Patagonia). It proposes that in the last 2500 years BP residential mobility underwent a drastic reduction as a result of the environmental desiccation processes suffered by the region during that period (Goñi 2010). The main odea that has guided research has been that, in Southern Patagonia, colonization and pattern of human occupation is highly dependent on the climatic and environmental variables. These variables present important changes during the Holocene: changes in the direction (6000 years BP) and intensity (ca. 1800 years BP) of the westerly winds or southern westerlies (Gilli et al 2001). Then , the height of a progressive desiccation was reached during the so-called Medieval Climatic Anomaly - MCA - (AD 1021 to 1228) (Stine 1994, & 2000). The new ecological characteristics involve the enlargement of steppes and a decline in the water level of lake basins in the region. The distribution of water as a critical resource in Patagonia must have varied drastically in regional terms. Thus, the broader and open sand-dune landscapes in the lowlands, with predominantly shrub vegetation and seasonal pastures in higher areas, present a geographic landscape that sets the scenery in wich the colonizing dynamics of the hunters of the Late Holocene unfolded.

ORAL

## 7. CHANGES IN THE ARCHAEOLOGICAL RECORD OF CENTRAL AND SOUTHERN PATAGONIA (ARGENTINA) DURING THE LATE HOLOCENE

*Rindel, Diego Damián (CONICET-INAPL) drindelarqueo@yahoo.com*

*Goñi, Rafel Agustín (INAPL-UBA) rafaellagustingoni@gmail.com*

*García Guráieb, Solana (CONICET-INAPL) solanagg@gmail.com*

*Re, Anahí (CONICET-INAPL) anahire1@gmail.com*

*Cassiodoro, Gisela Eva (CONICET-INAPL) gcassio@hotmail.com*

*Tessone, Augusto (CONICET-INGEIS) gutitessone@yahoo.com.ar*

*Dellepiane, Juan Matías (CONICET-INAPL) juandelle09@hotmail.com*

*Flores Coni, Josefina (CONICET-INAPL) coquequina@yahoo.*

*com.ar*

*Guichón, Francisco (CONICET-INAPL) guichonf@hotmail.com*  
*Pasqualini, Sebastián (INAPL-UBA) sebastian\_pasqualini@hotmail.com*

*Agnolín, Agustín (INAPL-UBA) agusagnolin@yahoo.com.ar*  
*Guichón, Rocío (INAPL-UNOCEN) rocioguichon@hotmail.com*

Relative to previous moments, the Late Holocene in Patagonia appears as a less humid environmental period. Nonetheless, this phenomenon registers local variations linked to the characteristics of specific environments, particularly their positions in the altitudinal, latitudinal and longitudinal gradients. These conditions would have necessarily had an impact in the strategies developed by the hunter gatherers groups that occupied this space.

The aim of this presentation is to evaluate the changes in the archaeological record of Central and Southern Argentinian Patagonia, specifically the macro-region limited by the Chubut river in the north (44° S) and the Santa Cruz river to the south (51° S).

Different lines of archaeological evidence will be considered: technology, archaeofauna, stable isotopes, bioarchaeology, rock art and archaeobotany. In our study area -Central-Western Santa Cruz province-, the analysis of these lines of inquiry have led to the identification of recurrent patterns and changes in the archaeological record. These are related both to spatial (plateaus, high and low altitude basins, steppe and woodlands) and temporal aspects (Middle, Initial Late and Final Late Holocene).

In general terms, the Late Holocene is characterized by changes in the composition of different aspects of the archaeological record, namely, the incorporation of new technologies (pottery and structures), new artifact and motifs designs, new animal species in the archaeofaunal assemblages, changes in the human burial types and their sex-age composition, among others. Also, variations in the distribution and density of this record are observed, specially linked to the ecological characteristics and the altitude of the different sectors. On the basis of this information, the hunter-gatherers mobility and land use models proposed for the study area have been corroborated. These models pose a reduction of residential mobility, a concentration of settlements in low sectors and a logistical and seasonal use of high lands.

This presentation seeks to expand this discussion and to compare the observed trends in a broader space scale. To achieve this, the data sets generated by our research team will be considered alongside information published by other teams working in the defined macro-region.

The main contribution of this presentation is to generate a deeper understanding of hunter-gatherers population dynamics in Central-Southern Patagonia during the Late Holocene, under fluctuating environmental conditions

ORAL

## 8. THE PALAEOENVIRONMENTAL RECORD OF THE BARDENAS REALES (NAVARRA, SPAIN) DURING THE EARLY LATE HOLOCENE.

*Iriarte-Chiapusso, María-José (IKERBASQUE - Universidad del País Vasco) mariajose.iriarte@ehu.es*

*Murelaga, Xabier (Universidad del País Vasco) xabier.murelaga@ehu.es*

*Sesma, Jesús (Dirección General de Cultura-Institución Príncipe de Viana) jesus.sesma.sesma@cfnavarra.es*

*García, María Luisa jesus.sesma.sesma@cfnavarra.es*

*Meaza, Guillermo (Universidad del País Vasco) mariajose.iriarte@ehu.es*

*Hernández-Beloqui, Begoña (Universidad del País Vasco) begona.hernandez@ehu.es*

*Echazarreta-Gallego, Amaya (Universidad del País Vasco) amayaechazarreta@gmail.com*

*Ayerdi, Miren (Universidad del País Vasco) miren.ayerdi@gmail.com*

*Sancho, Carlos (Universidad de Zaragoza) csancho@unizar.es*

*Ortega, Luis Angel (Universidad del País Vasco) luis.ortega@ehu.es*

The Bardenas Reales is an amazing region, located southeast of Navarra. The sub-desert character of the landscape and the lack of population centers (given the uniqueness of their ownership regime) are the most determining factors in its evolution during historic times. The combination of a continental Mediterranean climate (low and erratic rainfall, cold winters, hot summers and a major dry season), the irregularity of its waterways, wind, its geomorphological features (alternating layers of different hardness and resistance against erosion) and human action, have generated a unique landscape, which marks from north to south three different units: the alluvial terrace of El Plano, the erosive depression of White Bardena, and the Bardena Tabular or El Plano. The farming activities have relegated the natural vegetation and wildlife to areas hardly adequate to such activities, also influencing the composition of their communities. The pine forests of Aleppo pine and holm oak tree areas are the most characteristics, although their degradation enhances the development of the shrub layer. The degradation and salinization substrate parts of the Bardenas Reales, as the White Bardena, inhibit the growth of tree species, the territory being occupied by tamarisks-espar-

to fields and species with halophilic and/or steppe type. The study based on morphosedimentary analysis, the autoecology of the gastropods assemblage and isotopic analysis of their shells, show us a palaeoenvironmental pattern comprised of an early wetter/colder phase (4763±87 to 2848±55 yr cal BP) followed by a warmer/drier period (1403±60 to 836±65 yr cal BP) and, finally, an increase in both cold conditions and hydrological variability, is deduced for the Middle-Late Holocene (191±97 to 127±82 yr cal BP). Archaeological excavations have shown the interest in this territory that humans has had since prehistoric times. The information obtained from paleoenvironmental studies (fauna and flora) made in several of these archaeological sites, makes evident the differences in climatic conditions, in comparison to the current dry landscape and semiarid Bardenas Reales. The Bardenas Reales had a residual occupation during Roman times, practically limited to White Bardena, rural settlements with second order devoted to farming. The excavation in the rural village of Cantera Pichón has yielded a sequence of centuries II- III A.D. The intensification of human activity in the territory of the Bardenas Reales, especially from the Middle Ages, has implied a deterioration of the landscape, so that the natural resilience of the primitive vegetable coating has significantly decreased (apparition of substrate and consequently, higher incidence of erosion), reaching even to the steppe-formation in parts of the territory occur.

## POSTER

## POSTER

## 9. ENVIRONMENTAL CHANGES AND HISTORICAL PROCESSES DURING THE LATE PREHISTORY IN THE MIDDLE EBRO VALLEY. THE EXAMPLE OF THE HUERVA VALLEY.

*Pérez-Lambán, Fernando (Universidad de Zaragoza) fperezlamban@gmail.com*

*Picazo Millán, Jesús V. (Universidad de Zaragoza) jpicazo@unizar.es*

*Rodanés Vicente, José María (Universidad de Zaragoza) jrodanes@unizar.es*

*Peña-Monné, José Luis (Universidad de Zaragoza) jlpena@unizar.es*

The relationship between environmental changes – mostly climatic – and historical processes is a recurrent topic in certain explanations of the social change. These explanations have been accepted differently depending

on the real data behind them but also on the prevailing theoretical positions of each moment. Nowadays, circumstances seem favorable for the exploration of this relationship. On one hand this is a consequence of the present social sensibility to environmental change. On the other hand, it is due to the increasing availability of paleo-environmental and archaeological data. Therefore, recently it has been proposed again that slight climatic changes could be the cause of crisis that led to the extinction of certain societies (cfr. Hsiang et al. 2013, Drake 2012...). Some of these climatic changes are well recognized through the Holocene, as it is the case of the Bond events or Mayewsky's Rapid Climate Changes, and it is possible to imagine more climatic short episodes that could had a significant impact in societies dwelling fragile environments.

In this work we explore this relationship between the available paleo-environmental data and the historical processes identified through the final stages of the Prehistory in the geographic region of the Middle Ebro Valley, focusing our attention in one of its southern tributaries, the Huerva Valley. Interdisciplinary studies carried out in the last years gave a paleo-environmental dataset that is the framework for this research. Geomorphology has been the basis of these studies revealing the existence of erosive and sedimentation stages that are materialized in slope and bottom valley deposits. These stages are related to climate episodes as climate is one of the main factors driving the geomorphological processes. The climate episodes are also compared to the environmental data provided by anthracology, palynology and C12/C13 ratio analysis carried out in archaeological contexts from the Bronze Age (Los Collados) and Iron Age (Cabezo de la Cruz).

According to the data obtained from these analyses, climatic conditions were somehow variable and their variations can be related to the rapid transformation of the landscape suffered in this time period. Human activity is the other main factor in the environmental change. Recent archaeological studies in the area provide a well-established chronological framework based on C14 dating and the settlement trends: the changes in the segmentary societies of the Late Chalcolithic to the emergence of complex and unstable societies in the Early Iron Age and the irruption of Rome during the Late Iron Age. Through the parallel study of the changes in societies and in the environment we are able to distinguish that some of the anthropo-environmental processes are related to regional and global trends, while others are acting at local scale.

# B5

## New approaches to the study of Quartz lithic industries

Organiser: Arturo de Lombera-Hermida, Carlos Rodríguez-Rellán

Thursday 4th (9:00 to 13:30 15:00 to 19:30)  
A23 Meeting Room



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XVII World UISPP Congress  
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XVII Congreso Mundial de UISPP

ORAL CONTRIBUTIONS

ORAL

## 1. THE USE OF QUARTZITE IN THE EARLY STONE AGE AT OLDUVAI GORGE, TANZANIA.

*Proffitt, Tomos (Institute of Archaeology, UCL) t.proffitt@ucl.ac.uk*  
*Arroyo, Adrian (Institute of Archaeology, UCL) a.arroyo@ucl.ac.uk*  
*de la Torre, Ignacio (Institute of Archaeology, UCL) i.torre@ucl.ac.uk*

Quartzite was the primary raw material utilised by early hominins within the Olduvai basin during the Early Stone Age, as such it constitutes a significant proportion of the archaeological record and was readably available within 6km of the majority of Olduvai sites. Its extensive presence in the archaeological record warrants its use as an investigative tool in order to better understand archaeological sites and hominin behaviour at Olduvai Gorge.

Current research is focusing on experimental approaches designed to investigate the analytical and functional aspects of quartzite and its place in the archaeological record at Olduvai Gorge. Raw material used in the experimental approaches is sourced directly from Olduvai Gorge, Tanzania. A series of multi-disciplinary approaches have been utilised, including technological analysis, blind analysis, use wear analysis, and GIS analysis in order to better understand the analytical and functional issues relating to this raw material.

Results from these studies have highlighted the inherent difficulties in the analysis of this raw material as well as providing tentative suggestions for frameworks which will aid in the analysis and interpretation of quartzite in an Early Stone Age context.

This collaborative research provides a more complete picture of our understanding of the archaeology of Olduvai Gorge during Beds I and II times.

ORAL

## 2. QUARTZ AND QUARTZITE USE IN THE MIDDLE PALAEO-LITHIC BISON KILL AND BUTCHERY SITE OF COUDOULOUS I (SOUTHWESTERN FRANCE)

*Mourre, Vincent (Inrap, UMR 5608) vincent.mourre@inrap.fr*  
*Venditti, Flavia flavia.venditti@gmail.com*  
*Lemorini, Cristina clemorini@hotmail.com*  
*Jaubert, Jacques (Université de Bordeaux, PACEA) jacques.jaubert@u-bordeaux.fr*

The site of Coudoulous I provided one of the most important late Middle Pleistocene sequence in Southwestern France. The stratigraphic sequence is divided into 10 main units and shows the transition from a closed cave room to a sinkhole more and more opened towards the limestone plateau. This communication will focus on the lithic industry of the layer 4 bone bed. This unit dates back to MIS 6 and is a 40 cm thick layer mainly composed of steppe bison bones. The large number of individuals (NMI = 232 in 25 excavated m<sup>2</sup>), the presence of all the skeletal elements, the catastrophic mortality pattern with dominant juvenile and young adults, the recurrent late spring to early summer acquisition (based on wear studies and skeletochronology), the numerous anthropic modifications (green fracture, cut-marks and burnt bones) are good indicators of repeated human occupations targeted toward hunting events within a frame of organized planned activities of structured human groups using the natural sinkhole to trap bison.

The layer 4 lithic industry is dominated by quartz and quartzite (97%) supplemented by flint (2.5%) and a few other raw materials (0.5%). Almost all the lithic resources used in the site were available in the alluvial deposits of neighboring rivers. The use of flint imported from an outcrop located about 30 km away was documented for one single tool. Three flaking methods were: Discoid, bipolar-on-anvil and Levallois flaking (the latter only on flint), typical of the Early Middle Palaeolithic. Most of the flint flakes were used without any retouch but a few of them were retouched into Mousterian tools (namely scrapers and points). Only a few quartz and quartzite flakes were retouched.

Use-wear analysis has been carried out on a sample of 79 artifacts made of quartz and quartzite. Given the heavy alteration, no artifact made of flint was selected. As can be expected from such an archaeological context, butchering was the activity most frequently carried out. The hunting-oriented character of Coudoulous is further corroborated by the lack of other activities except for few cases of scraping or cutting of wood and dry hide that could be related to the making and the maintaining of the tool-kit used for hunting. The presence of possible hunting tools has been questioned through an experimental program in the framework of the "des Traces et des Hommes" collective project. A small number of archaeological artifacts with convergent edges show traces consistent with a use as spear points.

Coudoulous lithic industry thus confirms the importance of quartz and quartzite in the Middle Palaeolithic subsistence strategies and shows, as it still seems to be

necessary, that those materials should no longer be considered as second-rate and poorly informative ones.

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ORAL

### 3. QUARTZ MOUSTERIAN TECHNOLOGY IN NAVALMAÍLLO ROCKSHELTER (PINILLA DEL VALLE, MADRID, SPAIN). PRELIMINARY RESULTS OF THE TECHNOLOGICAL AND USE-WEAR ANALYSIS OF QUARTZ IMPLEMENTS.

*Márquez, Belén (Museo Arqueológico Regional de la Comunidad de Madrid) belen.marquez@madrid.org*

*Mosquera, Marina (Universitat Rovira i Virgili/IPHES) marina.mosquera@urv.net*

*Baquedano, Enrique (Museo Arqueológico Regional de la Comunidad de Madrid) enrique.baquedano@madrid.org*

*Pérez González, Alfredo (Centro Nacional de Investigación sobre la Evolución Humana (CENIEH) alfredo.perez@cenieh.es*

*Arsuaga, Juan Luis (Centro Mixto UCM-ISCIII de Evolución y Comportamiento Humanos) jlarsuaga@isciii.es*

*Panera, Joaquín (Institute of Evolution in Africa (I.D.E.A.) joaquin.panera@gmail.com*

*Espinosa, Juan Antonio (Estudios Arqueológicos ARQUEO S.C.) juan.espinosa.arqueosc@gmail.com*

*Gómez Hernanz, Juan (Arqueostrato S.L.) arqueostrato@gmail.com*

Navalmaíllo rockshelter, a Mousterian site at Pinilla del Valle in the Madrid region of central Spain, was discovered in 2002. Over time the shelter was completely buried by sediments.

Our work describes a preliminary study of the site's lithic industry. The most characteristic feature of the lithic sample at Navalmaíllo is that the artifacts are mostly made of quartz. Chert and other good raw materials, such as quartzites—found in river terraces—are relatively abundant in the central Iberian Peninsula, where Navalmaíllo rockshelter is located. Quartz cobbles are also common locally, but this material was usually avoided during the Middle Paleolithic period. The few exceptions are always in rockshelters or caves. Although archaeological assemblages dominated by quartz are not common in the central Iberian Peninsula, they are more common in peripheral areas such as Catalonia and Galicia.

As documented in other European sites, the abundance of quartz led to its becoming the main raw material used in tool-making in the area, even though it seems to be more difficult to knap than other, more homogeneous types of rock that fracture conchoidally.

The cores found at the Navalmaíllo site appear to have been intentionally worked to a very small size, a finding also reported for other European assemblages of similar age. The other raw materials found at the site include chert, quartzite, porphyry, rock crystal, and sandstone, all of which appear to have been worked in the same manner as the quartz. The scarcity or quality of raw materials is not the reason for this behavior.

The lack of any clear traces of soft-hammer percussion is notable. On the contrary, a large number of percussion marks that correspond to bipolar knapping on an anvil were identified on tools and cores of all materials. These are particularly visible on the quartz artifacts. Working small cores via the bipolar knapping technique is the best method for making small tools since the core is easily held in place when striking it.

A cultural explanation for this "microlithism" can be proposed in the sense that the Neanderthal groups that occupied the Navalmaíllo rockshelter may have followed a "microlithic-like" tradition of tool-making. To conclude, we have undertaken the use-wear analysis of some quartz implements to resolve, among others, questions related to the use of the small tools, as well as determining the possible intentionality of *Siret* fractures.

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ORAL

### 4. TWO ACTORS, ONE SCENARIO: THE MANAGEMENT OF QUARTZ AND QUARTZITE RESOURCES ALONG THE UPPER PLEISTOCENE SEQUENCE OF COVA EIRÓS.

*de Lombera-Hermida, Arturo (Institut Català de Paleoecologia Humana i Evolució Social (IPHES) C/ Marcel·lí Domingo s/n - Campus Sescelades URV (Edifici W3) 43007 Tarragona - Grupo de Estudos para a Prehistoria do Noroeste (GEPN) Dpto. Historia I Universidade de Santiago de Compostela) artulomb@gmail.com*

*Rodríguez-Álvarez, Xose Pedro ( Institut Català de Paleoecologia Humana i Evolució Social (IPHES) C/ Marcel·lí Domingo s/n - Campus Sescelades URV (Edifici W3) 43007 Tarragona) xprodriguez@iphes.cat*

*Fábregas Valcarce, Ramón (Grupo de Estudos para a Prehistoria do Noroeste (GEPN) Dpto. Historia I Universidade de Santiago de Compostela Fac. Xeografía e Historia Pz. da Universidade, nº1 15782 Santiago de Compostela) ramon.fabregas@usc.es*

Traditionally, quartz has been considered as a second-rate resource for the Paleolithic communities and as

prove of their subordination to the environmental constraints. The petrological and mechanical characteristics of this raw material become a handicap for fully develop their technological skills. Hence, these lithic assemblages are defined by the ambiguity of their technical features, in some cases, interpreted as archaism.

The cave site of Cova Eirós (Triacastela, Lugo) has a stratigraphic sequence yielding archaeological layers related to the Middle Paleolithic, Early Upper Paleolithic and Late Upper Paleolithic. The technological study of these assemblages allows us to compare the different lithic management strategies played by two hominin species within the same territory and with a restricted lithological offer.

Hominins make a rational and differential management of this lithic resource by applying selective raw material procurement strategies. Secondly, they adjust the different *chaînes opératoires* to the petrological and mechanical properties of the quartz varieties. Although the lithic assemblages are dominated by expeditive knapping strategies, they reflect technological features parallel to those identified in other coetaneous flint lithic assemblages.

For the Upper Paleolithic levels the presence of specialized and standardize reduction sequences for bladelet production on rock crystal, show the high knowledge of these communities about the mechanical particularities of this material, as well as their adaptative strategies carried out to overcome the lithological constraints.

The sequence of Cova Eirós shows that behind the apparent homogeneity of quartz lithic assemblages, complex technical behaviours can be identified. The Middle and Upper Paleolithic societies adapt their procurement strategies and knapping methods for fully develop their technological requirements.

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ORAL

## 5. UTILISATION DU QUARTZ AU PALÉOLITHIQUE : DÉPASSER LES ÉTUDES TECHNIQUES, ANALYSER LE SYSTÈME.

*Bracco, Jean-Pierre (LAMPEA - Aix-Marseille Université) jean-pierre.bracco@univ-amu.fr*

Studies on the Paleolithic quartz material have mainly concentrated for 30 years on technical analysis and reconstruction of "chaînes opératoires". This work now allow a technical understanding of quartz tools, often diffi-

cult to analyze. A new phase of research can now begin, to understand the reasons for the use of quartz during the Palaeolithic. Several recent studies suggest that the raw material availability is not sufficient to explain the use of this material. The resolution of this question is certainly in a comparative study of all mineral raw materials used for the manufacture of lithic technical equipment and the place of quartz within industries. Supported on current research, this paper will propose lines of research.

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ORAL

## 6. CONTEXTUALIZING QUARTZ RAW MATERIAL SELECTION AT ESPADANAL, PORTUGAL

*Paul Thacker (Department of Anthropology, Wake Forest University) thackep@wfu.edu*

Espadanal is a deep, stratified archaeological site located in a low terrace along a sand-bed tributary to the Rio Maior in central Portugal. The Early Upper Paleolithic assemblage from the site is comprised of more than 7,000 lithic artifacts. Consistent with the EUP of central Portugal, over 20% of debitage consists of blades or bladelets. Espadanal's assemblage is unusual for the UP of the Rio Maior area because of the combination of a very high percentage of chert blades (5%) and quartz bladelets (>10%).

Large blades and bladelets were manufactured from single platform prismatic chert cores, usually single platform convergent or opposed-lateral platform types. Chert bladelets were occasionally retouched but no backed bladelets, retouched points, or microgravettes are present. A very different and highly-developed quartz reduction strategy accompanied chert technological organization at Espadanal. Thin quartz bladelets and small flakes were removed from single platform, unidirectional bladelet cores. Many thick quartz "endscrapers" display parallel removals more typical of bladelet cores and probably should be considered as such.

Chert and quartz cortical flake frequencies are nearly equal and there is no evidence that either raw material was used more expediently or, conversely, intensively at Espadanal. The size variability of local quartz, quartzite, and chert cobbles was measured and contrasted with EUP debitage patterns. Results show a wide range of flake, blade, and bladelet sizes were manufactured on chert. However, the quartz assemblage is dominated by small flakes and bladelets. Quartz artifact size distributions are skewed to a substantially smaller range than



the possible debitage that could have been manufactured on local quartz cobbles. This finding contextualizes the complex prehistoric decision-making that occurred within both quartz and chert technological organization. Small quartz bladelets were 1) not equivalent to chert ones and 2) were not small because of quartz cobble size constraints. Small quartz bladelet dimensions were desired and cobbles were reduced using a distinctive technology to obtain them.

Assemblage analysis results from Espadanal challenge existing models of lithic raw material use. The EUP technological organization of chert and quartz are different and equally complex. Debitage of chert and quartz apparently were utilized for different functions and as blanks for fashioning different tool forms. These two radically-different chaînes opératoires are unrelated to on-site or provisioned raw material availability, a conclusion made possible by characterizing occurrence frequencies and size variability in local raw material cobbles.

Within lithic analysis more broadly, the interface of reduction strategies and raw material variability is frequently described using implicit or explicit concepts of supplementary or complementary technological behavior. At Espadanal, chert and quartz were both essential to the toolkit, and neither raw material can be considered expedient, supplemental, or equivalent to the other. Thus understanding stone tool technology at Espadanal requires consideration of the synergistic relationships between reduction strategies and procured raw material types.

The industry assemblages associated to prehistoric occupations from the interior regions of Western Iberia show a majority of quartz presence, traditionally interpreted as a raw material availability issue. Recent studies in Trás-os-Montes region, north of Douro river, can bring new light to the discussion since the sequence of human occupations spanning from the Upper Pleistocene to the Early Holocene show a range of reduction strategies associated to specific types of quartz, as is the case of Terraço Foz do Medal site.

With this presentation we intend to discuss the use of quartz, not only as a replacement for chert but also as a chosen raw material to achieve specific desired products.

Located in the Sabor valley, Douro Basin, Terraço da Foz do Medal is an open air site intensively occupied. With very few organic remains, stone tools provide the main target of the site's study. From its large Pleistocene and Holocene lithic assemblages, about two thirds are made using quartz. Contrary to chert, quartz is an abundant raw material in the Sabor valley and exists in various contexts and types. The many varieties of quartz with different knapping properties resulted in different approaches towards its reduction.

Until now we have been able to identify several quartz reduction strategies, like simple unidirectional methods as well as bipolar percussion using anvil technique for the production of a large quantity of flakes and small chips. We also found other strategies, traditionally more associated with chert, such as prismatic or carinated, and specific to quartz crystal morphology methods, used for the production of bladelets and small chips.

Quartz is the most represented raw material in every single layer of both Pleistocenic and Holocenic occupations of the Foz do Medal fluvial terrace. It seems clear that it has been in some circumstances a prime choice raw material. Its preponderant use cannot be justified only by its relatively large availability, but as deliberate selection towards the developing of more or less specific lithic reduction strategies.

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## ORAL

### **7. VARIABILITY AND SELECTION OF QUARTZ REDUCTION STRATEGIES FROM UPPER PLEISTOCENE TO EARLY HOLOCENE ASSEMBLAGES IN NORTH EAST PORTUGAL (SABOR VALLEY)**

*Ferreira, João (Baixo Sabor ACE) ritantunesgaspar@gmail.com*  
*Gaspar, Rita (Baixo Sabor ACE) ritantunesgaspar@gmail.com*  
*Silva, Maria João (Baixo Sabor ACE) ritantunesgaspar@gmail.com*  
*Molina, Francisco Javier (Baixo Sabor ACE) ritantunesgaspar@gmail.com*  
*Carrondo, Joana (Baixo Sabor ACE) ritantunesgaspar@gmail.com*  
*García-Vallido, Francisco (Baixo Sabor ACE) ritantunesgaspar@gmail.com*  
*Sutil, Patricia (Baixo Sabor ACE) ritantunesgaspar@gmail.com*  
*Gonzalez, Eva (Baixo Sabor ACE) ritantunesgaspar@gmail.com*

ORAL

**8. TREAD CAREFULLY: A QUARTZ AND CHERT HUMAN TRAMPLING EXPERIMENT AT THE COVA DEL PARCO ROCK SHELTER, SPAIN.**

*Driscoll, Killian (SERP, Universitat de Barcelona) killian-driscoll@gmail.com*

*Alcaina, Jonas (SERP, Universitat de Barcelona) killian-driscoll@gmail.com*

*Égüez, Natalia (SERP, Universitat de Barcelona) nataliaeguez@gmail.com*

*Mangado, Xavier (SERP, Universitat de Barcelona) mangado@ub.edu*

*Fullola, Josep Maria (SERP, Universitat de Barcelona) fullola@ub.edu*

Over the past 30 years researchers have approached the analysis of quartz stone tools from a number of perspectives, with an especial focus on experimental knapping to understand the fracture mechanics of quartz. However, there has been little attention on the effects of trampling on quartz assemblages and how such post-depositional processes may affect a given analysis of a lithic assemblage with quartz. In order to remedy this, a large scale human trampling experiment was carried out over two weeks in 2013 at the Upper Palaeolithic rock shelter at Cova del Parco in the Iberian Pre-Pyrenees. A total of 500 artefacts were selected for the trampling experiment, with slightly less than a quarter being chert artefacts which acted as a baseline to analyse the quartz. The results of the experiment have demonstrated the significant difference in the fracture patterns, and fracture rates, between quartz and chert, and suggest that post-depositional processes such as trampling need to be taken into account when analysing quartz stone tools.

ORAL

**9. QUARTZ IN CONTEXT: HOW FLINT USING GROUPS MOVING INTO SCANDINAVIA IN THE EARLY HOLOCENE ADAPTED TO QUARTZ**

*Knutsson, Helena (Stoneslab) stonesslab@gmail.se*

*Knutsson, Kjell (Uppsala University) kjell.knutsson@arkeologi.uu.se*

*Molin, Fredrik (National Bureau of Antiquities) fredrik.molin@raa.se*

*Zetterlund, Peter (National Bureau of Antiquities) peter.zetterlund@raa.se*

As the first hunter-gatherer societies settled in Scandi-

navia in the wake of the melting Weichselian ice some 11 000 yrs ago, they encountered a landscape that forced them to restructure their tool technologies considerably, from a developed blade technology to something less complex.

As it stands now, there seem to be a western and an eastern route into Scandinavia ultimately relating back to the Late Glacial Ahrensburg tradition in the west and Butovo/Veretye type material in the east during the Early Mesolithic. Both groups had developed their blade industries based on the presence of good flint. As they entered the new landscape devoid of flint, they had two options; to find alternatives to flint with similar characteristics or to change the technology to a more appropriate type to deal with the new materials encountered. Recent research has actually shown that both strategies were used by the pioneers.

In this paper we will focus on the result of our own research using use-wear and technological analysis to show in some detail how this adaptation to new circumstances may have taken place. Based on how quartz flakes were used in recent stone using societies and quartz flakes found in closed contexts (inserts in bone points and daggers from Scandinavia), we discuss and understand from a set of over 500 quartz flakes found on Mesolithic settlement sites in Sweden and Finland more generally how quartz may have been used.

It seems that quartz, the most common tool raw material in the region, albeit hard to control during knapping, was surprisingly easily integrated into the existing flint based tool systems.

A microwear analysis of a set of well contextualized quartz edged tools indicates that it was the edge qualities, not the knapping qualities that were important when tools with quartz edges were constructed.

ORAL

**10. THE USE OF QUARTZ AS RAW MATERIAL IN HUNTER-GATHERERS LITHIC ASSEMBLAGES: NECESSITY OR CHOICE?**

*Mansur, María Estela (CADIC-CONICET) estelamansur@gmail.com*

The study of lithic assemblages of hunter-gatherer societies constitutes one of the key tools to understand their technological organization and to propose hypotheses about aspects of the economic and social organization.

From this point of view, it is essential to try to understand the reason for the selection of specific raw materials for the manufacture of certain instruments. In order to approach this subject, we chose to address the analysis of the lithic assemblages from the perspective of the techno functional analysis, allowing to discuss three aspects closely interlinked: the selection of raw material, its transformation into consumer goods of mineral nature and the use of these tools to process various types of resources.

The lithic record of the southern sector of the southern cone is a great field to explore the relationships between these three aspects. Indeed, the archaeological sites of hunter-gatherer societies have provided extensive lithic series characterized by the diversity of raw materials represented in the assemblages, including quartzite, silicified tuffs, rhyolites, quartz, etc. The analysis has been developed on the basis of the techno morphologic characterization and the microscopic functional analysis.

A review of the representation of raw materials reveals that quartz is often represented. However, we noted that its representation is frequently a minority, but it is very common that it is present. It has also been observed that its use is related to the application of certain knapping techniques. Products made on quartz are different regarding the morphology of the edges, and they have frequently been used for specific tasks.

Therefore, their analysis allows us to discuss the interrelationship between raw material, technology, morphology and function.

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ORAL

## 11. QUARTZ AND SILCRETE RAW MATERIAL USE AND SELECTION IN LATE HOLOCENE ASSEMBLAGES FROM SEMI-ARID AUSTRALIA

*Holdaway, Simon (University of Auckland) sj.holdaway@auckland.ac.nz*

*Douglass, Matt (University of Nebraska) matt.j.douglass@gmail.com*

Both quartz and silcrete cobbles are abundant in the stony desert regions of western New South Wales, Australia and were used by Aboriginal people who occupied these regions from the mid to late Holocene. Archaeologists often characterise quartz as an inferior material for flaking when compared to silcrete yet Aboriginal people made intensive use of both materials. In this paper we

investigate the degree to which archaeologists can draw inferences about the choices people made in the past when considering different raw materials.

Different types of raw material were flaked more or less intensively but it is the utilization of the products of this flaking that allows inferences to be made about past intentions.

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ORAL

## 12. THE EFFECTS OF QUARTZ FLAKE FRAGMENTATION ON THE ORGANIZATION OF LITHIC TECHNOLOGY

*Manninen, Mikael A. (University of Helsinki) mikael.manninen@helsinki.fi*

*Tallavaara, Miikka (University of Helsinki) miikka.tallavaara@helsinki.fi*

*Hertell, Esa (University of Helsinki) ehertell@gmail.com*

*Rankama, Tuija (University of Helsinki) trankama@gmail.com*

In addition to being difficult to “read”, vein quartz is notorious for its tendency to easily break into pieces during lithic production and use. Therefore an understanding of quartz fracture mechanics and the properties of quartz in lithic production are essential for an understanding of prehistoric lithic technology in the quartz rich areas of the world. It has been shown that the high fragmentation tendency of vein quartz can be controlled to some degree by favourable technological choices.

Previously (Tallavaara *et al.* 2010, *JAS* 37:2442-8), we have suggested that due to its fragmentation proneness vein quartz should have been avoided by highly mobile groups when raw materials of better flakeability and controllability were available because of higher transportation costs and greater risk of raw material failure when using quartz. In this paper we present cases indicating that strategies that reduce quartz fragmentation in lithic production and use were indeed employed in prehistory and show that support for the expectation that less fragile raw materials were favoured by mobile hunter-gatherers in the most critical tasks can also be found. However, in some situations a trade-off between raw material availability and raw material quality seems to have led to the use of vein quartz even in highly mobile toolkits.

ORAL

### 13. ASSESSING THE EFFECTS OF ANISOTROPY ON THE KNAPPING OF AUTOMORPHIC QUARTZ

*Rodríguez-Rellán, Carlos (Universidad de Santiago de Compostela) carlos.rellan@usc.es*

Researchers have overcome their traditional disinterest on quartz lithic industries, as this session perfectly evidences. Still, most approaches are focused on the xenomorphic or vein quartz, while the automorphic variety of this raw material, known as rock crystal, has received less attention. Automorphic quartz shows several specificities during the knapping, caused not only by the morphology and size of the blanks –single crystals of prismatic habitus– but also by its anisotropic nature.

That scarcity of specific studies has resulted in a certain lack of knowledge about the general problems of the knapping of automorphic quartz. Due to its conchoidal fracture and homogeneity, it was initially considered to have a good quality, comparable to chalcedony or jasper. Thus, its knapping would be constrained only by the small size of the crystals, which –on the other hand– have a natural shape similar to a prismatic core. This view changed when researchers noted that the knapping of automorphic quartz was quite different from that on cryptocrystalline rocks, mainly due to its anisotropic nature that led to a remarkable variability in the ease of fracture depending on the direction it was worked. This was seen as a serious hinder and a reason for its allegedly anecdotic use in prehistoric times. In truth, the archaeological record shows that the industries made on ‘rock crystal’ are found worldwide, being even subjected to complex chaînes opératoires.

Therefore, a re-examination of the effects of anisotropy on the knapping of automorphic quartz seems appropriate, especially in order to see how this could have affected the characteristics of the archaeological assemblages recovered everywhere. An experimental protocol was designed in order to reconstruct the strategies of exploitation of this type of quartz and assessing the effects of its peculiar physical properties, showing how these are not an insurmountable obstacle for its knapping.

ORAL

### 14. IDENTIFICATION OF KNAPPING TECHNIQUES FOR MICRO-BLADE PRODUCTION APPLIED TO HYALINE QUARTZ DURING THE LATE NEOLITHIC IN NORTHERN GREECE (DIKILI TASH AND PROMACHONAS-TOPOLNI'A)

*Tardy, Nicolas (Archéorient 5133 CNRS) nicotardy@hotmail.com*

Two Late Neolithic sites, both situated in northern Greece, delivered small amounts of hyaline quartz products within a diversity of other lithic raw materials such as chalcedony, different types of flint and chert, vein quartz, jasper and obsidian. These hyaline quartz artefacts indicate a technology based on micro-blade production. The presence of these elements poses the question of the knapping techniques applied to this type of unusual raw material in prehistoric lithic industries.

The archaeological assemblage consists of a small amount of pieces, mostly represented by micro-blades and fragments of micro-blades. After a short summary concerning hyaline quartz's petrology as well as its mechanical properties, a technological analysis of the products gives information about the specific attributes of this micro-blade production. Then, the setting up of a knapping experiment, using various knapping techniques on hyaline quartz crystals allows identifying the knapping techniques used for the production of micro-blades.

This study demonstrates that, among the variety of tested knapping techniques, only a few modes of pressure flaking techniques are likely to produce micro-blades on this specific type of raw material. However, the technomorphological characteristics of some both archaeological and experimental products diverge markedly from the attributes that commonly characterize blade production made by pressure flaking on obsidian or flint. These divergences are mostly due to some mechanical properties of hyaline quartz, such as its anisotropic character.

The results of this analysis undertake a reflection on the problems associated with the identification of pressure knapping techniques on hyaline quartz, and in a more general way, on the variability of blade production made by pressure flaking techniques. On the other hand, the presence, amongst these archaeological assemblages, of some flakes, cores and technical pieces questioned the possibility of a “*in situ*” pressure debitage

in a regional and chronological context in which pressure blade products are generally considered as imported products, and exclusively found in consumer sites in the form of finished by-products (blades or tools made on blades).

ORAL

### 15. WEAR FEATURES ON QUARTZ, ROCK CRYSTAL AND QUARTZITE: A COMPARATIVE STUDY COMBINING OPTICAL LIGHT AND SCANNING ELECTRON MICROSCOPY

*Ollé Cañellas, Andreu (IPHES) aolle@iphes.cat*  
*Pederagnana, Antonella (IPHES) apederagnana@iphes.cat*  
*Martin, Sabine (Univ. Exeter) sajm201@exeter.ac.uk*  
*Fernández Marchena, Juan Luis (IPHES) juanl.ferna@gmail.com*  
*Borel, Antony (MNCN Paris) borel@mnhn.fr*  
*Aranda Sánchez, Victoria (IPHES) victoriaraandasanchez@gmail.com*

Quartz and in general most of non-flint rocks have not been very extensively studied from a functional point of view. Very frequently the definitions of micro-features connected with flint surfaces have been used to describe those encountered on non-flint tools. This circumstance has repeatedly posed serious methodological problems for evaluating the accuracy of functional results when analysing use-wear on quartz and quartzite implements. This is due to the intrinsic divergences in morphology and distribution of use-wear with regard to the different lithic raw materials.

A review of the experimental and archaeological literature dealing with this issue points out that efforts to systematize use-wear features on quartz have been done. Even so, there continues to be confusion and lack of standardization regarding terminology in this aspect.

We try to make progress in this research field by means of an extensive experimental program involving different raw materials, from the purest form of quartz found in nature (hyaline quartz and milky quartz) to rocks with a very high quartz content and extensively used for knapping throughout Prehistory (quartzites and quartzarenites). For data recording, we resorted to both Optical Light and Scanning Electron Microscopy.

The results obtained allowed to assess the different mechanical behaviour under the stress of a group of raw materials with the same chemical composition but very different in structure. Furthermore, we were able to assess the inefficiency of applying the methodology and

terminology developed for flint use-wear analysis to those rock types.

We finally propose an updated terminological selection of terms to be employed when documenting micro-wear on quartz, even recurring to external concepts coming from materials and geological sciences (e.g. tribology, quartz exoscopy...).

ORAL

### 16. IDENTIFICATION AND EVALUATION OF MECHANICAL WEAR TRACES ON QUARTZ ASSEMBLAGES: AN EXPERIMENTAL INVESTIGATION.

*Venditti, Flavia (University of Rome) flavia.venditti@gmail.com*  
*Tirillò, Jacopo (University of Rome) jacopo.tirillo@uniroma1.it*  
*Garcea, Elena*

The evaluation of the state of preservation of archaeological lithic artefacts is the first step before starting a functional analysis. If lithic artefacts show a variety of damage of many contact materials, they are also subject to modifications from "natural" causes, such as water transport, soil abrasion, trampling etc..(Levi Sala 1986, van Gijn 1980). Studying alteration features gives us information to reconstruct the life story of lithic tools after their abandon and helps us to better understand formation processes of archaeological sites. Prolonged movements under soil could be responsible for post depositional surface modifications that sometimes look like wear traces due to use. This alteration could have chemical and/or mechanical origin. Recognizing them is of paramount importance especially on quartz assemblages where use wear analysis requires a long and complex methodology that differs to a certain extent from the protocol applied to other manufactures produced with raw materials such as flint, obsidian etc...

For this reason, the use wear and post-depositional surface modification analysis on quartz and quartzite tools have been undertaken by very few researchers until now (De Araujo Igreja 2009, Conte & Gibaja Bao 2009, Eigeland 2009, Knutsson 1988). The aim of this poster is to increase the experimental field through the attempt to recreate mechanical contact between quartz flakes and sediment such as in archaeological contexts. Through the use of a Polishing Machine MECAPOL P320 equipped with two counter-rotating platens, it was possible to wear out two experimental flakes in a sandy quartzite sediment coming from island of Sai (Sudan) for about 240 hours.

After the experimentation, the two flakes showed no edge damage or other visible modifications, but some micro traces on the crystal surface were present. The micro traces definable as abrasions on some parts of the crystal surface, have been analysed by a metallographic microscope and compared with the same crystal portion of this latter taken before the experiment. Although and demanding, this step sharply reduces possible errors in the recognition during the experimental stage.

Even if it is difficult to reconstruct post depositional processes in a laboratory, this attempt shows that the contact between sediment and stone tools in a continuous movement can randomly abrade the crystal surface.

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#### ORAL

### **17. MICROSCOPIC ANALYSIS OF THE TECHNICAL AND FUNCTIONAL STIGMAS AS A METHOD FOR THE USE-WEAR ANALYSIS OF ROCK CRYSTAL TOOLS.**

*Fernández Marchena, Juan Luis (IPHES, Institut Català de Paleoeologia Humana i Evolució Social, Zona educacional 4 (Edifici W3), Campus Sescelades URV, 43007 Tarragona, Spain / Àrea de Prehistòria, Universitat Rovira i Virgili, Fac. de Lletres, Av. Catalunya 35, 43002 Tarragona, Spain) juanl.ferna@gmail.com*

Rock crystal is a quartz variety of very good quality and excellent aptitudes for knapping. Although it is a infrequent raw material, in certain geological contexts, as in our case study, it can assume a large part of the tooling. Despite this, it is a material very little researched. The reasons for this lack of interest may be various, from the difficulty of analyzing a translucent material to its direct attachment to the symbolic world.

Here we propose a methodology combining macro and microscopic analysis of knapping and use stigmas in order to establish a better approximation to the functionality of rock crystal artefacts. We integrally analyzed a series of experimental tools before use, with different microscopic equipment (low magnification microscopy, SEM and OLM with a Nomarski prism). After a first documentation, the tools were used in a sequential experimental program in order to observe the evolution of the use-wear. Fourteen experiments were done on different materials and with different actions, documenting the different traces of use with their respective orientations and sizes that appeared in each of the times recorded.

The set of experiments resulted in different associations of use-wear traces (striations, chipping, roundings and polish) characteristic of the various worked materials and actions employed. We have also documented the lancet as a stigma of a technical character, which can also provide functional information. This is due to the formation process of this stigma, either by percussion or pressure. While those formed from the impact point on the ventral side are distributed radially, those created into the chipped follow the kinematics of the tools.

Finally, we demonstrated that rock crystal is a material that offers many possibilities for use wear analysis. For this purpose, an analysis the association of a set of technical and functional stigmas is necessary. Furthermore, although the OLM with Nomarski prism is the best optical media to analyze rock crystal, the combination with other media can provide even more information.

# B6

## Beyond the stones: Inter-disciplinary approaches to interpreting Paleolithic Transitions

Organiser: Parth R. Chauhan and Marta Camps

Monday 1st (14:30 to 19:30)

Meeting Room: B24



2014 burgos  
1-7 sept.

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ORAL CONTRIBUTION

ORAL

**SCALES OF CHANGE. CASE STUDY OF A PHASE TRANSITION DURING THE WEICHSELIAN LATEGLACIAL IN NORTH-WEST EUROPE.**

*Grimm, Sonja B. (MONREPOS Archaeological Research Centre and Museum for Human Behavioural Evolution, RGZM) grimm@rgzm.de*

The Late Pleistocene is characterised by significant climatic and environmental changes in north-western Europe. The onset of the Weichselian Lateglacial Interstadial represented the most intense climatic shift since the Last Glacial Maximum. In the context of this important climatic change, the transition from the Upper Palaeolithic Late Magdalenian to the Final Palaeolithic established Azilian (Federmesser-Gruppen) occurred. Nevertheless, the role of the climatic change and the associated environmental developments in this transition remained uncertain. Moreover, defining a limit between the Late Magdalenian and the established Azilian continues to be difficult because the latter certainly arose from a substratum of the former. Thus, both traditions were considered as parts of a continuum. However, without identifying clear limits and dating those limits, questions relating to causal relations of significant change in human behaviour with a changing environment remain speculative. Therefore, these observations raised several questions: How to describe a continuous change? How to quantify change? Where to set a limit within a transition?

Based on the concept of archaeological taxonomic units (ATU, Foley / Lahr 1997), a hierarchy originally designed to study population history (Gamble et al. 2005) was refined and coupled with a high-resolution chronology to study changes in human behaviour. This hierarchical approach allowed changes to be observed at different levels of the archaeological record and also on different levels of human society.

This approach was used on the Weichselian Lateglacial record from North-West Europe. For this record, a high-resolution chronostratigraphy was created to make a reliable succession of behavioural changes and of climatic and environmental events possible.

In this example, changes at different levels of the archaeological record were recorded in a summed diagram according to their chronological appearance. Several smaller, some intermediate, and one larger leap in this

diagram can be observed. The hierarchical position of changes contributing to the large leap range from low, individual levels to very high, societal levels. Compared to the climatic and environmental record, this large leap is not concomitant with the most significant climatic shift but with a later, much smaller fluctuation which initiated a major environmental change.

In more detail, the transition from the Late Magdalenian to the established Azilian could be described as phase transition based on the above mentioned approach. Furthermore, a relation to changes in the surrounding environment were suggested which makes this process understandable as a part of an adaptive cycle in the Weichselian Lateglacial.

Nevertheless, uncertainties of this approach remain as a matter of discussion such as: Which steps should be registered? How should observations in the archaeological record be coupled with a hierarchy of behaviours to increase the observed impact of changes on the human society?

ORAL

**A BIOSOCIAL APPROACH TO UNDERSTANDING THE MODE 2/3 TRANSITION.**

*Barham, Lawrence (University of Liverpool) l.s.barham@liv.ac.uk*

The Mode 2 (Acheulean) to Mode 3 (Middle Palaeolithic/Middle Stone Age) transition took place in Africa and Europe in the latter part of the Middle Pleistocene. Archaeologists have focussed on when and where the transition took place with less attention given to how and why it happened. The Mode 3 Hypothesis (Lahr and Foley 2001) argues for a single African origin of prepared core technology and subsequent dispersal into south-west Asia and Europe. Others argue for a process of independent convergent technological change in Europe among populations of early Neanderthals (White and Ashton 2003; Moncel 2011). This paper avoids a primarily lithic based analysis of the transition and argues that it should be examined as a part of a longer-term process of social, cognitive and developmental evolution with deep roots in the genus *Homo* (Barham 2013). The biosocial perspective offered incorporates cultural transmission theory, life history data, and cognitive neuroscience and integrates these with a model of technological change rooted in complexity theory (Arthur 2009). A small set of 'integrative technologies' are identified in the Acheulean that serve as the social and cognitive pre-



cursors to the Mode 2/3 transition, where ever it takes place. These technologies, which include fire and the making of thinned bifaces, integrate knowledge of materials with differing properties and involve extended hierarchical planning and constructive memory (Ambrose 2010). Cooperative social groups are inferred to be a necessary context for the transmission of these technologies and invention of Mode 3 technologies (i.e., prepared cores and hafting).

The social, cognitive and technological precursors of Mode 3 were in place in parts of Africa, southwest Asia and Europe by ~ 400ka and the transition may have taken place independently in more than one region and with more than one species of hominin. The chronological resolution of the transition, however, is too poor - especially in Africa - to identify a place of origin and for now the question of origin cannot be answered. The biosocial perspective shifts our attention to the co-evolution of mind, body, society and technology. Stone tools by necessity remains a focal point of much of our research, but our analytical frameworks need to situate them in an expanded analytical framework if we are to understand the complex processes that underpin technological change.

ORAL

### **DOPAMINERGIC SYSTEMS EXPANSION AND THE ADVENT OF HOMO ERECTUS.**

*DeLouize, Alicia (University of Colorado, Denver) ALICIA.DAVIS@ucdenver.edu*

*Coolidge, Frederick (University of Colorado, Colorado Springs) fcoolidg@uccs.edu*

*Wynn, Thomas (University of Colorado, Colorado Springs) twynn@uccs.edu*

It is well accepted that a grade shift occurred in hominin evolution approximately 1.9 million years ago with the appearance of *Homo erectus*. With the challenges of complete terrestrial life, new cognitive abilities were selected for that allowed this species to thrive for the next million and a half years. It has also long been recognized that there was a change in diet with the advent of *Homo erectus*, that is, a greater reliance on meat. However, the relationship between additional meat and the cognitive abilities of *Homo erectus* has mostly remained unclear. The present paper proposes and presents extensive evidence that an increase in dietary meat protein and fats may have led to an increase in dopamine and dopaminergic systems, a critical chemical neurotransmitter in the brain. This purported change in dopaminergic sys-

tems may have played a key role in many of the traits and abilities exhibited by *Homo erectus* at that time, including increases in body and brain size, dispersion, and a greater aptitude for spatial and social cognitions.

ORAL

### **TEMPO AND MODE OF THE MP/EUP SHIFT IN MEDITERRANEAN EUROPE.**

*Longo, Laura (Musei Civici Fiorentini) longoflint@gmail.com*  
*Condemi, Silvana (UMR 7268 CNRS / Université de la Méditerranée/EFS) silvana.condemi@univ-amu.fr*

Until recently only Middle Paleolithic or Early Upper Paleolithic sites of northern and central Europe were brought into the discussion of the shift from Neanderthals to modern humans. The role played by Mediterranean Europe was weak and, due to the lack of articles dealing with southern Europe in English, the archaeological evidence on this topic was not readily available and was not cited in the leading scientific journals. Nonetheless, many southern European sites have been yielding consistent and reliable stratigraphic sequences, as well as human fossils associated with behavioral activities like the production of stone tools and intentional transformation of fauna and other "raw materials". PaleoDNA analysis, new protocols for reliable radiocarbon dating, and paleoenvironmental reconstructions of MIS 3 which are now also applied to the Mediterranean sites present a wholly different scenario concerning the role played by Mediterranean Europe in the demise of Neanderthals. It is necessary to obtain reliable chronological datasets and archaeological sequences for which the relation of both behavioural and environmental conditions can be proved. Investigation must also be carried out in reliable sites where human findings can be related to their activities. It is in other words essential to apply proxies considered to be fundamental for drawing further conclusions concerning acculturation or its absence. These proxies should be: (i) reliable conditions for distinguishing between feasible/probable/certain attribution of human remains to the cultural horizon with which they are associated; (ii) reliable species attribution of the human findings; (iii) AMS methodological extraction for radiocarbon dating; (iv) reliable sampling of humanly modified animal remains or charcoal; (v) in view of ascertaining the reliability of the relation established between human remains and their activities, the unquestionable association of the human remains with their cultural assemblages (Mousterian or EUP); last but not least, (vi) carrying out of radiocarbon dating on human genetically typified bone collagen. Radiocarbon dating

made from bone collagen is very important and, due to lack of human remains or of collagen on those that are found, it is often absent from the MP/EUP sites, and proxies (i) and (iv) cannot be applied to them. This is a crucial issue regarding future efforts to develop reliable protocols to enhance genetic and morphological analytical techniques. If we are to advance in our discussion of the role played by Neanderthals and modern humans in the evolutionary sequence, a consideration of the contemporary incidence of these proxies in a given site is of central importance. This paper presents the situation of the northern Mediterranean basin and focuses specifically on the Italian Peninsula and on its relationship with presently available data from western and eastern regions of Europe.

ORAL

### **SPIRITUAL LEAPS IN HUMAN EVOLUTION**

*Otte, Marcel (Université de Liège) marcel.otte@ulg.ac.be*

ORAL

### **COMPARING MOUSTERIAN AND PROTO-AURIGNACIAN USE OF SPACE AT RIPARO BOMBRINI: IMPLICATIONS FOR THE MIDDEL-UPPER PALEOLITHIC TRANSITION**

*Riel-Salvatore, Julien (University of Colorado Denver) julien.riel-salvatore@ucdenver.edu*

*Ludeke, Ingrid (University of Colorado Denver) iludeke800@gmail.com*

*Negrino, Fabio (Università di Genova) fabio.negrino@unige.it*

Aurignacian sites are often claimed to differ from Mousterian ones on the basis of their showing clear evidence for spatially discrete activity areas and, by extension, where various types of discarded archaeological remains cluster within them. On the other hand, with a few notable exceptions, Mousterian sites have been generally argued not to show clearly separated activity areas. Assessing the true significance of these differences is difficult, however, when site size, shape, and functions cannot be controlled for. This highlights the need to conduct spatial analyses at sites that contain levels accumulated by both modern humans and Neanderthals to directly compare their degree of intrasite organization. To this end, this study uses piece-plotted finds (lithics, bones, shells, ochre) to contrast hominin use of space in proto-Aurignacian and late Mousterian levels from Riparo Bombrini (Liguria, Italy), where only a few hun-

dred years separate the two types of occupations. To date, spatial analyses at the site have been largely impressionistic though recent efforts at quantification have shown suggestive evidence of distinct activity areas in the Mousterian levels. The present analysis employs unconstrained cluster analysis to explore the distribution of co-occurring sets of artifacts in both the Mousterian and proto-Aurignacian levels. This allows us to conclude that 1) both Neanderthal and modern human occupations varied in their spatial organization across levels attributed to a single industry; 2) in the proto-Aurignacian, lithic manufacture, shellworking, and butchering activities appear to have been concentrated in different areas when the site was occupied by logistically- vs. residentially-organized *Homo sapiens*, with level A2 showing strong evidence for systematic sweeping/debris removal; and 3) that the organization of activities in the Mousterian also vary as a function of site use modalities over time, reinforcing the idea that Neanderthals also purposefully segregated different tasks within the rockshelter. In contrast, to previous studies, this suggests that Neanderthals and modern humans did not have a qualitatively different way of organizing their use of Riparo Bombrini. The implications of these patterns for the process of the Middle-Upper Paleolithic Transition at the site (and NW Italy more broadly) are also discussed.

# B8 Hominid-bird interactions in Prehistory. The humankind and the avian world: archaeological evidence for inferring behavioural evolutionary signatures.

Organiser: Ruth Blasco and Marco Peresani

Thursday 4th (9:00 to 13:30)  
A24 Meeting Room



2014 burgos  
1-7 sept.

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ORAL CONTRIBUTIONS

ORAL

**1. BIRDS IN THE FIGURATIVE IMAGERY OF UPPER PALEOLITHIC POPULATIONS. EXPLORING THE RELATION BETWEEN ART, ZOOARCHAEOZOOLOGY AND ETHNOARCHAEOLOGY.**

*Cestari, Martina (University of Ferrara) martina.cestari@student.unife.it*

*Peresani, Marco (University of Ferrara) marco.peresani@unife.it*

The depictions of birds in the Paleolithic art are uncommon compared to the large repertory of big mammals and predators, but are attested in many Eurasian Paleolithic sites where avifaunal resources are often an integral part of the diet and the ornament of the hunter-gatherers groups. Many studies have tried to explain these representations for identifying species represented and their frequency in some contexts, but their investigations have been limited only to some countries. This contribution wants to present a synthesis of old and recent interpretations in a wider geographical area. For this purpose we have created a database taking data from the literature and directly from some collections of archaeological remains.

Data from as many as possible sites, levels, culture, chronology have been collected also taking into account the type of context: burial, cave art, residential site. The depictions have been classified according to the current taxonomic identifications and, when ambiguous or uncertain, we have tried to identify the figured birds at the order or family levels, in relation to the anatomical or the ethological features. The data have been statistically analyzed for establishing the frequency of the represented families. Subsequently, materials have been studied in relation to the species present in the faunal assemblages, with consideration of the geographical and chronological extensions of each techno-cultural area. Finally, the ethnoarchaeological record has been taken into account by identifying some ethnic groups of the subarctic regions, where the birds constitute part of the diet and of the artistic and ceremonial manifestations.

The compared reveals higher frequency of specific orders of Aves as Anseriformes, Gruiformes, Strigiformes and Passeriformes (Corvidae), compared to other: Galliformes, Charadriiformes and Accipitriformes that can be found only in a few contexts. The comparison with zooarchaeological remains have shown that only few

species are represented compared to those hunted, specifically stand out owls and aquatic birds frequently attested in Magdalenian sites in Western Europe, but also in Paleolithic sites of the Eurasian steppe.

Relations between environment, avian ethology, the species of birds depicted and hunted by the Late Paleolithic hunter-gatherers have been found. Implications are here proposed.

ORAL

**2. BIRD CONSUMPTION IN COVA NEGRA MOUSTE-RIAN SITE (XÀTIVA)**

*Martínez Valle, Rafael (Laboratorio de Arqueología y Paleontología. IVC+R. CulturArts Generalitat) martinez\_rafval@gva.es*

*Villaverde Bonilla, Valentín (Prehistory and Archeology Department. Universitat de Valencia) valentin.villaverde@uv.es*  
*Guillem Calatayud, Pere M. (Archeology and Paleontology Laboratory. IVC+R. CulturArts. Generalitat Valenciana) martinez\_rafval@gva.es*

Since the end of the XIX century there has been an ongoing debate about the hunting of birds during the Paleolithic, about the importance that it might have had as a source of food and for the use of feathers and bones for personal ornaments (Bouchud, 1953; Mourer Chauviré, 1975, Vilette 1983). There is still debate regarding the Middle Paleolithic, particularly concerning the study of the Neanderthals' capabilities (Blasco y Fernández, 2009; Finlayson et al, 2012).

The excavation campaigns carried out in Cova Negra between 1981 and 1991 have yielded a large number of bird remains. In the area known as the North Sector, which contains the most recent levels of the sequence (OIS 5e-d), 1,594 remains, from 42 taxa, have been recovered. Doves (*Columba livia/oenas*), choughs (*Pyrrhocorax pyrrhocorax* and *Pyrrhocorax graculus*), and partridges (*Alectoris rufa*) predominate (Martínez Valle, 1996).

The taphonomic study of these remains has shown that a substantial part of bone remains correspond to human contributions. In a significant part of these remains human marks of fracture can be found, such as disarticulation incisions and scraping for flesh removal, made with lithic implements. These marks are related to the processing of the piece and to teeth marks made by consumption.

This paper describes the remains that show evidence of human manipulation. The process of selection and consumption of birds in the site is reconstructed and results are contrasted to patterns observed in the treatment of bird bones in Paleolithic sites in the region.

ORAL

### 3. POTENTIAL EXPLOITATION OF AVIAN RESOURCES BY EARLY HUMANS.

*Negro, Juan José (Estación Biológica de Doñana (CSIC) negro@ebd.csic.es*

Human consumption of bird meat in modern societies comes in two ways: as embryos –i.e., eggs- and as hatched individuals, either young or adults. Compared to the available species, about 10,000 in the world, the number of avian species domesticated for their eggs or meat is however very reduced at a global scale (two galliforms -the chicken and the turkey-, a few waterfowl -geese and ducks-, and the pigeon. But even if birds provide today only a relatively small fraction of the animal proteins in human diets, the bird-human interface is possibly an ancient one and has remain important until today. Hundreds of species are kept as pets, a few others are used themselves as hunting or fishing weapons (the falconry birds, and the cormorants, respectively), and non-edible products, such as feathers or eggshells are used by traditional cultures in all continents as body ornaments, headdresses or jewelry.

Regarding early humans, it has been proposed that Neandertals decorated themselves with raptors and corvid feathers, with a preference for dark colours. It is also known that they consumed birds, including pigeons, according to cutmarks in bone remains. Even if birds may be perceived as elusive prey due to their flight capabilities, they are forced to incubate their eggs in a fixed position, the nest, where the nestlings grow until they reach full size. This makes eggs, nestlings and brooding adults easy prey. Even roosting birds are practically defenceless against stealth predators. And humans may become such when they learn to interpret cues left behind by a flock of birds. Birds share a common sensitive world with humans. Most birds are diurnal as we are, and they rely on visual and auditive cues for communication, that we may learn to interpret, or that we can even imitate.

ORAL

### 4. AN ATTEMPT TO CHARACTERIZE LITHIC USE-WEAR AND RESIDUES RELATED TO THE AVIFAUNAL RESOURCES EXPLOITATION

*Pedergrana, Antonella (IPHES) apedergrana@iphes.cat  
Blasco, Ruth (Gibraltar Museum) rblascolopez@gmail.com*

The proposed issue of the interaction between humans and the avifaunal species is here approached from the lithic studies perspective. Pilot experiments on the treatment of bird carcasses employing flint flakes were performed. The executed actions comprised skinning and de-feathering different avifaunal species (*Circaetus gallicus* and *Gyps fulvus*), connected with the migratory routes crossing the Gibraltar Strait.

The main aim of this experimental program was to document use-wear traits on flint implements related to the avifaunal carcasses management for then being able to recognize those actions in the archaeological record. An additional effort is done concerning the experimental organic residues associated with the bird species included in the experiments (skin, meat, feathers). For each residue type a detailed chemical and morphological characterization is provided, with the aim of creating an experimental database to be comparable with micro-residues possibly found on the archaeological stone tools.

For microscopic observations, we employed both Scanning Electron Microscopy (SEM) and Optical Light Microscopy (OLM). A detailed description of use-wear features and residue types is done through a systematic comparison of micrographs taken with both techniques. In addition, EDS (energy-dispersive x-ray spectroscopy) is applied to obtain elemental composition of residues.

Future developments of the research will improve the methodology by expanding the experimental program and through its further application to archaeological collections (at sites where the processing activity of this kind of animals has already been identified). Subsequently, the taphonomic analysis of the bones of the carcasses used in the experimental program will be added. In fact, it will be interesting to compare the cut marks distribution on bones with the use-wear pattern on the employed lithic implements.

Therewith, by crossing data coming from different disciplines, we hope to suggest an innovative point of view for better understanding the exploitation of the avifaunal resources by human groups throughout Prehistory.

ORAL

**5. AN ASSESSMENT OF THE EXPLOITATION OF BIRDS IN THE LATE MIDDLE PALAEOOLITHIC BASED ON NEW EVIDENCE FROM GROTTA DI FUMANE.**

*Romandini, Matteo (University of Ferrara) matteo.romandini@unife.it*

*Fiore, Ivana (Museo Nazionale Preistorico Etnografico L. Pigorini) iva\_fiore@yahoo.it*

*Gala, Monica (Museo Nazionale Preistorico Etnografico L. Pigorini) monarix@yahoo.it*

*Tagliacozzo, Antonio (Museo Nazionale Preistorico Etnografico L. Pigorini) antonio.tagliacozzo@beniculturali.it*

*Cocca, Enzo (University of Ferrara) enzo.cocca@unife.it*

*Peresani, Marco (University of Ferrara) marco.peresani@unife.it*

In the debate on the Neanderthal behavior and its dietary habit, a role is played by the taphonomy of avifaunal complexes. However, data suggesting deliberate exploitation of this resource are still sparse across western Eurasia. To reinforce this scenario, new data have been recently achieved at Grotta di Fumane, a site in the North of Italy known for producing important material for the study of Neanderthal behavior, especially during the latest Levallois Mousterian complex A5-A6 (Peresani et al. 2011). To confirm the deliberate extraction of remixed feathers from large raptors and, at the same time, to enlarge the body of evidence, the bird bone assemblage of the Mousterian unit A9 is here presented.

A taxonomic determination of over 500 bird bones has been based on comparison with the zoological collection of the Quaternary Palaeontology and Archaeozoology Section of the Pigorini National Ethnographic Museum. Microscopic analyses of the bone surfaces have been carried out using Nikon 1000 (Rome) and Leica S6D Green Ough (L.A.T. of Ferrara) stereomicroscopes (20-220X). Experimental butcherings on large raptors have been conducted for a better understanding of the striae formation on the bones and the gestures performed. The spatial distribution of the bones has also been taken into account, integrated by statistics, database and GIS.

Over 29 species have been identified. Mostly are Passeriformes, mainly Corvids, with numerous Gruiformes and Galliformes. Diurnal and nocturnal raptors are also present. Species from mountain cleared and forested environments dominate the assemblage and, in comparison to unit A6-A5, unit A9 records less harsh climatic signatures. Taphonomical traces show anthropic modifications like cut-marks and fractures ascribable to the frag-

mentation of bone when fresh. These traces have been observed of species of different size and positioned on various anatomical zones, suggesting that the carcass was exploited according to a well experienced process. The spatial distribution of the bones, when related to the taphonomical traces, hearths and other structures reveals that the bird exploitation in the cave was planned in a different way than the ungulate fauna was.

Besides backdating the acquisition of valuable elements of avian plumage in human history, this and other new evidence from the final Mousterian levels increases the variability in exploitation of different species of birds, so strengthening our view of behavioral complexity among Neanderthals.

ORAL

**6. PIGEONS AND CHOUGHES, A USUAL RECOURSE FOR THE NEANDERTHALS IN GIBRALTAR.**

*Rosell, Jordi (Universitat Rovira i Virgili (URV)-IPHES, Institut Català de Paleoecologia Humana i Evolució Social) jordi.rosell@urv.cat*

*Blasco, Ruth (Gibraltar Museum) rblascolopez@gmail.com*  
*Sánchez Marco, Antonio (Institut Català de Paleontologia) antonio.sanchez@icp.cat*

*Finlayson, Stewart (Gibraltar Museum) stewart.finlayson@gibmuseum.gi*

*Finlayson, Geraldine (Gibraltar Museum) geraldine.finlayson@gibmuseum.gi*

*Negro, Juan José (Estación Biológica de Doñana (CSIC) negro@ebd.csic.es*

*Giles Pacheco, Francisco (Gibraltar Museum) pacogiles@hotmail.es*

*Rodríguez-Vidal, Joaquín (Universidad de Huelva) jrvidal@dgeo.uhu.es*

*Finlayson, Clive (Gibraltar Museum) clive.finlayson@gibmuseum.gi*

Pigeons (*Columba*) are species of rocky habitats, nesting typically on cliff ledges and at the entrance to large caves. Corvids are forest birds, and a few colonial species, such as choughs (*Pyrrhocorax*), can also breed in rocky outcrops or cliffs; nevertheless, choughs do not seem capable of reaching the high population densities of doves. At Gorham's Cave, Gibraltar, the Neanderthals exploited pigeons and choughs for a period of more than 40 kya, with the earliest evidence dating to at least 67 kya. We show that the exploitation was not occasional, having found repeated evidence of the practice in different layers within the cave. The Gibraltar sites seem to

provide the ideal conditions to broaden the spectrum of prey during MIS 3. The high diversity of avian species identified in the faunal assemblages could be related to the location of the caves, which enable exploiting coastal and rocky habitats. This fact seems to argue for the unique circumstances and foraging opportunities at this particular locality, where the available prey and environmental conditions seem to be conditioned to the Neanderthal diet.

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ORAL

### **7. WHO IS BRINGING BIRDS? AN APPROACH FROM THE MIDDLE AND EARLY LATE PLEISTOCENE ACCUMULATIONS FROM PAYRE AND ABRI DES PÊCHEURS (ARDÈCHE, FRANCE)**

*Rufà, Anna (Institut Català de Paleoecologia Humana i Evolució Social (IPHES) - Àrea de Prehistòria, Universitat Rovira i Virgili (URV) arufa@iphes.cat*

*Blasco, Ruth (The Gibraltar Museum) rblascolopez@gmail.com*

*Moncel, Marie-Hélène (Département de Préhistoire, Muséum National d'Histoire Naturelle - Institut de Paléontologie Humaine) moncel@mnhn.fr*

*Thierry, Roger (Laboratoire de Préhistoire du Lazaret) trogier@lazaret.unice.fr*

The acquisition of quick-flying small prey has been a wide discussed topic during last decades, especially since the emergence of archaeological bird collections more ancient than expected with evidence of anthropic processing. The acquisition and processing of birds is different from those done on larger fauna. For its small size, it may be difficult to find human activity on bird bones in form of cut-marks, since they could be eaten directly without using tools. This added to the fact that bird specimens might be also deposited in archaeological contexts by natural causes and/or by other biological agents (such as raptors or mammal carnivores) makes their association with human consumption difficult.

In the archaeological site of Payre (end MIS 8/beginning MIS 7 to end MIS 6/beginning MIS 5), human activity on birds has been suggested thorough the residue analysis made on stone tools from the site but, up to now, further analysis have not been carried out on avian remains from the site. In the same way, no detailed taphonomic data from bird bones has been obtained from the near site called Abri des Pêcheurs (MIS 5-3). These data could be interesting to have a global point of view from the Ardèche region, in relation with the Neanderthal subsist-

ence. For this reasons, the main objectives of this work are: (1) to demonstrate whether birds are consumed or not by hominids in these archaeological sites; (2) to establish subsistence patterns, in case human consumption of birds exist. If it is not, it will be important to (3) detect the taphonomical agents which could intervene on the remains, to find the origin of the accumulations. Payre and Abri des Pêcheurs correspond to the Middle Palaeolithic period. Payre is divided in 8 archaeological levels, in turn divided in sub-levels. Bird remains come from levels A, D, F and G. On the other hand, Abri des Pêcheurs is composed by 4 archaeological levels (from Sector 1 to 4). In both sites, human activity was demonstrated on large and medium fauna.

To achieve the goals established above, bird bones from both sites were analysed on the framework of the Taphonomy methodology. Bone representation, fragmentation, tooth-marks, corrosions and other taphonomical processes were considered.

As a result of this analysis, a wide variety of avian species from different families were identified. Despite of that, human activity does not seem to be present on any of them. The presence of carnivore tooth-marks, beak-marks and digestions pointed out carnivores (nocturnal raptors and small mammal carnivores) as possible accumulator agents. Initially, it can run into contradiction with stone tool residue results, but it should be taken as new data which complements the previously proposed. In summary, bird bones analysis pointed out carnivores as the main accumulator agents in both sites. Even so, it could be used as an example of Neanderthal adaptation in front of different ecological circumstances.

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ORAL

### **8. EATING CROW OR A FEATHER IN ONE'S CAP: THE AVIFAUNA FROM THE MAGDALENIAN SITES OF GÖNNERSDORF AND ANDERNACH (GERMANY).**

*Street, Martin (MONREPOS Archaeological Research Centre and Museum for Human Behavioural Evolution, RGZM) street@rgzm.de*

*Turner, Elaine (MONREPOS Archaeological Research Centre and Museum for Human Behavioural Evolution, RGZM) turner@rgzm.de*

The Central Rhineland Magdalenian sites Gönnersdorf and Andernach produced an extremely rich corpus of diverse archaeological finds, including some 14,500 faunal remains at Gönnersdorf and some 4000 at Andernach.

Faunal studies have focussed on the large game, mainly horse, however favourable conditions of preservation at both sites provide an opportunity to examine not only smaller mammal taxa, but also for detailed analyses of the avifauna. Here we present results of these analyses with particular emphasis on the economical and social role of birds in Magdalenian life.

Standard zooarchaeological methods were used to establish NISP and MNI and to identify presence of butchery traces on avian bones. By applying a holistic approach we were able to attribute remains with details of individual stages of carcass processing of birds to a specific location within site area, providing a combination of information relevant to settlement organisation and site formation.

Bird bones at Gönnersdorf are from large to medium-sized species, the majority of them ptarmigan / willow grouse and raven, but also swan, snowy owl, goose and gull. Here, some of the most complete late Upper Palaeolithic settlement structures in western central Europe are interpreted as four distinct dwellings, with birds recovered from three of these (K I - K III). The smaller assemblage of bird bones from Andernach is identified to ptarmigan / willow grouse, raven and goose. Post-settlement disturbance leads to a less clear picture here.

Selection for wing elements of swan and goose suggests these large birds may have been primarily of interest in terms of their pinion feathers or wing bones. In contrast the skeletal representation of ptarmigan or willow grouse suggests that complete carcasses were brought to the site for processing / consumption. Cut marks on raven phalanges probably result from the detachment of the feet and claws. A complete praemaxilla and dentary of a raven from a pit in Gönnersdorf K II represent a complete head. Its location, together with the overall representation of raven bone, perhaps suggest non-utilitarian motives for the presence of entire feathered skins of ravens within Gönnersdorf dwelling structures.

In view of the large numbers of horse hunted at both sites, the relatively small number of bird remains show that they did not play major role as a food resource. Other uses for body parts such as feathers and claws must be considered.

Combining zooarchaeological analysis with spatial data provides insights into Magdalenian economic and social organisation practically down to a household level. Ravens have played a major role in the spiritual life of many northern peoples and an engraving from Gönnersdorf

shows that their character and probably their significance were clearly appreciated by the artist. Insight into Magdalenian perception of birds is also provided by an inspired carving of a bird from Andernach.

ORAL

## 9. BIRD REMAINS FROM DOLNÍ VESTONICE I AND PEDMOSTI (PAVLOVIAN, CZECH REPUBLIC).

*Wertz, Krzysztof (Institute of Systematics and Evolution of Animals, Polish Academy of Sciences, Slawkowska 17, 31-016 Kraków, Poland) wertz@isez.pan.krakow.pl*

*Wilczynski, Jaroslaw (Institute of Systematics and Evolution of Animals, Polish Academy of Sciences, Slawkowska 17, 31-016 Kraków, Poland) wilczynski@isez.pan.krakow.pl*

*Tomek, Teresa (Institute of Systematics and Evolution of Animals, Polish Academy of Sciences, Slawkowska 17, 31-016 Kraków, Poland) tomek@isez.pan.krakow.pl*

*Roblickova, Martina (Anthropos Institute, Moravian Museum, Zelný trh 6, 659 37 Brno, Czech Republic) mroblickova@mzm.cz*

*Oliva, Martin (Anthropos Institute, Moravian Museum, Zelný trh 6, 659 37 Brno, Czech Republic) moliva@mzm.cz*

Dolní Vestonice I and Pedmosti are one of the largest and best known Pavlovian sites known from Moravia (Czech Republic). They have yielded extraordinary assemblages of osseous and lithic artefacts, as well as animal remains, subsequently addressed in innumerable publications. The presentation briefly summarizes the results of the analysis of bird bone remains from Dolní Vestonice I and Pedmosti. Analysis of features such as species composition, representation of anatomical remains, and fragmentation of bones, confirms that rather than being natural these accumulations took form as a result of human activity. The observable domination of the remains of Raven (*Corvus corax*), which is confirmed also in other Gravettian sites in Moravia, may be a feature distinctive for the Pavlovian culture/Gravettian of Moravia.

POSTER

POSTER

## 10. HUMAN CONSUMPTION OF BIRDS AT BOLOMOR CAVE (VALENCIA, SPAIN, MIS 9-5)

*Blasco, Ruth (Gibraltar Museum) rblascolopez@gmail.com*  
*Fernández Peris, Josep (SIP (Servei d'Investigació Prehistòrica), Museo de Prehistòria) josep.fernandez@bolomor.com*



The diversification of subsistence in pre-Upper Palaeolithic periods has developed over the past 40 years, and is one of the main topics of discussion in Europe. Environmental and socio-cultural aspects invite us to reflect on the characteristics that delimit the meat diet and the correct assessment of this in relation to human behaviour and the availability of prey. The ecological context in which sites are located and the environmental characteristics of the period in which human occupations occur must be considered to correctly assess how diet has evolved throughout time. This proposal leads to the suggestion that more than one diet could exist because it could vary according to the locally available resources as well as socio-cultural variables. Bird predation was practised since at least the Early Middle Pleistocene and seems to be directed towards edible species, with clear evidence of consumption in Mediterranean Europe in the Bolomor Cave layers. Bolomor Cave, dated between 350 and 100 kya, emerges as some of the clearest and earliest evidence of hominin use of birds. Here, we present a general taphonomical view of bird assemblages from Bolomor through its stratigraphic sequence by presenting a bird record from sublevels XVlla and XVllc (lower sequence, MIS 9), levels XII and XI (middle sequence, MIS 6) and level IV (upper sequence, MIS 5e). Bolomor is an example of how the subsistence strategies across the Middle and early Late Pleistocene may display significant variability based on local environmental adaptation, occupational pattern—mobility and site functionality—as well as other possible socio-cultural factors.

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POSTER

**11. FLUTE OF ISTURITZ? EXPERIMENTAL REPRODUCTION AND ARCHAEMUSICOLOGICAL ANALYSIS.**

*García Benito, Carlos (University of Zaragoza) cgb@unizar.es*  
*Mazo Pérez, Carlos (University of Zaragoza) cmazo@unizar.es*  
*Alcolea Gracia, Marta (University of Zaragoza) malcolea@unizar.es*

The prehistoric archaeological remains interpreted as flutes of Cave of Isturitz, are they really this particular type of wind instrument?

Through the research that being carried out on the experimental reproduction of the only complete aerophone of Isturitz -1914 F3a 75252/A3-Ist. III 83 888 1939-, made using replicas of prehistoric flint tools (blades, chisels and drills) in a bone of griffon vulture (*Gyps fulvus*), this study suggests that this object can be up to

three different kind of aerophone: end-blow instrument (*ney flute*), reed instrument (*clarinet*) or reep lip instrument (*brass*).

In this sense, it will mostrate the first results of this archaeomusicological analysis demonstrating this sound and musical ability, along with all previous research that has allowed us to know what is the manufacturing process.

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POSTER

**12. BIRD-BONES MODIFICATIONS CONDUCTED BY IBERIAN LYNX: TAPHONOMIC ANALYSIS OF NON-INGESTED RED PARTRIDGE REMAINS**

*Rodríguez-Hidalgo, Antonio (IPHES) ajrh78@gmail.com*  
*Saladié Balleste, Palmira (IPHES) palmira.saba@gmail.com*  
*Marín Hernando, Juan (EPPEX) juan.marin.hernando@gmail.com*  
*Canals Salomó, Antoni (IPHES) acanals@iphes.cat*

Bird-bones accumulations may be due to multiple origins. Understanding the taphonomic signal of different bone accumulators (agent and processes) is important to establish whether or not anthropogenic origin of birds in the fossil assemblages. The Iberian lynx (*Lynx pardinus*) must be a significant taphonomic agent in Iberian ecosystems. Their diet is based mostly on rabbits complemented mainly with birds of the family of Phasianidae, Anatidae and Corvidae.

Here we present the results of a taphonomic research conducted to assess the modifications produced by this predator on non ingested red partridge (*Alectoris rufa*) remains after the meal. Through the anatomical representation, breakage pattern and bone surface modifications we were able to establish the main characteristics of the taphocoenosis of Iberian lynx regarding to one of its complementary preys.

The entire skeletons show very low survival, mainly leaving offal entrails and feathers, which can hardly be preserved in the archaeological fossil record. Anatomically there is greater survival of thorax (especially synsacrum and adjoining ribs), and distal areas of the upper and lower limbs. The breakage is low and presents a lot of whole elements although none of the major long bones has preserved complete. The bones in the meaty portions (wings/humerus, drumstick/femur and tibia, and breast/sternum), appear very fragmented. The tooth marks are rare and occur mainly in the form of notches in

fracture edges. It has been documented midshaft bone cylinders.

This pattern can be used for archaeological purposes.

# B9 Staring at the ground: archaeological surveys as a research tool in the early 21st century

Organiser: Marta Navazo Ruiz, Jesús F. Jordá Pardo and Alfredo Maximiano Castillejo.

Friday 5th (9:00 to 13:30)  
B02 Meeting Room



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XVII World UISPP Congress  
XVIIe Congrès Mondial de l'UISPP  
XVII Congreso Mundial de UISPP

ORAL CONTRIBUTIONS

ORAL

## 1. ARCHAEOLOGICAL FIELD SURVEY GOES INTERDISCIPLINARY!

*van Leusen, Martijn (Groningen Institute of Archaeology)  
p.m.van.leusen@rug.nl*  
*de Neef, Wieke (Groningen Institute of Archaeology) w.de.neef@rug.nl*

The organizers of this session propose that archaeological field survey has come of age as a research method and that it is now time to bring the seeming multiplicity of approaches and terminology into a single, internally consistent and comparable, framework. We support this proposal and will present recent experiments conducted in central and southern Italy that probe the meaning of commonly used surveying concepts, such as that of the 'transect sample' and the 'visibility correction factor'. We will argue that archaeological survey in the 21st century must, at a minimum, become geoarchaeological survey - that is, all surface surveys must be accompanied by studies of the geological and anthropogenic processes that 'produce' the surface archaeological record.

ORAL

## 2. GEOARCHAEOLOGY AND ARCHAEOLOGICAL FIELD SURVEY.

*Burillo-Mozota, Francisco (Universidad de Zaragoza)  
faburillo@gmail.com*  
*Peña-Monné, José Luis (Universidad de Zaragoza) jlpena@unizar.es*  
*Pérez-Lambán, Fernando (Universidad de Zaragoza)  
fperezlamban@gmail.com*  
*Picazo-Millán, Jesús V. (Universidad de Zaragoza) jpicazo@unizar.es*

The end of the 20th and the beginning of the 21st centuries are characterized by the development of New Information Technologies applied to survey data. A bad use of these NIT has led to a neo-positivism in which the power of computers and apparent splendor of their results have fulfilled with self-confidence to some young researchers. In some cases, a Doctoral Thesis has been fully based in data provided by regional archaeological databases without field contrast and verification, relying on the assumed "objectivity" of the data contained in these databases.

Against this tendency we must continue to defend the need to push forward the archaeological survey and analysis strategies. For more than 30 years, our research group applies geoarchaeological methods in the fieldwork, with an increasing concern of the importance of the great alterations suffered by the physical environment and, consequently, the archaeological evidences.

In semiarid environments, as it is the Mediterranean, erosive and sedimentary processes cause large landscape transformations, even in the recent stages of the Holocene. Consequently, most archaeological sites are seriously affected by erosion and deposition of sediments. Therefore, it is necessary to develop a methodology focused in the detection and interpretation of these landscape alterations, which span in a range that goes from complete erosive destruction to disappearance under several meters of sediments.

In this work we present several cases of geoarchaeological analysis from the Ebro Valley and Iberian Ranges (NE Spain). The experience of these studies is condensed in a methodological proposal for the reconstruction of the archaeological evidence and paleo-environmental processes. In this way, it is possible to give a better reliability to the data before it is included in databases or analyzed with NIT.

ORAL

## 3. ARCHAEOLOGICAL SURVEY NOWADAYS: PROJECTS, METHODS AND RESULTS. A CASE OF SIERRA DE ATAPUERCA (BURGOS, SPAIN).

*Navazo Ruiz, Marta (Universidad de Burgos) mnnavazo@ubu.es*  
*Carbonell, Eudald (IPHES) eudald.carbonell@urv.net*  
*Alonso, Rodrigo (MEH) ralonso@museoevolucionhumana.com*  
*Benito, Alfonso (CENIEH) alfonso.benito@cenieh.es*  
*Jordá Pardo, Jesús F. (UNED) jjorda@geo.uned.es*

As we all know, archaeological surveys have progressed from a secondary discipline to a solid, consistent working method that is evolving in step with the goals of prehistoric research. Almost 60 years have passed since New Archaeology began to point out the importance of archaeological surveys for the study of prehistoric settlement patterns, and many meetings and communications have discussed this issue. Now, it is not only

individual sites that matter. In order to understand the lives of human groups, we know we also have to study their interactions with other sites and the environment in which they operated, i.e., their territory. In this context, we began a survey aimed at documenting all the prehistoric settlements in Sierra de Atapuerca and its environs that had been preserved.

A full-cover, high intensity archaeological survey was conducted in a 314 km<sup>2</sup> area (Navazo 2006). The study area was defined by a 10 km radius circle centred on one of the excavated caves in Sierra de Atapuerca, *Cueva Mayor*. A total of eight surveys were conducted over a 5 year period, structured on the basis of the natural areas in the zone defined with geoarchaeological methodology (Navazo et al. 2005).

In all, 181 archaeological sites were located. For the purposes of the in-depth study, we distinguished the 31 Middle Paleolithic sites (Navazo et al. 2011; Navazo and Carbonell, i.p). These sites were studied from different perspectives, focusing on raw materials (Navazo et al., 2008), lithic industry, stratigraphy, geoarchaeology, etc. The results are presented in this communication in order to discuss two issues that remain outstanding after such a large-scale survey: 1. There seem to be as many surveys as research projects, and indeed as many methodologies as there are surveyed natural areas. From the experience of our work, we wish to defend/support the unification of methodologies.

2. Lack of a global vocabulary. Terms such as records, landscape, site, location, etc., mean different things to different authors and studies.

Additionally, in order to discuss the feasibility of one method or another, we will design different survey methods for our study area to assess the suitability of each one with a view to ascertaining the settlement patterns of prehistoric groups.

The issues that we share in this communication haunt us from our own experience. We will explain our research goals, methodology and results as an introduction to the discussion of the two proposed issues.

ORAL

#### 4. EXPLORING PREHISTORIC SETTLEMENT IN THE EASTERN PRE-PYRENEES (LLEIDA, IBERIA): A MULTIDISCIPLINARY APPROACH.

*Roy Sunyer, Miquel (CEPAP-UAB) miquel.roy@uab.cat*  
*Pizarro Barberá, Jezabel (CEPAP-AUB) jezabelpb@hotmail.com*  
*Plasencia Figuera, Javier (CEPAP-AUB) fcojavier.plasencia@e-campus.uab.cat*  
*Mora Torcal, Rafael (CEPAP-UAB) rafael.mora@uab.cat*  
*Martínez-Moreno, Jorge (CEPAP-UAB) jorge.martinez@uab.cat*

We present the survey project "Settlement of transversal valleys between Serra Llarga and Serra de Montclús (Noguera)". This project is carried out by the Centre for the Studies of Prehistoric Archaeological Heritage (CEPAP-UAB) since 2007. Its main objective is to dig deeper in the knowledge of the prehistoric settlement of a geographical sector located in the region of La Noguera (Eastern Pre-pyrenees, Iberia) from a multidisciplinary point of view: the discovery of new archaeological findings and the location of raw material sources.

The archaeological potential of this geographic sector has been historically ignored, although several examples revealed an exceptional richness in this aspect. After eight survey seasons (2007-2014), new findings enrich the prehistoric conception of this region. The use of current data recovery field techniques (GPS, SIG) has led to a systematic and consistent work.

The contribution of new data is considerable: new archaeological sites, surface materials and prehistoric engravings have been documented. These findings increase the prehistoric interest of this region from older (Middle Palaeolithic) to modern chronologies (recent Prehistory). On the other hand, the study of raw materials sources has been carried out in two directions: location of primary geological outcrops and the study of "secondary deposits". To date, multiple new outcrops and rock types that were potentially exploitable have been documented.

Current data suggests a repeated occupation of shelters and caves through side valleys of the two major rivers (Noguera Ribagorçana and Noguera Pallaresa – Segre) and the use of these valleys as secondary circulation routes.

POSTER

POSTER

#### 5. BACK TO THE ASTURIAN DWELLING AREAS: NEW DATA FROM EL ALLORU (NORTHERN SPAIN).

*Arias, Pablo (Universidad de Cantabria) pablo.arias@unican.es*

*Cubas, Miriam (Universidad de Cantabria) miriam.cubas@hotmail.com*

*Fano, Miguel Ángel (Universidad de la Rioja) miguel-angel.fano@unirioja.es*

*Álvarez Fernández, Esteban (Universidad de Salamanca) estebanalf@hotmai.com*

*Araújo, Ana Cristina (Direção Geral do Património Cultural) acaraujo@dGPC.pt*

*Cueto, Marián (Universitat Autònoma de Barcelona) mariancueto@gmail.com*

*Fernández Sánchez, Patricia (Universidad de Cantabria) patriciaes@yahoo.es*

*Iriarte, Eneko (Universidad de Burgos) eiriarte@ubu.es*

*López-Dóriga, Inés L. lopezli@unican.es*

*Núñez, Sara (Universidad de Valencia) sara.n.delafuente@gmail.com*

*Salzmann, Christoph (Ruprecht-Karls-Universität Heidelberg) c-salzmann@web.de*

*Duarte Simões, Carlos - (Universidad de Cantabria) carlosduarte.simoes@unican.es*

*Teichner, Felix (Philipps-Universität Marburg) teichner@staff.uni-marburg.de*

*Teira, Luis C. (Universidad de Cantabria) luis.teira@unican.es*

Since the very beginning of the twentieth century, several generations of archaeologists have investigated about one of the most characteristic manifestations of the Mesolithic of Atlantic Europe, the *Asturian*. Yet the available information for this archaeological entity is clearly biased, as the research has focused on shell midden deposits in the mouth of caves and rock shelters, in most cases providing scarce, if any, evidence that suggest that they may be considered living places. Thus, one of the most relevant issues that are currently opened to discussion is the location of the main settlement areas corresponding to the *Asturian*. The hypothesis has been posed that those hunter-gatherers groups might have been mainly established in open-air camps close to the caves where the shell middens have been preserved. However, so far, no systematic attempt has been made to test it. This paper exposes some preliminary results of a programme of research aiming to solve that problem.

In 2013 a systematic geophysical survey of the surrounding of a group of selected *Asturian* sites was started, looking for Mesolithic remains in the open air. They were chosen attending to both Geomorphological and Archaeological criteria, attempting to define the places with the highest probabilities of preserving Mesolithic sites. One of the areas that were chosen was close to the cave site of El Alloru, right in the core area

of the *Asturian*, in Llanes (northern Spain). A surface of 1670 m<sup>2</sup> was surveyed using magnetic gradiometry methods. That permitted the location of some anomalies that were judged to be potentially related to prehistoric human activity. Four test pits were opened to validate that hypothesis.

Both geological and archaeological features were found in the test pits, confirming the hypothetical interpretations of the survey. The Mesolithic open air site includes a high density of Holocene marine molluscs and *Asturian* picks. Unlike the typical *Asturian* ensembles, evidence of knapping and other kinds of artefacts, such as bone and antler tools, and pendants were recovered. Besides two small pits possibly corresponding to postholes were identified. It appears to be the first *Asturian* dwelling structure discovered.

The hypothesis that the shell middens could be linked to nearby areas where the greater part of everyday activities were performed has found confirmation through the combined use of geophysical surveying and archaeological excavations.

ORAL

ORAL

## 6. ARCHAEOLOGICAL SURVEY AFTER FOREST FIRES: THE EXAMPLE OF THE NATIONAL PARK OF GARAJONAY 2012 (LA GOMERA, CANARY ISLANDS, SPAIN).

*Hernández-Marrero, Juan Carlos (Museo Arqueológico de La Gomera (Cabildo Insular) museoarqueologico@lagomera.es*

*Rodríguez-Mendoza, Mario (Museo Arqueológico de La Gomera (Cabildo Insular) mariocgb@hotmail.com*

La Gomera is the second smallest island within the Canary Archipelago. It has a surface area of 369.76 kms<sup>2</sup> with the highest point at El Alto del Garajonay (1,487 metres). The island has a very steep topography and its central area is relatively flat and is occupied by a thick forest that was declared, as of 1981, the National Park of Garajonay (3,986 hectares).

In 2012, there was a violent forest fire in the South-center of the island that destroyed 3,617 hectares (almost 10% of the total island). From then till the present year, there have been an archaeological survey project within the limits of the National Park (741 hectares), besides visits to

the known archaeological sites to see what impact the first fire heat has had upon the same.

The conditions observed in the latest campaign of surveys (2002-2004) had offered low visibility, low perception and great difficulty in access and linkage. Now the fire modified radically those conditions. This was the considerable advantage of this year over previous campaigns: the burning atmosphere was depressing, but it was also a unique opportunity.

The survey was superficial and intensive, corresponding to a sample over eleven selected areas or polygons, according to their geomorphological and cultural criteria. Coverage in said areas was almost 100%.

We use methods not previously used in La Gomera: systematic probes with parallel bands that overlap in altitude whose breadth depended on the topographic profiles and vegetation; so we covered whole selected polygons. The survey system that is often used in the Canary Island and, above all, on the more mountainous islands such as La Gomera, is performed by movements that cover lineal vectors, rather than polygons, centring on specific geomorphological units.

We did not detect the significant impact of the fire on the archaeological materials, although there was an impact. The surrounding vegetation, the geomorphological host units and the nature of the material explain, to a certain extent, this outcome. In fact, the archaeological material founded was mainly lithic artefacts and, therefore, low conductivity, low quality as fuel and very resistant to thermal alterations.

With respect to the archaeological sites earlier projects in the highlands of La Gomera (1974, 1994, 2002-2004) marks a few archaeological sites with a total of 25 archaeological sites. This draft has greatly increased the number of sites: about 100 new archaeological places.

What is most interesting is the new types and heterogeneity detected after the forest fire, allowing for a more extensive and complex interpretation of the use of the forest by the original inhabitants of La Gomera. Previous results said that most of the sites corresponded to religious sites used for ritual services. Now, quarry and stone tool workshops, shepherd shelters, possible areas of woodworking, new ritual places, etc., have been located inside the forest.

We believe it is necessary that subsequent legal protocols to any fire on the island, take the need to incorporate

this type of study on the cultural heritage of these areas that have been burned.

ORAL

## 7. IN SEARCH OF A LOST VILLAGE. PROSPECTING TECHNIQUES AT THE SITE MARIANO MIRÓ (LA PAMPA ARGENTINA, EARLY TWENTIETH CENTURY).

*Tapia, Alicia (Instituto de Arqueología, Universidad de Buenos Aires) aliciahtapia@yahoo.com.ar*

*Doval, Jimena (Conicet, Instituto de Arqueología, Universidad de Buenos Aires) jdoval84@hotmail.com*

*Montanari, Emanuel (Instituto de Arqueología, Universidad de Buenos Aires) emanuelmontanari@gmail.com*

*Pineau, Virginia (Instituto de Arqueología, Universidad de Buenos Aires) virpineau@gmail.com*

*Landa, Carlos (Conicet, Instituto de Arqueología, Universidad de Buenos Aires) carlosglanda@gmail.com*

*Caretti, Florencia (Instituto de Arqueología, Universidad de Buenos Aires) florenciacaretti@gmail.com*

In 2011, called by Culture Department of La Pampa province government we began the archaeological investigations at Mariano Miró site (Chapaleufú, La Pampa, Argentina). In this archaeological site there are material culture remains of a country village, which emerged in 1901 in front of a train station. This Railway goes to Buenos Aires city. This village was inhabited by about 500 people and had a number of typical shops of agricultural and livestock settlements (stores, bakery, hairdresser, etc.), as indicated by historical documents. Around 1911 the village had to be forcibly abandoned because the owner of the land did not renew the rental contract. Since then, the owners of the land used for agricultural labors. Because of that there are not standing structures of the ancient village. The archaeological study of the site Mariano Miro is included within a goal of broader research, which aims to know the population dynamics of the area in the late nineteenth and early twentieth century; when these lands were incorporated into the country after the military campaigns, which annihilated and subdued the indigenous people who occupied them. In this paper we present the results obtained from the various prospecting techniques used to delimited the area occupied by the old town.

While structures are not observed at the present, there is in the superficial a large amount of glass, ceramic and metal fragments from which a study area of 240 x140 meters was defined. All the surface of this area -that covering 39,200 m<sup>2</sup>- was surveyed from transect

using metal detector and a systematic collection of surface materials was performed. The diversity of data was processed using Geographic Information System (GIS) software with ARCGIS10 that allow us to correlate different analysis variables. Also the use of documentary sources (aerial photos, maps and plans of the layout of the town) facilitated the identification of some of the site formation processes, as ancient buried structures and sectors related to specific activities or social practices.

The systematic collection made in transects allowed us to register 11,407 artifacts from different raw materials. From this data we generated potential excavating areas. We excavated 19m<sup>2</sup> at the moment and were recovered 2460 artifacts.

The prospection design applied allowed us to guide the interventions in a vast area, and from the analysis of the distribution and density of the findings helped us to differentiate areas, that respond to deliberate social practices during the occupation of the people (eg landfills) from those that would result from anthropogenic and natural post-depositional processes.

POSTER

POSTER

## 8. RAW MATERIAL FILE - LITHIC SOURCING AND COLLECTION MANAGEMENT.

*Siegeris, Markus (Collaborate Research Center 1070, University of Tuebingen) markus.siegeris@uni-tuebingen.de*  
*Floss, Harald (WG Early Prehistory and Quaternary Ecology, University of Tuebingen) harald.floss@uni-tuebingen.de*

Both lithic sourcing and management of lithic raw material collections are a field of accurate but also time saving work. In the last decades a few different kinds of files had been created to source lithic raw material in the field. But the practical site of the files had not been good enough to cover all the needed aspects while describing a source and its materials.

Working on my thesis I created a new file for describing the sources and lithic raw materials both in the field and the collection. The file contains information about the geography and geology, about the source and its characteristics and information about the lithic raw materials themselves.

After publishing the file in the new lexica about lithic artifacts by Prof. Harald Floss in 2012, it also became an open access product in the internet. The file fits on a regular DIN-A4 page and is available as a PDF in several languages like German, English, French and Spanish. Other languages will follow.

ORAL

## 9. CARACTERIZACIÓN Y APROVISIONAMIENTO DE MATERIAS PRIMAS DE LOS GRUPOS NEANDERTALES DE LA CUEVA DE PRADO VARGAS.

*Vallejo Rodriguez, Santiago (UPV/EHU) svallejo\_rodriguez@hotmail.com*

*Navazo Ruiz, Marta (UBU) mnavazo@ubu.es*

Se ha llevado a cabo una prospección sistemática en el área entorno a la cueva de Prado Vargas (Cornejo, Burgos), la cual presenta evidencias de ocupación humana en el Paleolítico Medio (Navazo et al, 2005). El objetivo del estudio es localizar afloramientos de materias primas que puedan haber sido utilizadas para la fabricación de herramientas líticas por estos grupos neandertales.

Se prospectan 46,6 Km<sup>2</sup> entorno a la cueva recorriendo todos los pisos geológicos, en donde se recogen materiales y se registran todo tipo de evidencias antropicas. Posteriormente con los materiales líticos se utilizan diferentes técnicas analíticas (Espectroscopía de Infrarrojos con Transformada de Fourier [FT-IR], Difracción de Rayos X [DRX] y Espectrometría de Masas con Plasma Acoplado Inductivamente [ICP-MS], con el fin de caracterizar los materiales líticos localizados en diez muestras seleccionadas de sílex en posición primaria en caja caliza y diez muestras seleccionadas de sílex en posición secundaria en caja de arcilla. También se han realizado análisis sobre nueve muestras de lascas arqueológicas procedentes de las excavaciones de la cueva.

Se lleva a cabo el trabajo de campo durante 33 jornadas, invirtiendo un total de 214 horas, de las cuales 130 horas son de prospección efectiva, recorriendo 313 Km de transectos, localizándose 94 lugares donde se recogen sílex y otros materiales de interés arqueológico y etnográfico. Se caracterizan las muestras de sílex natural y se interpretan los resultados de los datos de FT-IR, DRX e ICP-MS, se observa una similitud entre muestras de origen natural y arqueológico, localizando las posibles áreas de captación de recursos líticos. Se presentan a continuación los resultados de la prospección en donde



se han documentado diferentes áreas de captación de materia prima, así como se localizan posibles yacimientos arqueológicos.

La prospección en superficie aporta información de interés para comprender las relaciones entre los grupos humanos y el medio ambiente en el que vivieron. Se caracteriza el material lítico que utilizaron, pero los análisis geoquímicos y mineralógicos efectuados no fueron concluyentes con la existencia de marcadores netos, aunque el tratamiento estadístico sí que aporta información muy interesante entre analogías de las muestras. Estas correlaciones entre muestras de sílex natural y arqueológico proyectan unas ubicaciones espaciales en el territorio muy interesantes para su estudio, por lo que el análisis geoquímico también puede ser utilizado como herramienta de prospección selectiva para localizar yacimientos arqueológicos en superficie.

# B10 The interglacial Holsteinian eldorado and the onset of the Middle Palaeolithic (400-300 ka)

Organiser: Marta Arzarello [rzmrt@unife.it](mailto:rzmrt@unife.it), Marie H el ene Moncel, Carlo Peretto & Anne Marie-Moigne

Thursday 4th (9:00 to 13:30 15:00 to 19:30)  
C15 Meeting Room



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XVII World UISPP Congress  
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XVII Congreso Mundial de UISPP

ORAL CONTRIBUTION

ORAL

## 1. THE LITHIC ASSEMBLAGES AT THE MIDDLE PALEOLITHIC ONSET: THE UNCHANGED SUBSTRATUM AND THE NEW NEEDS

Arzarello, Marta (*Università degli Studi di Ferrara*) [marta.arzarello@unife.it](mailto:marta.arzarello@unife.it)

Moncel, Marie-Hélène (*Muséum National d'Histoire Naturelle de Paris*) [moncel@mnhn.fr](mailto:moncel@mnhn.fr)

Peretto, Carlo (*Università degli Studi di Ferrara*) [carlo.peretto@unife.it](mailto:carlo.peretto@unife.it)

The Holstanian period covers a large period of time, from the MIS 11 to the MIS 9 (from 427 to 301 ka) if we refer to the chronological curves. Archaeological data and human activity all over Eurasia show an increase of the number of sites following the Anglian or Elsterian glaciation (MIS 12) which is considered as a main crisis. It is often considered otherwise difficult to distinguish the two interglacial periods because they are short and share common climatic and environmental features. This period of time is though crucial; it's characterized by a wide biodiversity, a large faunal dispersion associated to a regionalization of mammal communities and variability of hominin morphology.

Our aim is to focus on the main well-dated sites all over Europe to identify the common features and the main innovations in their environmental and climatic framework. Sites from Spain, Italy, France, Great-Britain, Belgium, Germany and Poland will be documented and compared. We will take in account the technological behaviors but also the related subsistence strategies and the environmental and faunal patterns. We will focus also on the sites that have dates consistent with Late Acheulean but have not bifacial tools.

Large behavioral variability is observed with both Late Acheulean and onset of Early Middle Palaeolithic assemblages with sometimes some remaining bifacial tools, fire use generalization and structured living places. Management of local resources leads to another type of land use with seasonal settlements and evidence of specialized hunting into a territorial network. A new core technologies appear (Levallois) or previous ones are more and more complex (discoid-type).

The unchanged component that remains rooted for environmental constraints or cultural reasons is often overlooked and continues in some sites till MIS 7.

Through an interdisciplinary approach, the comparison will allow us making an overview of the main changes that occurred in relation to the unchanged substrate.

The Holstanian period indicates that changes obey by a mosaic of new behaviors which occurred at different scales and speeds. It opens to the Neanderthal world from MIS 8.

ORAL

## 2. THE END OF THE LOWER PALEOLITHIC IN THE LEVANT: THE ACHEULO-YABRUDIAN LITHIC TECHNOLOGY AT MISLIYA CAVE, ISRAEL.

Zaidner, Yossi (*Zinman Institute of Archaeology, University of Haifa; Institute of Archaeology, The Hebrew University of Jerusalem, Israel*) [yzaidner@research.haifa.ac.il](mailto:yzaidner@research.haifa.ac.il)

Weinstein-Evron, Mina (*Zinman Institute of Archaeology, University of Haifa, Israel*) [evron@research.haifa.ac.il](mailto:evron@research.haifa.ac.il)

The end of the Lower Paleolithic in the Levant is marked by the emergence of a new technocomplex known as Acheulo-Yabrudian (400-250 Ky). Stratigraphically placed at the transition between the Acheulian and Mousterian technocomplexes, the Acheulo-Yabrudian is crucial for the understanding of biological, cultural and behavioral evolution from the Lower to the Middle Paleolithic in the Levant. While some suggest that emergence of the Acheulo-Yabrudian is accompanied by arrival of new populations, others see continuity within the Levantine Lower Paleolithic and suggest that major technological and behavioral change occurred only with the onset of the Middle Paleolithic.

Misliya Cave, Mount Carmel, is one of the rare Levantine sites in which both the Acheulo-Yabrudian and Early Mousterian are present, allowing direct comparison between the two industries. Here we present the analysis of an Acheulo-Yabrudian lithic assemblage from the site and discuss its place within Levantine technological and cultural frameworks. Three technological systems were identified in Misliya Acheulo-Yabrudian assemblage:

- 1) Bifacial shaping
- 2) Production of thin flakes from unidirectional cores and cores with one preferential flaking surface and prepared striking platform. The flakes were usually left unmodified.
- 3) Production of large and thick, often cortical, flakes from unprepared cores. The flakes were used for manu-

facturing large scrapers by Quina or semi-Quina retouch. The two former systems are well-known from the Lower Paleolithic assemblages in the Levant, indicating regional continuity from the Acheulian, while the production of Quina scrapers seems to be a major technological innovation of the Acheulo-Yabrudian.

The three Acheulo-Yabrudian technological systems described above were not identified in the Early Middle Paleolithic assemblages of Misliya Cave. Moreover, Levallois and laminar technologies, and production of retouched points that mark the emergence of the Middle Paleolithic in the Levant, are absent from the Acheulo-Yabrudian of Misliya Cave, further supporting the view that a marked technological break in the region occurred ca. 250 ky ago with the onset of the Middle Paleolithic.

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ORAL

### 3. THE LOWER TO MIDDLE PALEOLITHIC TRANSITION AND THE DIVERSIFICATION OF LEVALLOIS TECHNOLOGY IN THE SOUTHERN LEVANT: EVIDENCE FROM TABUN CAVE, ISRAEL

*Shimelmitz, Ron (University of Haifa and David Yellin Academic College of Education) ronishim@gmail.com*

*Weinstein-Evron, Mina (University of Haifa) evron@research.haifa.ac.il*

*Ronen, Avraham (University of Haifa) aronen@research.haifa.ac.il*

*Jelinek, Arthur (University of Arizona) ajelinek@email.arizona.edu*

*Kuhn, Steven (University of Arizona) skuhn@email.arizona.edu*

The transition from the Lower to the Middle Paleolithic has received renewed attention recently following the realization that many traits once thought to be characteristic of the Middle Paleolithic in fact appeared already in Lower Paleolithic assemblages. In the Levant, the Acheulo-Yabrudian complex constitutes the latest part of the Lower Paleolithic, preceding the Levantine Mousterian. It is dated from 415 to 250 kyr at Tabun Cave. However, the nature of the transition between the Lower and Middle Paleolithic in the Levant remains highly controversial with a range of opinions. While some suggest lines of continuity others claim a complete separation between the two complexes. Considering the fundamental transformation in human behavior that occurred during the Acheulo-Yabrudian complex, which includes the use of habitual fire and the intensive use of predetermined blank technology among the emer-

gence of other traits, it is of significance whether these transformations continued in the Levant from the Lower Paleolithic to the Middle Paleolithic or whether they were completely swept away by a new wave of humans bringing with them similar as well as different sets of behaviours. This question can be best elucidated through a search of continuity in technological choices which can reflect socially-learned traditions of stone knapping. Our study is carried out on the long 16 m deep archaeological sequence of Tabun Cave, by combining results from Ronen's and Jelinek's excavations, which comprise ca. 100 superimposed layers, ranging from the Lower to the Middle Paleolithic. An overview of various reduction sequences, i.e., the Yabrudian scraper-blank production, the blade production of the Amudian, the exploitation of various types of cores on flakes, the variable exploitation of handaxes as cores and the Levallois technology at the site, indicates that although the Acheulo-Yabrudian and the Levantine Mousterian complexes exhibit marked differences in the macro level, there are also some significant features of similarity in the micro level, as reflected in particular technological choices within the reduction sequences that suggest some continuity in technological tradition. Exploring all ranges of reduction sequences can also provide new insights regarding the development of Levallois technology that burst at the Middle Paleolithic and demonstrate how particular technological choices that were already embedded in the knapping tradition of the Acheulo-Yabrudian are manifested in the particular method of Levallois that characterize the Mousterian of Tabun Cave.

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ORAL

### 4. THE END OF LOWER PALAEOOLITHIC AND THE BEGINNING OF MIDDLE PALAEOOLITHIC IN EAST EUROPE AND THE CAUCASUS.

*Golovanova, Liubov (Laboratory of Prehistory) labprehistory@yandex.ru*

*Doronichev, Vladimir (Laboratory of Prehistory) labprehistory@yandex.ru*

In East Europe, and the Southern and Northern Caucasus, the border between the Lower and Middle Palaeolithic is currently marked during MIS 6, after which the archaeological record shows the appearance of Middle Palaeolithic industries in MIS 5e.

In the **Southern Caucasus**, the available chronological data from cave sites document a late age (between 350 and 200 ka) for the Acheulean, comparable to the

final stage of Late Acheulean or Acheulo-Yabrudian in the Levant. The most representative Late Acheulean assemblages of Acheulo-Kudarian variant are dated from MIS 10 through MIS 7. In the Lesser Caucasus, Acheulean assemblages are known from many locations in volcanic uplands of southern Georgia and Armenia. During the last decade, Dashtadem-3 and Nor Geghi-1 open-air sites – the first stratified Late Acheulean occupations – were excavated in Armenia. The lithic assemblages of Kudaro-Djruchula Mousterian represent the earliest Middle Palaeolithic industry in the Southern Caucasus. Until recently, the chronological estimates suggested that Kudaro-Djruchula Mousterian appeared in the Southern Caucasus no earlier than the Last Interglaciation (MIS 5e, 130-115 ka). The recent TL dating in Djrchula Cave has produced the earlier unexpected dates between 260-210 ka for Layer 2. Our most important point of disagreement with the TL dates is that hominids could not occupy the cave during that time. This is because the cave entrance, opening now at the elevation of only 40 m above the modern riverbed, did not exist that time in the Djrchula River canyon. The geomorphologic studies suggest that the lower parts (at elevations less than ~100 m above modern channels) of river valleys in this part of the Caucasus formed during the Upper Pleistocene.

In the **Northern Caucasus**, the age of Late Acheulean industries is now estimated no younger than the beginning of MIS 6, and a chronological hiatus separates local Late Acheulean and Middle Palaeolithic industries. The initial stage of the North-west Caucasian Middle Palaeolithic is present by the assemblages from lower levels 5-7 at Matuzka Cave, dated to MIS 5 – MIS 5. In the end of MIS 5, the Eastern Micoquian appeared in the Northern Caucasus.

In the **Eastern Europe**, the lithic industries of Pre-Mousterian complex survived until the end of Lower Palaeolithic, beyond the distribution range of the Acheulean complex in West Europe and West Asia, including the Southern Caucasus. A large-scale hominin colonization of Eastern Europe began with the spread of leaf point assemblages in the later Middle Pleistocene (MIS 7 – early MIS 6). Later, the earliest industries representing Eastern Micoquian appear in the region since MIS 5e.

Thus, the now available data provide no evidence for the transition from Lower to Middle Paleolithic in the Caucasus and Eastern Europe. The earliest Middle Paleolithic assemblages appeared here as completely formed technological traditions and likely originated from different centers, West Asia for the Middle Palaeolithic in the

Southern Caucasus, and Central and the south of Northern Europe for the Middle Palaeolithic in the Eastern Europe and Northern Caucasus.

ORAL

## 5. THE PRE-MOUSTERIAN INDUSTRIAL COMPLEX IN EUROPE AND THE CAUCASUS BETWEEN 400-300 KA

*Doronichev, Vladimir (Laboratory of Prehistory) labprehistory@yandex.ru*

Since the onset of intensive Acheulean expansion within Western Eurasia at about 0.8-0.75 Ma, the frontier for the maximum distribution of the Acheulean assemblages changed through the time as the Acheulean-making populations of *H. heidelbergensis* expanded northward in the West Europe and West Asia, and the distribution area of non-Acheulean assemblages reduced. The continuity of stone-working traditions suggests the Middle Pleistocene non-Acheulean hominids originated from the earliest pre-Acheulean hominin population to enter Western Eurasia, and thus the first present the hominin population separated in Europe by at least 1.0 Ma years from the Acheulean-making *H. heidelbergensis* first penetrated to Europe from Africa at about 0.8-0.7 Ma. The unquestionable archaeological records also indicate that the non-Acheulean hominids were the first *Homo* to settle in continental Europe north of Alps and between the Alps and Caucasus since ca. 0.7–0.6 Ma or earlier.

In the late stage of Early Palaeolithic, between 400-300 ka, when the Acheulean expansion reached its maximum spread in Europe, as far eastward as the Rhine River in Northern Europe and the Po River in Mediterranean Europe, and as far northward as the Greater Caucasus in the West Asia, exclusively industries of flake-tools and choppers (defined as Pre-Mousterian complex) were spread in the Central and Eastern Europe, and the Balkans, beyond the Acheulean distribution area.

The assemblages of Pre-Mousterian complex are variable due to their functional differentiation and other reasons, but generally comprise the next three components: (1) simple (mostly primary and orthogonal, and also rare unipolar and centripetal) cores with short reduction sequences, consisting of flaking of 1-3 flakes from one platform, followed by the core rotation or discard; (2) flake-tools, which are made mostly (but not exclusively) on small-sized flakes with beveled platforms and include varieties of simple side-scrapers, denticulates, notches,

thick end-scrapers, awls, and convergent pieces, as well as small numbers of tools with flat ventral retouch or bifacial retouched edges; and (3) large-sized tools are always present and include mostly unifacial choppers, and more rare chopping-tools and proto-bifaces (or pointed choppers) with partial bifacial processing. Nevertheless, despite the absence of complex technologies for blank and tool production, the hominids that produced lithic industries of Pre-Mousterian complex acquired a high behavioural plasticity to settle in most uncomfortable (within Western Eurasia) forested and forest-steppe environments with cold winters in Central and Eastern Europe. The hominids developed tool inventories well suited for bone- and woodworking, made real wooden throwing spears found in Schöningen 13 and composite tools with wooden hafts that are found in Schöningen 12.

In contrast to the Acheulean complex in West Europe and West Asia, assemblages of Pre-Mousterian complex do not show a transition (temporally being placed now during MIS 8 – MIS 7, between ca. 300-200 ka in both the regions) toward the Middle Palaeolithic technology and typology. In contrast to the Acheulean to Middle Palaeolithic transition, which is associated with final neanderthalization of *H. heidelbergensis* and the origin of *H. neanderthalensis*, the assemblages of Pre-Mousterian complex disappear with the spread of early Middle Palaeolithic Neanderthals.

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ORAL

## 6. MIS 11-9 LOCALITY OF MEDZHIBOZH, UKRAINE : ARCHEOLOGICAL AND PALEZOOLOGICAL EVIDENCE

*moigne, anne-marie (MNHN.Paris) moigne@mnhn.fr*  
*Stepanchuck, Vadim (Institute of NIAS Kiev) vadimstepanchuck@yahoo.com*  
*Rizhov, Sergei (Kien taras Schevchenko Nat Univ) seryzh@gmail.com*

Lower Paleolithic localities near Medzhibozh town, Khmel'nitsky region in the west of Ukraine, represent a group of multilayered sites on southern Bug River. Two localities Medzhybozh 1 which age is defined as the beginning of Zavadovka episode MIS 11 and Medzhybozh A Lubny time MIS 13-15 contain Early and Middle Pleistocene deposits, remains of fauna, stone artifacts and presumable trace of hearths

Multidisciplinary studies stratigraphy, micromorphology, paleontology (large mammals micro-mammals, shells)

techno-typology and zooarchaeology are combined/ Medzhybozh studies are directly relevant of study of reconstruction of the ancient migration paths at the territory of the North western Eurasia in the East European segment

Faunal large Mammals list (NISP= 450) reveal few carnivores, *Ursus deningeri* and *Ursus thibetanus*, a typical association for interglacial middle Pleistocene period. Dominance of cervids as *Cervus elaphus*, *Dama clactoniana* and *Capreolus suessenbornensis*, *Sus scrofa*, *Stephanorhinus kirchbergensis* and *Castor fiber* confirm the temperate climate as well as biochronological attribution. Faunal list correspond to the humid and forest environment already described from the microfauna and shell analysis (Rekovetz, 2009). Cervid are mostly represented by adult animals. Bones are characterised by systematic intentional breakage with percussion notches and cutmarks. Rhino ribs and vertebra present also long and deep cutmarks. Carnivore activity is rare.

From archaeological point of view, six distinct assemblages of Medzhibozh 1 and Medzhibozh A horizons should most adequately be defined as belonging to the industries of technological Mode 1 (Oldowan). Materials cultural horizons despite of relatively late age (about 400 Ka) are characterized by the predominance of choppers, choppings, isolated retouched flakes, few flake and knapped, broken and fragmented pieces of various raw materials showing a minimum of secondary working. Available inventories contain no good instances of core knapping, as well as almost no morphologically stable shaping of flake tools and no signs of bifacial technology. The upper culture-bearing horizons provide likely remains of hearths. By its parameters the first culture-bearing horizon of Medzhibozh A resembles a living floor. This human occupation could be one the most ancient in Ukraine. Human activities, as subsistence can be compared to western sites as Orgnac 3 or Cagny l'Épinette but technological sequence is different. During Mis 11 and 9, a large variability can be observed in Europe.

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ORAL

## 7. THE ONSET OF THE MIDDLE PALAEOOLITHIC IN THE CENTRAL BALKANS

*Mihailovic, Dusan (Faculty of Philosophy, University of Belgrade) dmihailo@gmail.com*  
*Marin-Arroyo, Ana Belen (Instituto Internacional de Investigaciones Prehistóricas de Cantabria (IIIIPC), Universidad de Cantabria) anabelen.marin@unican.es*

Recent investigations in Serbia shed some more light on changes in the settlement pattern, technology and economy at the time of transition from the Lower to the Middle Palaeolithic in this part of Europe.

In the course of site surveying of the right bank of the Zapadna (Western) Morava river, in central Serbia, a whole series of sites, which could be dated to the end of Lower and the beginning of Middle Paleolithic have been recorded on the highest river terrace. There, to the more or less extent, choppers, Levallois and Kombewa cores and blanks, denticulated and notched tools on asymmetrical flakes, Quinson points and Clactonian elements were discovered. All that indicates the possibility that river valleys in the central Balkans had been intensively settled during the end of Middle and the beginning of Upper Pleistocene.

Settlements on hilly and mountainous areas had been recorded already half a million years ago. This is confirmed by the discovery of mandible of *Homo erectus* s.l. in Mala Balanica near Niš for which it has been established a minimum age between 397 and 525 ka. In the same cave, as well as in the nearby Velika Balanica cave, stratigraphic levels with Charentian-like assemblages, dated to the Middle Pleistocene according to the microfauna found, have been confirmed. On the meantime, macrofaunal results show evidence of regular use of fire and many elements of Middle Palaeolithic behavior like hunting middle-sized game (red deer and ibex), orientation to prime age individuals and suboptimal transport strategy of hunted animals has been confirmed at this site.

ORAL

## 8. FIRST SETTLEMENTS IN CENTRAL EUROPE: BETWEEN ORIGINALITY AND BANALITY

*Rocca, Roxane (UMR 7041 ArScAn AnTET) roxane.rocca@gmail.com*

The situation of Central Europe during Lower Palaeolithic seems to be original. Evidence of human occupations before 0.5 million years ago is sparse and handaxes are absent during the entire duration of the Lower Palaeolithic. Despite being located on the Out of Africa route towards Europe, this region has not yielded the archaeological evidence that could have been expected.

At the end of the Lower Palaeolithic, between 400 and 300 ka in Central Europe the lithic industry are charac-

terized by a small tool production. We will analyse this typical production thanks to two lithic assemblages (Vértesszölös in Hungary and Bilzingsleben in Germany). If those assemblages are original compared to the Western Acheulean, some elements can be likened to some other industries in Southern Europe.

The results of this study of the first lithic industries from Central Europe, allow a reconsideration of settlement dynamic in Europe at the end of Lower Palaeolithic. The classical division between Eastern and western Europe, can be discussed, according to the criteria taken into account in the definition of the different Lower Palaeolithic cultural entities and technological systems.

ORAL

## 9. MENEZ-DREGAN I, LAYER 4: A TRANSITIONAL LAYER BETWEEN THE LOWER AND MIDDLE PALAEOLITHIC IN BRITTANY

*Ravon, Anne-Lyse (Université Rennes 1) annelyse.ravon@voila.fr*

*Monnier, Jean-Laurent (CNRS) jean-laurent.monnier@univ-rennes1.fr*

Menez-Dregan I is a lower palaeolithic site situated at Plouhinec, Finistère, in Brittany. It is an ancient marine cave whose roof has gradually collapsed. Layer 4 from the site of Menez-Dregan I is the last occupation of this deposit, at the boundary between the lower and middle palaeolithic. Geological correlations tend to place layer 4 in OIS 9 or 11, although the only TL dating available for this level gave an age of 270 ky.

This study focuses on the lithic industry from the 1991-2004 excavations and was undertaken in order to capture the various types of technical behaviour that could communicate the transition between lower and middle palaeolithic. We present the lithic industry of this layer, which simultaneously combines lower palaeolithic characteristics, such as large quantities of pebble tools (due to the environment of the site), and the emergence of characteristics that are common to the middle palaeolithic, such as standardisation of flake production, or adapting knapping methods to the dimensions of the raw materials (discoid knapping for quartzite, bipolar flaking on an anvil for small flint pebbles).

The lithic industry from layer 4 and its three levels (4a, 4b and 4c) has been analyzed. The lithic industry includes flakes (33.1%), flake fragments (28.4%), debris

(21%), retouched flake tools (7%), cores (4.3%), pebble tools (3.2%), pebble fragments (1.7%); 1.3% are miscellaneous pieces. The raw materials used in layer 4 are flint (71%), quartz (13%), sandstone (10%), microgranite (5%), quartzite (0.8%) and glossy sandstone (0.5%), and were collected from the fossil beaches in or nearby the deposit. Retouched flake tools are mostly denticulates (68.2 %), scrapers (19.7 %) and notches (12.1 %). Layer 4 of Menez-Dregan I has been attributed to the "colombianian" by J.-L. Monnier on the basis of the composition of its lithic industry: a predominance of cobble tools among the heavy-duty tools, retouched light-duty tools on flake-supports comprising mostly notches and denticulates, and knapping method akin to the "clactonian" (wide butts rarely faceted, prominent bulbs, wide open flaking angles). The Levallois method is absent, bifaces are absent or extremely rare, and there are few scrapers. The colombianian proves to be a facies of the lower palaeolithic, contemporary with classic acheulean but typologically distinct.

However, standardisation of flake production leads us to foresee a change in the lithic industry of layer 4, and allows us to highlight a transitional period from the lower palaeolithic to the middle palaeolithic in the latest occupation of this deposit. This study is a contribution to the documentation of the diversity and variability of lower and middle palaeolithic lithic industries, demonstrating that the large amount of cobble tools in layer 4 are an unchanged component due to environmental constraints.

## ORAL

### 10. A NEW KEY-SITE FOR THE END OF LOWER PALAEO-LITHIC AND THE ONSET OF MIDDLE PALAEO-LITHIC AT ETRICOURT-MANANCOURT (SOMME, FRANCE)

Hérisson, David (UMR7194, INRAP) davidherisson@yahoo.fr  
 Goval, Emilie (INRAP, UMR7194) emilie.goval@inrap.fr  
 Loch, Jean-Luc (INRAP, UMR8591) jean-luc.locht@inrap.fr  
 Coutard, Sylvie (INRAP, UMR8591) sylvie.coutard@inrap.fr  
 Antoine, Pierre (UMR8591) pierre.antoine@cnsr-bellevue.fr  
 Chantreau, Yoann (INRAP, UMR6566) yoann.chantreau@inrap.fr  
 Debenham, Nick (Quaternary TL Survey) n.debenham@qtl.globalnet.co.uk

Rare are new testimonies for the MIS 11 to 9 in Eurasia. The discovery and the excavation of a new site in 2012 at Etricourt-Manancourt (Somme, France) in a very large area was an exceptional event.

In 2010, at the place of the future retention basin, a palaeolithic trial excavation was carried out by Emilie Goval on 170 000 square meters. It produced many flint artefacts, proving the existence of at least two important Middle Palaeolithic sites. In 2012, an excavation on the first favourable sector was conducted by David Hérisson over 6 months on 4500 square meters. This excavation has been led by a multidisciplinary scientific team, including prehistorians, geomorphologists. This allows us to apply a reliable chronostratigraphical approach based on the sequential analysis of glacial-interglacial deposit successions.

Five palaeolithic occupations have been excavated *in situ*, dating from 330 to 80 ky. The youngest occupation dates from 70-80 ky and corresponds to a recent phase of the Middle Palaeolithic. The next two layers belong to the Early Middle Palaeolithic during the Saalian, between 190 and 240 ky. Finally, the two oldest layers have dates between 330 and 280 ky and belong to the Lower Palaeolithic. In addition to this archaeological wealth, the sedimentary sequence is very dilated (11 meters high) and presents for the first time in Northern France a continuous record of the three last interglacial-glacial cycles. This talk will present archaeological and chronostratigraphical results of the excavation of Etricourt-Manancourt and its input with high resolution data to discuss behavioural changes occurring at the end of the Lower Palaeolithic and the onset of the Middle Palaeolithic.

## ORAL

### 11. IS IT POSSIBLE TO RECOGNIZE STRUCTURED LIVING-PLACES AND ACTIVITIES AT CAGNY-L'EPINETTE, SOMME BASIN ?

Tuffreau, Alain (université de Lille) alain.tuffreau@univ-lille1.fr  
 Lamotte, Agnes (université de Lille) agnes.lamotte@univ-lille1.fr  
 Auguste, Patrick (CNRS) patrick.auguste@univ-lille1.fr  
 Moigne, Anne-Marie (Muséum d'Histoire Naturelle) moigne@tautavel.univ-perp.fr  
 Peudon, Floriane floriane.peudon@gmail.com

Fine Fluvial deposits (end of MIS 10 and MIS 9) from Cagny-l'Épinette site permits the discovery of numerous bones of big mammals (*bos primigenius*, *cervus elaphus*, *Equus caballus mosbachensis*) which show us many signals of anthropic activities and acheulean artefacts, all both records in different stratigraphic units. Refittings have been made between lithic, bones and teeth in



different of those units. Pieces have been damaged by taphonomic aspects underlined by the orientation of artefacts. Nevertheless, a great part of lithic and bones discoveries are well preserved (absence of patina and rolled edges). A spatial analysis associated with stratigraphy try to treat taphonomic aspects correlated to anthropic activities.

ORAL

## 12. THE ACHEULIAN OF THE SOMME BASIN (FRANCE) : VARIABILITY AND CONVERGENCE IN PRODUCTION SYSTEMS

*Lamotte, Agnes (université Lille 1) agnes.lamotte@univ-lille1.fr*

*Tuffreau, Alain (Université Lille 1) alain.tuffreau@univ-lille1.fr*

Around Amiens, several acheulean sites dated between stages MIS 12 to 9, are located in the Somme Valley. We are dealing with the sites of Cagny-la-Garenne I, Cagny-la-Garenne II, Cagny-la-Ferme de l'Épinette, Cagny-l'Épinette, Revelles and Gentelles. The aim of the communication is to present in each site, and during time and space, the raw material procurement, the core status, the biface and tool-flake status, but also many aspects of shaping and knapping like the hammer presence or specialized aspects of lithic classes. We'll present a synthesis of datas which will underlines changing in lithic main categories of artefacts, variability or convergences in the production systems. Some focus will be made in/or between main artefacts with the care to quantify those phenomenon.

ORAL

## 13. COMPORTEMENTS TECHNIQUES DES ACHEULÉENS DE LA GROTTÉ D'ALDÈNE (CESSERAS, HÉRAULT, FRANCE).

*Rossoni-Notter, Elena (Musée d'Anthropologie préhistorique de Monaco) elenarosso@hotmail.fr*

*Notter, Olivier (UMR 7194, Muséum National d'Histoire Naturelle) notterolivier@hotmail.com*

*Simon, Patrick (Musée d'Anthropologie préhistorique de Monaco) fburle@gouv.mc*

*Simone, Suzanne (Musée d'Anthropologie préhistorique de Monaco) suzanne\_simone@libello.com*

La grotte d'Aldène (Cesseras, Hérault, France), aussi appelée grotte de la Coquille ou de Fauzan se compose

d'un vaste réseau karstique s'étendant sur plusieurs niveaux étagés. Ce site est remarquable par la conservation de ses gravures et tracés digitaux pariétaux attribués au Paléolithique supérieur mais aussi par ses empreintes de pas d'ours, d'hyènes et d'Hommes (Mésolithique). Cependant, les plus anciens témoignages d'occupation anthropique se situent au niveau du porche effondré et de l'entrée de la grotte.

Cette zone fut fouillée par le Musée d'Anthropologie préhistorique de Monaco, entre 1971 et 1991, puis de 1996 à 1998. Le remplissage, tronqué par l'exploitation industrielle des phosphates, a néanmoins conservé plusieurs témoins stratigraphiques (T1 à T9) attestant d'une longue séquence d'occupations acheuléennes (cf. Taya-cien) et pré-moustériennes, depuis la fin du stade isotopique 13 jusqu'au stade 5.5.

Les études interdisciplinaires conduites (paléobotanique, paléontologie, micropaléontologie, paléoclimatologie, sédimentologie, datations radiométriques par U/Th et ESR) ont permis de mettre en place un cadre paléoenvironnemental et chronostratigraphique pour chaque unité archéostratigraphique. Certaines de ces unités, appartenant à différents témoins sédimentaires, ont pu en outre être corrélées.

L'étude de l'ensemble des industries lithiques caractérisée, par différentes approches (pétroarchéologique, structurelle et technologique), la diversité des comportements techniques des groupes ayant séjourné aux abords de la Cesse et propose une interprétation réactualisée des technocomplexes en présence. Par ailleurs, le vaste développement stratigraphique d'Aldène donne l'occasion de décrire et positionner chronostratigraphiquement les principales innovations techniques de ces périodes telles que l'apparition du concept Levallois, du feu, ainsi que des structurations de l'espace (foyer, dallage).

Ces résultats, confrontés à ceux de sites pénécotemporains de l'arc méditerranéen franco-ligure, contribuent à la connaissance des comportements techniques, à la charnière du Paléolithique inférieur et moyen (Modes 2-3).

ORAL

## 14. BONE RETOUCHERS FROM MIDDLE PLEISTOCENE SITES. A FOCUS ON ORGNAC 3, CAGNY-L'ÉPINETTE, CUEVA DEL ANGEL AND LAZARET CAVE

*Moigne, Anne-Marie (MNHN) anne-marie.moigne@cerp-tautavel.com*

*Moncel, Marie-Helene (MNHN-CNRS) moncel@mnhn.fr*

*Auguste, Patrick (Université de Lille) Patrick.Auguste(at)univ-lille1.fr*

*Valensi, Patricia (Lazaret) valensi@lazaret.unice.fr*

*Solano, José (Cueva del Angel Project) joseriquelme22@hotmail.com*

*Tuffreau, Alain (Université de Lille) alain.tuffreau@univ-lille1.fr*

*Lamotte, Agnès (Université de Lille) lamotte@univ-lille1.fr*

*Barroso, Cecilio (Cueva del Angel Project) barroso.cecilio@gmail.com*

Boen retouchers are common for the Middle Palaeolithic (from MIS 7 to 3) and are now considered as a part of the tool kit of Neanderthals. They exist in Middle Pleistocene sites even they are few and attest to the scarcity of use of bones for shaping tools. Some sites allow us describing the onset of bone use. Our aim is to present details about the bone retouchers in assemblages yielding bifacial tools and often described as Late Acheulean.

The sites studied are Orgnac 3 and Cagny-l'Épinette (MIS 9 in France), Cueva del Angel (Spain, MIS 11-7) and the Lazaret cave (MIS 6, France). We will examine the number, supports, types of species, size and types of marks of the retouchers; The results will be compared to retouchers already published (Cueva del Bolomor and Gran Dolina TD10 in Spain, Qesem in Israel, La Micoque and Payre in France).

Our corpus yielded between 1 and 6 retouchers by level in one or several layers for each site. They are made on fragments of bones of the main species hunted on the site. Marks indicate specific processes for selecting bones and allow us suggesting hypotheses for their use: for retouching bifacial tools and flake-tools and for direct percussion.

The onset of the bone use is one of the features attesting behavioral changes from MIS 9 in Europe. Data will be discussed in relation to the characteristics of the lithic assemblages and the subsistence strategies.

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ORAL

### **15. FUNCTIONAL CHARACTERISTICS OF HANDAXES FROM TERRA AMATA (SOUTHERN FRANCE, MIS11)**

*Viallet, Cyril (UMR 7194 - UPVD - MNHN) cyril.viallet@cerp-tautavel.com*

We present preliminary results of handaxes structural and functional analysis. Artifacts come from Terra Amata in southern France and are assigned to the MIS 11. Terra Amata deposit reveals one of the oldest traces of fire-place in Eurasia.

On a structural point of view, all handaxes (n=16) are 'cortical basis', little shaped and only four are retouched. Structural analyses show that handaxes are designed as "handaxes-tools". Nearly half (n=7) are shaped to obtain a distal bevel or a thick tip (n=3). The others are structured for travel with edge (n=4) or tip-edge (n=2).

One handaxe, with an edge as active part, shows use-wear in relation to a tool motion longitudinal translation. For handaxes with distal bevel or thick tip, functional analysis of active part shows chipping and crushing marks, associated with a percussive tool-motion. On the opposite part, the cortical basis, pits and scratches are typical of percussion use. The contemporaneity of the two types of use-wear is unprovable. However this association between the use of percussion and handaxes with distal bevel or thick tip is constant and reflects a specific use for these tools.

In the case of Terra Amata, handaxe is not a unique or multifunctional tool, it is apprehended like a matrix, from which a minimum of three types of tools can be produced. These results should be compared with the functional characteristics of other tools – especially cleavers and pecks – to understand the role of handaxes at Terra Amata.

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ORAL

### **16. NOTABLE TECHNICAL CHANGES IN WESTERN EUROPE BETWEEN MIS 11 AND MIS 9 AS TOLD BY THE BIFACIAL INDUSTRIES**

*Nicoud, Elisa (Ecole française de Rome) elisa.nicoud@gmail.com*

Bifacial industries in Western Europe between MIS 11 and MIS 9 indicate technical changes that may be interpreted as technical invention and innovation. That informs us on previously unseen diffusion of population within Europe at this time.

Conventional technological studies do not offer a comprehensive enough approach for analyzing these ancient industries due to the absence of well-developed "chaînes opératoires". We performed a technical study

of 36 lithic assemblages from France, England, Italy and Spain.

During what we usually call "Acheulean" in Western Europe, the biface as a typological entity actually consists of three different technical structures. We identify the "biface used as a blank for tools", the "biface as a tool" and "pebbles/blocks with bifacial removals". Other tools are made on flakes – by-products of bifacial shaping or from core reduction sequences – but also on small pebbles and various natural fragments.

The bifacial structure changes together with the rest of the production. This major change of the bifacial structure as well as the rest of the production seems to occur around MIS 10. The rhythms and occurrences of this change could reveal a new diffusion of populations within Western Europe, going South, during Middle Pleistocene. In any case, the biface is a secondary phenomenon within Lower Palaeolithic in Europe.

ORAL

### 17. NEW ESR DATINGS OF ACHEULIAN LEVELS AT ATAPUERCA DOLINA AND GALERIA SITES AND THEIR POSITION IN THE EUROPEAN PREHISTORIC CONTEXT

Falgueres, Christophe (CNRS) [falguere@mnhn.fr](mailto:falguere@mnhn.fr)  
Moreno, Davinia (MNHN) [moreno@mnhn.fr](mailto:moreno@mnhn.fr)  
Bahain, Jean-Jacques (MNHN) [bahain@mnhn.fr](mailto:bahain@mnhn.fr)  
Voinchet, Pierre (MNHN) [pvoinch@mnhn.fr](mailto:pvoinch@mnhn.fr)

The Sierra of Atapuerca, Northern Spain, has yielded many prehistoric and palaeontologic data documenting the human history in Eurasia during the last million years. The stratigraphical sequences of three major sites, Gran Dolina, Galería and Sima del Elefante, cover almost the entire period of the Pleistocene from the oldest Hominin bearing levels of Western Europe dated to 1.1 to 1.3 Ma at Elefante (Carbonell et al., 2008) to c.a. 0.2 Ma on the top of the Galería archaeological sequence (Falguères et al., 2013). The upper levels of Dolina and the entire sequence of Galería have provided a rich Acheulian assemblage documenting the earliest stage of the second human settlement of south-western Europe.

Recent results obtained by combined ESR/U-series dating on 20 herbivorous teeth from different levels at the Galería site allow a chronological comparison with upper levels of Dolina site. For these levels, several data were obtained using independent methods (TL, ESR/U-series,

TIMS) yielding a more accurate idea on the chronology for the first Acheulian levels in these major sites of Middle Pleistocene.

The obtained ages range between 300 and 500 ka and are contemporaneous with the lower part of Arago (France) and Visogliano (Italy) stratigraphical sequences. They succeed from one hand to La Noira site (France) in which Acheulian tools have been identified at more than 650 ka (Moncel et al., 2013) and in the other hand to Mauer (Germany), Pakefield (England) and Isernia la Pineta (Italy) sites recently dated to 600 ka or more and which do not contain Acheulian artefacts.

ORAL

### 18. THE MODE 2 TO MODE 3 TRANSITION IN ATAPUERCA. THE LITHIC ASSEMBLAGE OF TD10.1 FROM GRAN DOLINA SITE.

de Lombera-Hermida, Arturo (Institut Català de Paleoecologia Humana i Evolució Social (IPHES) C/ Marcel·lí Domingo s/n - Campus Sescelades URV (Edifici W3) 43007 Tarragona - Grupo de Estudios para a Prehistoria do Noroeste (GEPN) Dpto. Historia I Universidade de Santiago de Compostel) [artulomb@gmail.com](mailto:artulomb@gmail.com)

Ollé, Andreu (Institut Català de Paleoecologia Humana i Evolució Social (IPHES) C/ Marcel·lí Domingo s/n - Campus Sescelades URV (Edifici W3) 43007 Tarragona) [aolle@iphes.cat](mailto:aolle@iphes.cat)

Mosquera, Marina (Institut Català de Paleoecologia Humana i Evolució Social (IPHES) C/ Marcel·lí Domingo s/n - Campus Sescelades URV (Edifici W3) 43007 Tarragona) [marina.mosquera@urv.cat](mailto:marina.mosquera@urv.cat)

Rodríguez-Álvarez, Xose Pedro (Institut Català de Paleoecologia Humana i Evolució Social (IPHES) C/ Marcel·lí Domingo s/n - Campus Sescelades URV (Edifici W3) 43007 Tarragona) [xprodriguez@iphes.cat](mailto:xprodriguez@iphes.cat)

García-Medrano, Paola (Institut Català de Paleoecologia Humana i Evolució Social (IPHES) C/ Marcel·lí Domingo s/n - Campus Sescelades URV (Edifici W3) 43007 Tarragona) [paolaoliv@hotmail.com](mailto:paolaoliv@hotmail.com)

Terradillos, Marcos (Área de Prehistoria. Universidad de Burgos. Edificio I+D+i. Plaza Misael Bañuelos s/n. 09001, Burgos. Spain. [mterradillos@hotmail.com](mailto:mterradillos@hotmail.com) <sup>2</sup>Fundación Atapuerca. Ctra. Logroño Nº 44. 09198 Ibeas de Juarros, Burgos) [mterradillos@hotmail.com](mailto:mterradillos@hotmail.com)

Pedergrana, Antonella (Institut Català de Paleoecologia Humana i Evolució Social (IPHES) C/ Marcel·lí Domingo s/n - Campus Sescelades URV (Edifici W3) 43007 Tarragona)

Rodríguez-Hidalgo, Antonio (Institut Català de Paleoecologia Humana i Evolució Social (IPHES) C/ Marcel·lí Domingo

*s/n - Campus Sescelades URV (Edifici W3) 43007 Tarragona)  
Saladé, Palmira (Institut Català de Paleoeologia Humana  
i Evolució Social (IPHES) C/ Marcel·lí Domingo s/n - Campus  
Sescelades URV (Edifici W3) 43007 Tarragona)  
Carbonell, Eudald (Institut Català de Paleoeologia Hu-  
mana i Evolució Social (IPHES) C/ Marcel·lí Domingo s/n  
- Campus Sescelades URV (Edifici W3) 43007 Tarragona)*

The Atapuerca sites offer a long series of hominin occupations since the Lower Pleistocene. In this sense, it becomes a key site for understanding the continuity and discontinuity of the technological and settlement dynamics in Western Europe.

The thick sedimentary record from Gran Dolina site comprises 11 stratigraphic units that cover the last million years. The level TD10 is located in the upper part of the sequence and divided into four lithostratigraphic units (T10.4 to TD10.1, from bottom to top) dated between less than 480 ky and 240 ky. In this work we present the study of the whole lithic assemblage belonging to TD10.1, the uppermost unit.

The archeostratigraphic studies have identified the existence of several occupations within its approximately 1.5 meters thickness. Their artifact densities and occupational models differ; some of them related to base camps and others to sporadic and opportunistic occupations. However, no remarkable technical differences are observed among them, showing a great technological homogeneity. Nevertheless, they show more evolved features compared to other Mode 2 assemblages from Atapuerca, and even to the lower section of the TD10 level, currently under excavation (namely TD10.3). These changes are reflected in a selective raw material management strategies; an increase of the hierarchized and predetermined reduction methods; the progressive detriment of LCT in the lithic assemblages with respect to light-duty tools, the latter defined by a greater morphological and typological standardization; and the evidence of tool-hafting. These technological changes do not suppose a clear-cut rupture with respect to previous technological models, although they are accompanied by other punctuated but significant changes in subsistence and behavioral strategies (bone tools and retouchers) that later will be consolidated during the Middle Paleolithic.

Hence, the archaeological record from TD10.1 points to a local transition from Mode 2 to Mode 3 technocomplexes in Atapuerca, parallel to that observed in other European sites.

ORAL

## 19. THE CUEVA DEL ANGEL (LUCENA, SPAIN) - A COMPARATIVE ANALYSIS WITH GALERIA OF ATAPUERCA AND COVA DEL BOLOMOR

*Barroso, Cecilio (Director of the Cueva del Angel research project.) cecilibarroso1@hotmail.com*

*Caparros, Miguel (Muséum National d'Histoire Naturelle. Département de Préhistoire, Paris.) capmig@aol.com*

The Cueva del Angel (Lucena, Spain) site is an archaeological open-air sedimentary sequence remnant of a collapsed cave, part of a karst complex. Taphonomical characteristics of the herbivore faunal assemblage, the well developed final Acheulean industry and a preliminary  $^{230}\text{Th}/^{234}\text{U}$  date of  $121 \pm 11/-10$  ky points to a chronology stretching from the end of the Middle Pleistocene to the beginning of the Upper Pleistocene (MIS 11 to MIS 5).?

Most of the well known middle Middle Pleistocene Acheulean assemblages of the Iberian Peninsula are located in terraces of major rivers and their industries, made essentially of quartzite cobbles, are far removed from the one encountered in Cueva del Angel. Two sites that would help to clarify where the culture of the Cueva del Angel hominins would fit are to be found in a cave context, such as Galeria at Atapuerca and Cova del Bolomor in the province of Valencia. These three caves stopped functioning during MIS 5 (Cueva del Angel cave probably collapsed, while Galeria and Bolomor were sealed off).

A comparative analysis of the three sites will illustrate how groups of *Homo heidelbergensis s.s./* Neanderthals took advantage of karst cavities before the MIS 5 discontinuous event. The reviewed sites illustrate the relative adaptive responses of these human groups to the diverse ecological environments and the faunal and raw material resources available, taking into account the fierce competition for animal nutrients that existed between them and carnivores.

From a comparison of the Acheulean lithic assemblage of Cueva del Angel with the the Acheulean ensemble of Galeria and the so-called non-Acheulean mousterian industry of Bolomor, it appears that there is no clear boundary between the Lower and Middle Palaeolithic in the Iberian Peninsula, and that tools made on flakes, once considered a feature of the Middle Palaeolithic are common in Acheulean industries. This diversity fits very well with the archaeological evidence encountered in other regions of Western Europe.

ORAL

**20. ACHEULEAN HANDAXES FROM CUEVA DEL ANGEL SITE, LUCENA, SOUTH OF SPAIN: PRELIMINARY STUDY OF MORPHOMETRICAL AND FUNCTIONAL UNITIES.**

*Celiberti, Vincenzo (CERP Tautavel UPVD Perpignan, UMR 7194 CNRS) vincenzo.celiberti@cerptautavel.com*

*Barroso Ruíz, Cecilio (Fundación Instituto de Investigación de Prehistoria y Evolución Humana) ceciliobarroso1@hotmail.com*

*Grégoire, Sophie (CERP Tautavel UPVD Perpignan, UMR 7194 CNRS) sophie.gregoire@cerptautavel.com*

*Jiménez-Cobos, Francisca (Departamento de prehistoria y arqueología - Universidad de Granada) franciscajimenezcobos@gmail.com*

*Cauche, Dominique (Laboratoire départemental de préhistoire du Lazaret, Nice, UMR 7194 CNRS) dcauche@yahoo.fr*

*Notter, Olivier (MNHN, UMR 7194 CNRS, Musée d'Anthropologie préhistorique de Monaco) notterolivier@hotmail.com*

*Rossoni-Notter, Elena (Musée d'Anthropologie préhistorique de Monaco) elenarosso@hotmail.fr*

*García Solano, José Antonio (Departamento de Investigación en Recursos Geológicos, I.G.M.E., Madrid) solanillo@hotmail.com*

*Moigne, Anne-Marie (MNHN, UMR 7194 CNRS, CERP Tautavel) anne-marie.moigne@cerptautavel.com*

The Cueva del Angel archaeological site is a collapsed open-air cave, located on the outskirts of the town of Lucena, province of Cordoba, with an excavated and well preserved sedimentary sequence and a stratigraphy evidencing a Middle to Upper Pleistocene human occupation. In 1995, a team led by C. Barroso and D. Botella discovers a rich stratigraphy on top of the site. To date seven excavation campaigns have yielded numerous faunal remains and substantial late Lower Palaeolithic type lithic artifacts, including a number of handaxes, but so far no human fossil. The faunal assemblage dominated by equids, large bovinds and cervids has been subjected to intense anthropic actions reflecting selective predation. The fauna may be correlated with the end of the Middle Pleistocene to the beginning of the Upper Pleistocene. Further datations are presently being undertaken to assess more precisely the chronology of the sequence.

More than 80,000 lithic artifacts have been found in the site but about 5000 pieces have been extracted from the stratigraphy and coordinated. The assemblage is relatively well preserved though a given quantity of flints is highly desilicified. Evidence of fire is observed on about a third of the artifacts throughout the sequence. Three

main petrographical categories of raw material have been distinguished: flint, largely dominant, then quartzite and limestone. The source of flint raw material identified comes principally in the form of pebbles, and less frequently small slabs or cobbles. The lithic assemblage is dominated by non-modified flakes and abundant retouched tools with the presence of 46 handaxes. Many of the flakes show signs of use wear with thin or flat irregular retouch. Whole pebbles, percussion instruments and pebble tools are extremely rare. Side scrapers are largely dominant throughout the stratigraphy and the notched tools are the second most numerous retouched tools. Most of the cores were knapped from flint and the rest from quartzite, reflecting flake raw material distributions. Recurrent unipolar flaking dominates for flint pieces and bifacial discoidal flaking is most commonly observed for the quartzite ones. Levallois flaking methods are however absent in the site.

The present analysis will be based on handaxes, who were configured mainly on large flakes or fractured pebbles. Some conserve more or less cortical residue. The degree of raw material selection, the morphology and quality of blanks, the interaction between *débitage* and *façonnage* (shaping) and their operational sequence (similarities and differences in methods and techniques), the function of the site, are some of the conditioning or determining factors in the operational schema of bifacial shaping. These pieces allow us to produce a new way of understanding the way those bifaces are made and used. The technological approach through the diacritic analysis and a morphometrical study will present the different steps of productions and the identification of the functioning and the functional unities linked to the morphology and technology of the tools.

ORAL

**21. A REDFINITION OF A CLACTONIAN AND ACHEULIAN SEQUENCE IN CENTRAL ITALY: NEW RESEARCHES IN VALLE GIUMENTINA (ABRUZZO)**

*Nicoud, Elisa (Ecole française de Rome) elisa.nicoud@gmail.com*

*Aureli, Daniele (Università di Siena)*

*Pagli, Marina (ArScAn AnTET)*

*Villa, Valentina (Paris 1/Pisa/EFR/LGP UMR 8591)*

*Agostini, Silvano (Soprintendenza Abruzzo)*

*Boschian, Giovanni (Università di Pisa)*

*Chaussé, Christine (Inrap/UMR 8591 LGP)*

*Degeai, Jean-Philippe (CNRS UMR 5140)*

*Fusco, Fabio (Università Bologna)*  
*Hernandez, Marion (Max Plank Institut)*  
*Kuzucuoglu, Catherine (CNRS UMR 8591)*  
*Lahaye, Christelle (Université Bordeaux Montaigne/ UMR 5060)*  
*Lemorini, Cristina (Università di Roma)*  
*Mazza, Paolo (Università di Firenze)*  
*Mercier, Norbert (CNRS UMR 5060)*  
*Robert, Vincent (CNRS UMR 8591)*  
*Virmoux, Clément (CNRS UMR 8591)*  
*Zupancich, Andrea (Università di Roma)*

Many models have been established to show settlement dynamics in Europe and the Italian peninsula during Middle and Upper Pleistocene: the **Out of Africa** theory (Acheulian dispersal from Africa), the hypothesis of an evolution of bifacial industries within Europe around MIS 10, and the idea of a cultural mosaic in Italia.

But, these models need more technical data and accurate chronologies. This statement leads us to reopen researches at Valle Giumentina (Ecole française de Rome-project 2012-2016). Valle Giumentina is a little valley within the Majella mountain range that has been sealed during Pleistocene. Nine archaeological levels assigned to Clactonian, Acheulian and Mousterian cultures have been discovered during the 1950's excavations by A.M. Radmilli and J. Demangeot.

A technical study of lithic industries from ancient and new excavations give new results on this extraordinary open air site. Since 2012, hundreds of lithic artefacts have been discovered with few faunal remains. Use wear analysis shows well preserved marks. Lithostratigraphic correlations between the ancient and the new excavation are in progress thanks to a new stratigraphic section of 17m high and a 45 m sedimentary core. We try to characterize the environment and the age of human occupations. The morphology of the Quaternary deposits is known by electric resistivity. OSL and Ar/Ar dating are in progress on sands and volcanic deposits. Palynology and malacology are also started.

Valle Giumentina is of great interest both for Prehistory and Quaternary chronostratigraphy. It will help us to comprehend the Middle Pleistocene cultural evolution in Europe and the Mediterranean area.

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ORAL

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**22. 40AR/39AR CONSTRAINTS ON THE AGE OF LOWER PALAEOOLITHIC SITES IN CENTRAL ITALY**

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**(LATIUM AND MOLISE) DURING THE 400-300 KA PERIOD**

*Nomade, Sébastien (Laboratoire des Sciences du Climat et de l'Environnement, IPSL, CEA-CNRS-UVSQ, Avenue de la Terrasse, 91198 Gif-sur-Yvette Cedex, France) sebastien.nomade@lsce.ipsl.fr*

*Pereira, Alison (Département de Préhistoire du Muséum national d'Histoire Naturelle, Paris, UMR 7194 du CNRS, 1 rue René Panhard, 75013 Paris, France) alison.pereira@edu.mnhn.fr*

*Bahain, Jean-Jacques (Département de Préhistoire du Muséum national d'Histoire Naturelle, Paris, UMR 7194 du CNRS, 1 rue René Panhard, 75013 Paris, France) bahain@mnhn.fr*

*Arzarello, Marta (Sezione di Scienze Preistoriche e Antropologiche, Dipartimento di Studi Umanistici, Università degli Studi di Ferrara, C.so Ercole I d'Este 32, 44100 Ferrara, Italy) rzmrt@unife.it*

*Peretto, Carlo (Sezione di Scienze Preistoriche e Antropologiche, Dipartimento di Studi Umanistici, Università degli Studi di Ferrara, C.so Ercole I d'Este 32, 44100 Ferrara, Italy) carlo.peretto@unife.it*

*Piperno, Marcello (Membre du Conseil scientifique, Musée archéologique «Biagio Greco» Mondragone (Caserta) m.piperno@tin.it*

*Falguères, Christophe (Département de Préhistoire du Muséum national d'Histoire Naturelle, Paris, UMR 7194 du CNRS, 1 rue René Panhard, 75013 Paris, France) falguere@mnhn.fr*

*Guillou, Hervé (Laboratoire des Sciences du Climat et de l'Environnement, IPSL, CEA-CNRS-UVSQ, Avenue de la Terrasse, 91198 Gif-sur-Yvette Cedex, France) herve.guillou@lsce.ipsl.fr*

*Voinchet, Pierre (Département de Préhistoire du Muséum national d'Histoire Naturelle, Paris, UMR 7194 du CNRS, 1 rue René Panhard, 75013 Paris, France) pvoinch@mnhn.fr*

*Scao, Vincent (Laboratoire des Sciences du Climat et de l'Environnement, IPSL, CEA-CNRS-UVSQ, Avenue de la Terrasse, 91198 Gif-sur-Yvette Cedex, France) vincent.scao@lsce.ipsl.fr*

*Bulagrelli, Grazia (: Soprintendenza Archeologica di Roma, Piazza delle Finanze 1, 00185 Rome, Italy) graziabulgarelli@libero.it*

*Anzidei, Ana Paola (Soprintendenza Archeologica di Roma, Piazza delle Finanze 1, 00185 Rome, Italy) annapaola.anzidei@beniculturali.it*

Building a precise and accurate chronology for the cultural and hominins evolutions during the Lower Palaeolithic in Western Europe has always been a challenge. The Italian Peninsula, because of the quality, the number of sites from the Middle Pleistocene as well as the contemporaneous volcanic activity is a unique place in Western Europe. In the frame of a Italian-French multidisciplinary

team we started two years ago a program that aim at improving the chronology of some of the landmark sites of the Latium and Molise provinces using several methods ( $^{40}\text{Ar}/^{39}\text{Ar}$ , ESR-U/Th) and covering the period between 1 Ma and 300 ka.

In this contribution we will present the first  $^{40}\text{Ar}/^{39}\text{Ar}$  ages constraints we obtained using single sanidine crystal laser fusion method on three archeological sites: la Polledrara, Torre in Pietra, both located North East of Roma (Latium) and Guado San-Nicola found in the South of the Isernia la Pineta site (Molise).

These new ages show that all the investigated sites are all dated within a narrow time window between 400 to 310 ka that also encompassed the Devil footsteps that were found on the Roccamonfina volcano slope and the Ceprano calvarium (Scaillet et al., 2009, Nomade et al., 2012). Thank to these new chronological anchors we will discuss the cultural evolution in central Italy during the short period that covers the end of interglacial 11 and the interglacial 9. During our presentation we will also introduce a new approach we have developed based on the systematic  $^{40}\text{Ar}/^{39}\text{Ar}$  dating of sanidine single crystal in fluvial deposits.

Based on the first results we have we show that we are now able to evaluate the reshuffle of the volcanic materials within fluvial units, identify the sources (the volcano and sometimes a specific eruption) as well as give an maximum age to the deposition of these sediments. Our approach using the systematic dating of single crystal could be used in almost all archeological sites in Central and Southern Italy that contain primary volcanic deposits such as tephras or sedimentary layers containing feldspar crystals (Sanidine, Leucite).

# B13 Mathematical approaches for the study of Human-Fauna interactions in the Pleistocene

Organiser: Ana Mateos and Jesús Rodríguez with support of the Commission HaBCom de INQUA



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ORAL CONTRIBUTION

ORAL

## 1. QUANTITATIVE RECONSTRUCTIONS OF HOMININ ECOSPACES

*Hertler, Christine (ROCEEH, Senckenberg Research Institute)  
christine.hertler@senckenberg.de*

*Hölzchen, Ericson (ROCEEH, Senckenberg Research Institute)  
ericson.hoelzchen@senckenberg.de*

*Haupt, Susanne (ROCEEH, Senckenberg Research Institute)  
susanne.haupt@senckenberg.de*

*Volmer, Rebekka (ROCEEH, Senckenberg Research Institute)  
rebekka.volmer@senckenberg.de*

*Bruch, Angela (ROCEEH, Senckenberg Research Institute)  
angela.bruch@senckenberg.de*

*Märker, Michael (ROCEEH, University of Tübingen) michael.  
maerker@geographie.uni-tuebingen.de*

Identifying the ecological niches occupied by diverse hominin taxa represents an important step in modelling early hominin distribution and dispersal. Several parameters have already been suggested as being of decisive impact, for instance seasonality and primary productivity. Apparently, it is not easy to link this parameters with human behaviour in a direct way. The concept of ecospace summarizes a set of descriptive parameters including mammal communities, vegetation, climate, and landscapes, and permits testing correlations among them.

The ecospace concept is designed to compare ecosystems inhabited by diverse hominin taxa, eventually located on different continents and situated in different latitudes. It allows for the evaluation of correlations between ecologically relevant parameters. The aim is to develop a set of predictive factors, which can be tested with the fossil record of hominins. Which factors are relevant for hominins? Which types of ecosystems are selected by specific hominin taxa?

We introduce the ecospace concept in its theoretical context and illustrate it by focusing on ecosystems around the mid-Pleistocene transition in tropical and sub-tropical latitudes.

ORAL

## 2. CONCEPT "OUT OF AFRICA" BY MEANS OF AGENT-BASED MODELING (ABM)

*Hölzchen, Ericson (Senckenberg Research Institute, ROCEEH)  
ericson.hoelzchen@senckenberg.de*

*Hertler, Christine (Senckenberg Research Institute, ROCEEH)  
christine.hertler@senckenberg.de*

*Timm, Ingo J. (University of Trier, Business Informatics I) ingo.  
timm@uni-trier.de*

*Lorig, Fabian (University of Trier, Business Informatics I) lo-  
rigf@uni-trier.de*

*Gutmann, Mathias (Karlsruher Institut für Technologie, In-  
stitut für Philosophie) mathias.gutmann@kit.edu*

There are currently four competing hypotheses for the human dispersal out of Africa, via the Bab al Mandab Route, along the Levantine Corridor, the Sicily Route and/or the Gibraltar Route (Bar-Yosef and Belfer-Cohen 2001; Derricourt 2005; Armitage et al. 2011; Abbate and Sagri 2012). Several factors play a role for the human dispersal such as ecological variations and demographic pressure (Abbate and Sagri 2012), climatic changes (Agustí et al. 2009; Leroy et al. 2011; Van der Made 2011), biological and social organization (Van der Made 2011), dispersal of megafauna in Asia (Hemmer 2001), carnivore competition (Turner 1992), vegetation (Leroy et al. 2011). The evaluation of the contributions of each of the factors is still ongoing.

In the last decades, agent-based modeling (ABM) has been established as innovative methodology for modeling and simulating of artificial societies (Davidsson 2002). Within this project we develop a new approach for modeling and simulation of various human dispersal scenarios out of Africa. ABM enables us to analyze dynamic effects within artificial societies, i.e., emergence effects, which represent global effects resulting from local interaction of actors, the so-called agents, and the environment (Timm et al. 2006). Applied to the dispersal scenarios, external conditions, like climate or nutrition resources, have to be identified, specified and represented in the environment and individual behavior, capabilities, and interactions of tribes have to be considered in the agent model. The main question is how early hominins dispersed from Africa into Eurasia. This implies the questions when, where and under which prerequisites, constraints and circumstances hominins dispersed out of Africa and which routes were taken. Furthermore we may ask whether out of Africa was limited to members of Genus Homo or not and include the dispersal potential of different Homo species. With ABM we will model various scenarios in which we can simulate and compare different hypotheses.

ORAL

### 3. CLIMATIC NICHE DYNAMICS OF ANATOMICALLY MODERN HUMANS DURING THE LATE PLEISTOCENE

*Giampoudakis, Konstantinos (Center for Macroecology, Evolution and Climate) konstantinosg@snm.ku.dk*

*Marske, Katharine Ann (Center for Macroecology, Evolution and Climate) kamarske@snm.ku.dk*

*Ugan, Andrew (University of Utah) andrew.ugan@anthro.utah.edu*

*Singarayer, Joy (University of Reading) j.s.singarayer@reading.ac.uk*

*Borregaard, Michael (Mansfield College, Oxford) mkborregaard@snm.ku.dk*

*Valdes, Paul (University of Bristol) p.j.valdes@bristol.ac.uk*

*Carsten, Rahbek (Center for Macroecology, Evolution and Climate) crahbek@snm.ku.dk*

*Nogués-Bravo, David (Center for Macroecology, Evolution and Climate) dnogues@snm.ku.dk*

Many studies have assessed the relationship of Anatomically Modern Humans, AMHs, with climate and other megafauna species, including other Hominines, but a climatic niche-based perspective incorporating Community Ecology and Macroecology approaches has yet to be applied to the patterns and drivers of the great human expansion during the Late Pleistocene. The aim of this study is to describe and quantify climatic niche and range dynamics of Paleolithic Eurasian AMHs, from 46kya to 11kya (kya=thousands years ago), and to quantify the role of climatic forcing and technological/cultural transitions in those dynamics.

Using paleoclimatic simulations from AOGCMs (Atmospheric Ocean Coupled General Circulation Models) and 5,300 archaeologically associated radiocarbon dated materials we applied a community ecology framework to calculate metrics of niche overlap, niche breadth and marginality of the niche (distance of the mean conditions occupied by modern humans to the mean climatic conditions of Eurasia) between consecutive time periods. We also mapped the potential distributions of humans, calculated their range size for each time period using Climate Envelope Models (CEMs) and identified climatically stable areas through time as potential climatic refugia. Finally, we used General Additive Models to quantify the effect of climate forcing and techno-cultural changes on niche parameters and range size.

We can divide the climatic niche and range dynamics of AMHs for the time extent of the study into two periods,

largely coinciding with parts of Marine Isotope Stages (MIS) MIS3 and MIS2. In the first period (46kya – 24kya) humans' climatic niche was highly unstable, while the niche breadth was expanding with some time bins revealing an explosion of the niche, as humans occupied different climatic conditions. At the same time, we found that range size is increasing, and the distribution of humans is shifting into new areas, expanding from Europe towards the Far East through a mid-latitude belt, in South Siberia-China. In contrast the second period (24kya-11kya) revealed a much more stable niche, with a gradual decrease in niche breadth and continuous changes in range size.

The niche of Paleolithic Eurasian Anatomically Modern Humans drastically varied from 46kya to 11kya, with climate forcing being the most important factor driving these changes. During the climatically variable but less harsh MIS3, humans expanded their climatic niches and dispersed to new environments. Cultural transitions appeared to facilitate this expansion. In contrast, during the extreme conditions of the MIS2, which included the Last Glacial Maximum, the climatic niche of AMHs contracted and increased in marginality, in spite of technological transitions. It appears that AMH dealt with these extreme conditions by shifting geographically to track suitable climatic conditions instead of adapt to these new climatic conditions. This framework provides a quantitative reconstruction of AMH's spatiotemporal niche dynamics and allows quantification of the effects of climate forcing and cultural changes on the mode and tempo of the great expansion of modern humans across the planet.

ORAL

### 4. A NEW HIGH-RESOLUTION MULTI-PROXY RECORD FROM THE CROMERIAN STRATOTYPE AT WEST RUNTON, UK: PALAEOENVIRONMENTAL AND ANTHROPOLOGICAL IMPLICATIONS

*Rowney, Francis (Plymouth University) francis.rowney@plymouth.ac.uk*

*Whitehouse, Nicola (Plymouth University) nicola.whitehouse@plymouth.ac.uk*

*Candy, Ian (Royal Holloway, University of London) ian.candy@rhul.ac.uk*

*Fyfe, Ralph (Plymouth University) ralph.fyfe@plymouth.ac.uk*

*Schreve, Danielle (Royal Holloway, University of London) danielle.schreve@rhul.ac.uk*

The early Middle Pleistocene (MIS 19-13, c. 780-474 ka) is a critical period in the Lower Palaeolithic of Northern

Europe, during which time southern Britain represented the north-western fringe of hominin habitation. The region is therefore regarded as an area of sporadic hominin presence and periodic extirpation, for which an understanding of the environmental context is of fundamental importance. Thus, through the analysis of palaeoecological (entomological and palynological) records, this paper aims to refine understanding of the palaeoclimatic and macroecological characteristics of early Middle Pleistocene interglacials in Britain. This will aid the development of a more nuanced understanding of the ecology of, and potential stresses on, these marginal populations. Additionally, this will also facilitate a broader investigation into the terrestrial expression of the Mid-Brunhes Transition (MBT) (c. 430 ka) in Britain; potentially the most significant climatic transition of the last 800 ka. However, in spite of its significance, its expression in Northwest European terrestrial environments remains relatively poorly understood, due to the limited nature of previous analytical approaches and a paucity of high-resolution records.

A new high-resolution, multi-proxy palaeoenvironmental record from the stratotype for the Cromerian stage of Northern Europe, the West Runton Freshwater Bed (WRFB) on the North Sea coast of England, is an ongoing aspect of this work. Previous palaeoclimatic and palaeoecological studies of the WRFB have concluded that it was deposited in a temperate climate, similar to modern Britain, in a predominantly lentic freshwater habitat, with areas of both open grassland and mixed deciduous-coniferous woodland in the vicinity. However, these have been based on low-resolution records, with little attention paid to stratigraphic change through the sequences, thus new approaches to the collection and analysis of palaeoentomological and palynological data will allow for more detailed reconstructions.

Both palaeoecological and palaeoclimatic analyses will be carried out, utilising entomological and palynological assemblages from the WRFB. Palaeotemperatures will be reconstructed using the mutual climatic range (MCR) technique, applied to insect assemblages, and an ecological functional-type approach will be utilised in the analysis of both insect and pollen assemblages in order to provide an ecologically-based palaeolandscape reconstruction.

Preliminary results from this new high-resolution multi-proxy palaeoenvironmental record for the WRFB will be presented, including sedimentology and outline palynological and palaeoentomological records.

The new palaeoclimatic and palaeoecological records will be summarised, and their significance regarding the character of early Middle Pleistocene interglacial environments in Britain, and the implications for Lower Palaeolithic populations, will be discussed and evaluated.

ORAL

## 5. FITTING A SURVIVAL MODEL TO DESCRIBE THE AGE STRUCTURE OF FOSSIL POPULATIONS

*Martín-González, Jesús A. (UBU - CENIEH) [jesusangel.martin@ubu.cenieh.es](mailto:jesusangel.martin@ubu.cenieh.es)*

*Mateos, Ana (CENIEH) [ana.mateos@cenieh.es](mailto:ana.mateos@cenieh.es)*

*Rodríguez-Gómez, Guillermo (CENIEH) [guillermo.rodri-guez@cenieh.es](mailto:guillermo.rodri-guez@cenieh.es)*

*Rodríguez, Jesús (CENIEH) [jesus.rodriguez@cenieh.es](mailto:jesus.rodriguez@cenieh.es)*

Building mortality profiles to study age-at death patterns is a typical component of most faunal analyses. These age profiles are used to reconstruct aspects of a sample's taphonomical history, including prey selection or mode of accumulation. The attritional profile, produced by natural deaths by predation, disease, etc., reflects the animals dead by each age class in a living population. Several methods, like histograms, boxplots and triangular plots are currently used to describe and compare mortality profiles and living population profiles.

The main goal of this study is to reconstruct the age structure of fossil populations from attritional mortality profiles by assuming that this structure may be mathematically modeled by a survival model. Eventually, demographic parameters as life expectancy at birth, birth rate, mortality rate, etc, may be estimated from the model. Moreover, descriptions and comparisons between fossil and living populations can be developed.

Dental eruption, dental attrition, epiphyseal fusion and skeletochronology provide reliable estimations of the age at death from fossil samples. However, although some of these techniques are claimed to provide punctual age estimations, most of them provide interval age estimations. The age intervals may be equal for all life stages but more frequently they are different in length for different life stages. These type of data are called censored data in statistics analysis. The nature of censored data produce limitations in the estimations and require the use of specific statistical techniques.

If the age at death is reliably known with high accuracy (no censored data) several models can be easily

proposed by estimating the parameters using the maximum likelihood method. However, censored data make it more difficult to obtain a likelihood function.

Several models are fitted to a sample with interval censored data and the best one is selected. The set of models used are called Exponential, Weibull, Log-Normal, Extreme value, and Gamma and Rayleigh. These are typical models used in survival analysis.

All the tested models fit the data. However, Exponential and Weibull present better performance. Both of them exhibit a similarly good adjustment to the data, but the use of the exponential model is recommended because of its simplicity. Note that the Exponential model has only one parameter whilst Weibull has two. The parameter to be estimated in the case of the exponential model is  $\lambda$ . This can be interpreted like the mean time of death is  $1/\lambda$  years. Moreover, the Survival Function, i.e. the proportion of individuals alive at time  $t$ , or the Lifetime Function, i.e. proportion of individuals with more than  $t$  years, can be easily obtained. These functions, besides the mortality profile, are useful to compare populations.

Mathematical and statistical techniques have been found to be useful for the description, comparison and analysis of the age structure of fossil populations. In addition, the features of the fossil record, as the limitations in the size of the sample, and the nature of censored data, are properly dealt with using these techniques.

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ORAL

**6. INFERENCES OF SOCIAL BEHAVIOR IN BONE-CRACKING HYAENIDS (CARNIVORA, HYAENIDAE): COMPUTERIZED PALEONEUROLOGICAL TECHNIQUES SHED LIGHT ON THE HUMAN-CARNIVORE INTERACTIONS IN THE EUROPEAN PLEISTOCENE.**

*Vinuesa, Víctor (Institut Català de Paleontologia Miquel Crusafont, Universitat Autònoma de Barcelona, Campus de la UAB, c/ de les Columnes s/n, 08193 Cerdanyola del Vallès, Barcelona, Spain) victor.vinuesa@icp.cat*

*Iurino, Dawid (Dipartimento di Scienze della Terra, Sapienza Università di Roma, Piazzale Aldo Moro 5, 00185 Roma, Italy) dawid.iurino@uniroma1.it*

*Madurell Malapeira, Joan (Dipartimento di Scienze della Terra, Sapienza Università di Roma, Piazzale Aldo Moro 5, 00185 Roma, Italy) joan.madurell@icp.cat*

*Fortuny, Josep (Institut Català de Paleontologia Miquel Crusafont, Universitat Autònoma de Barcelona, Campus de la UAB, c/ de les Columnes s/n, 08193 Cerdanyola del Vallès,*

*Barcelona, Spain) josep.fortuny@icp.cat*

*Sardella, Raffaele (Dipartimento di Scienze della Terra, Sapienza Università di Roma, Piazzale Aldo Moro 5, 00185 Roma, Italy)*

*raffaele.sardella@uniroma1.it*

*Alba, David M. (Institut Català de Paleontologia Miquel Crusafont, Universitat Autònoma de Barcelona, Campus de la UAB, c/ de les Columnes s/n, 08193 Cerdanyola del Vallès, Barcelona, Spain) david.alba@icp.cat*

The presence of large predators is one of the main factors that probably affected the successive dispersal of humans across the Mediterranean area during the Pleistocene. In this respect, food acquisition must have been one of the key problems for these human populations to overcome in an environment subject to periodic glaciations. Several authors have suggested that the survival of these hominins during the cold seasons was probably made possible through the development of scavenging strategies focused on ungulate carcasses. The availability of these carcasses depends to a large extent on the internal structure of the carnivore guild and the intrinsic relationships between top predators.

Previous works have suggested, based on available taphonomical evidence, that sabertoothed and conical-toothed cats as well as bone-cracking hyenas developed complex social behaviors of hunting in packs. Concerning hyaenids, the degree of gregariousness among extant species is variable, with *Crocuta crocuta* being the most social hyena. For some extinct hyaenids, paleobiological inferences on social behavior have been made on the basis of bone accumulations in putative dens of *Pachycrocuta brevirostris* and *Crocuta spelaea*. Some studies have also relied on encephalization metrics (relative brain size) to infer social behavior on fossil carnivorans in general, or extant hyaenids in particular, although no study had previously focused on an extinct hyaenid.

A recent analysis focused on extant hyaenids, following a research line initiated by Holekamp and coauthors, established a positive correlation between the relative size of the anterior brain and group size—with the most social *Crocuta* displaying the greatest development of this region, and the solitary *Proteles* the least. Besides several other structures, the anterior region of the brain is mainly constituted by the frontal cortex. In primates and other mammals, the frontal cortex intervenes in complex cognitive processes related to social decision-making, such as the inhibitory behaviors required in complex fission-fusion societies. Therefore, a relatively larger frontal cortex may reflect the enhanced abilities required to process social information.

In the present study, the shape and size of the internal cranial cavities of *Pliocrocota perrieri* and *Crocota spelaea* are compared with those of extant hyaenids with the aid of computed tomography techniques. Our results indicate that *Pliocrocota* displays an anterior cerebrum relatively smaller than in all extant bone-cracking hyenas whereas *C. spelaea* shows an anterior cerebrum of the same relative size as the highly social *C. crocuta*. These facts suggest that *P. perrieri* possessed less developed cognitive abilities than extant bone-cracking hyenas and *C. spelaea* for processing the information associated with complex social behaviors.

The reported evidence supports previous taphonomical data, indicating a highly social behavior for *C. spelaea* and further suggesting the existence competition for food resources between this hyena and Pleistocene hominins. The results for *P. perrieri*, in turn, contradict previous assumptions of complex social behaviors for all Pleistocene bone-cracking hyenas. Further research based on other bone-cracking hyenas coeval with humans, such as *Pachycrocota brevis*, are required to further evaluate the role played by trophic competition between hyaenids and early *Homo* during the Pleistocene.

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## 7. ASSESSING COMPETITION RELATIONSHIPS ON THE BASIS OF COMPETITION-FREE CARRYING CAPACITY

Rebekka, Volmer (Senckenberg Research Institute) rebekka.volmer@senckenberg.de  
Christine, Hertler (Senckenberg Research Institute) christine.hertler@senckenberg.de

The evolution of humans must be understood in their ecological context. Hominins had to cope with environmental conditions like climate, vegetation, resources and competitors.

Since meat played a key role in human evolution the impact of interspecific competition for prey in fossil carnivore guilds needs to be assessed.

To analyze guild structure and the role of guild members we introduce a model based on the theory of competition effects. In this model prey is considered as a limited resource. The guild depends on this resource and consumption of the resource by one guild member must

affect other guild members. To calculate the effects of competition we developed the concept of competition-free carrying capacity (CFCC). The ecological term 'carrying capacity' means the maximum population size of a specific species in a given habitat. The CFCC represents the population size a guild member could reach if all other guild members were absent and it consumed all available prey mass on its own. In this regard, only prey categories relevant to the specific guild member are used. To calculate the CFCC we characterize the guild member by its actual population size, prey mass requirements and prey spectrum. The prey spectrum is very important, because not all potential prey species constitute essential resources for each guild member. Thus the prey is characterized by its size and sorted into prey mass classes. The prey spectrum comprises the prey classes that a guild member hunts. Next we calculated the CFCC for each guild member. The prey consumption of each guild member in each prey category allows the calculation of the capacity loss of one guild member to another. We call the percentage loss of CFCC of one guild member to another 'competition effect'. The structures of carnivore guilds from the Pleistocene of the Indonesian Archipelago are assessed by the model. The results reveal new invaders are challenged to establish in an existing carnivore guild. Further it is discussed whether faunal changes in the prey guild can be responses to high predation pressure.

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## 8. COMPETENCE INDEXES TO COMPARE ENVIRONMENT CONDITIONS FOR SECONDARY CONSUMERS BETWEEN DIFFERENT FAUNAL ASSEMBLAGES

Rodríguez-Gómez, Guillermo (Centro Nacional de Investigación sobre la Evolución Humana (CENIEH), Paseo Sierra de Atapuerca 3, 09002, Burgos, Spain.) guillermo.rodriguez@cenieh.es; guillerwilson@gmail.com  
Martín-González, Jesús A. (Departamento de Matemáticas y computación, Universidad de Burgos, Plaza Misael Bañuelos s/n, 09001, Burgos, Spain. Temporarily assigned to CENIEH.) jesus.martin@tfo.upm.es  
Mateos, Ana (Centro Nacional de Investigación sobre la Evolución Humana (CENIEH), Paseo Sierra de Atapuerca 3, 09002, Burgos, Spain.) ana.mateos@cenieh.es  
Rodríguez, Jesús (Centro Nacional de Investigación sobre la Evolución Humana (CENIEH), Paseo Sierra de Atapuerca 3, 09002, Burgos, Spain.) jesus.rodriguez@cenieh.es

The availability of resources and the competition with secondary consumer have been proposed as

key limiting factor for the European human dispersals during Early and Middle Pleistocene. However, to determine the actual influence of these factors on the distribution of human populations it is necessary to quantify them and compare the values among different sites or environmental conditions. A standard method to measure competition intensity and resource availability in different assemblages is thus required.

The ratio primary consumer biomass to secondary consumer biomass is commonly used to describe trophic conditions of a mammal community. However, this ratio is an oversimplification, since the feed habits and limitations of the secondary consumers are not taken into account. We present different indexes to measure the intensity of competition between secondary consumers in faunal assemblages with a standard approach using a mathematical model based on Leslie Matrices. In this way, competition intensity may be compared between different faunal assemblages. The mathematical model provides sustainable densities for each secondary consumer species in an assemblage, taking into account the available prey and the competitors, while expected densities are estimated from allometric equations. We apply several indexes to these results relating estimated and expected densities, number of individuals and biomass for secondary consumers.

The different indexes provide different information helpful to analyze competition intensity between secondary consumers. Comparing several faunal samples with these indexes would be a first step to get a standardized tool.

Several methods to estimate the intensity of competition between secondary consumer in faunal assemblages are presented. These methods are based on the estimated densities obtained from a mathematical model, which standardizes the estimations of competition intensity allowing comparisons between different assemblages to be carried out. However, the faunal assemblages included in the comparison should be complete enough, i.e. representative of the living community, in order to make these estimations reliable.

*Caparros, Miguel (Muséum National d'Histoire Naturelle, Département de Préhistoire, Paris) capmig@aol.com*  
*Barroso, Cecilio (Director of the Cueva de Zafarraya research project.) ceciliobarroso1@hotmail.com*  
*Moigne, Anne Marie (Muséum National d'Histoire Naturelle, CERP, Tautavel) moigne@mnhn.fr*  
*Monclova, Antonio (Grupo PAI-HUM 440, Área de Prehistoria. Facultad Filosofía y Letras, Cádiz) anmonc@terra.com*

We present here a novel approach to study the interactions of Neanderthals and carnivores in the cave of Zafarraya by comparing the lithic archaeological and faunal records of the site with a statistical path analysis.

A multiple regression with independent variables such as for example lithic and carnivore elements could be used to explain herbivore accumulation, the dependent variable. The main drawback of multiple regression is that it assumes that the independent variables are direct unrelated causes of the dependent variable, disregarding the indirect causal relationship that might exist between them. Alternatively one could use the correlation coefficients between all the variables to make inferences on herbivore accumulation and Neanderthal – carnivore competition for nutritional resources. However, correlation analysis serves to determine only whether two variables are interdependent or co-vary, but does not assert a causal relationship between them. Path analysis, developed by Sewall Wright (1968), is a powerful statistical technique considered as an extension of multiple-regression that takes into account the effects of correlated independent variables. In light of the shortcoming of regression and correlation analyses, we used a statistical path analysis to infer the causal relationships between the herbivore prey accumulations and the presence of accumulators (carnivores and Neanderthals) in this site after taking into account the reciprocal influence of the accumulator variables.

The results of the statistical analyses confirm and shed further light on previous taphonomic and zooarcheological research. The findings concur with the two-species Lotka-Volterra competition model for resources which stipulates that when niche overlap is complete the species with the larger fitness excludes the other. Our analysis shows that in the immediate vicinity of the cave the fitness of *Panthera* was greater than Neanderthals', i.e. when *Panthera* was present it excluded Neanderthals as evidenced by the record of *Capra* and *Rupicapra* remains. It also shows that further in the southern hills and the polje where large herbivores roamed, Neanderthals had a greater fitness than carnivores which translated into their primary

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## 9. ANALYZING NEANDERTHALS AND CARNIVORES INTERACTIONS IN THE SURROUNDINGS OF THE CAVE OF ZAFARRAYA (SPAIN) BY MEANS OF A STATISTICAL PATH ANALYSIS.

accumulation in the cave of remains of *C. elaphus* and other large herbivores.

Coexistence from occasional niche overlap is apparent when one or the other predator scavenged, but from a time prospective it must have been short periods linked to seasonality, weather conditions and occupation randomness. In Zafarraya, the archaeological record would indicate that the degree of fitness of the herbivore prey accumulators, carnivores or Neanderthals, was related to the nature of the geomorphological domains in the vicinity of the cave and the favored foraging areas of hunted herbivores.

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ORAL

**10. EXPLORING PALEO FOOD-WEBS IN THE EUROPEAN EARLY AND MIDDLE PLEISTOCENE: A NETWORK APPROACH**

*Lozano, Sergi (IPHES & URV) - slozano@iphes.cat*

*Mateos, Ana (CENIEH) ana.mateos@cenieh.es*

*Prignano, Luce (IPHES & URV) luceprignano@yahoo.it*

*Rodríguez-Gómez, Guillermo (CENIEH) guillermo.rodri-guez@cenieh.es*

*Rodríguez, Jesús (CENIEH) jesus.rodri-guez@cenieh.es*

Food webs are networks of feeding (trophic) interactions among species. As any other network approach, research on food webs focuses its analysis on the structure of direct and indirect interactions among diverse species, rather than looking at the particularities of certain taxa. In recent times, scholars have collected an impressive amount of empirical food-web data to study present day terrestrial and aquatic habitats. Moreover, there is an increasing literature on the construction of theoretical models of food-web structure to understand dynamics of ecological communities (for instance, robustness to the extinction of certain species or introduction of new ones).

This approach has also been applied to trophic interactions represented in the fossil record of extinct ecosystems. Since the seminal paper by Dune *et al.* on Cambrian food-webs, several authors have reconstructed and/or modeled paleo or fossil food-webs. Nevertheless, to our knowledge, none of them has addressed the role played by the different Pleistocene hominin species as part of such food-webs. In this work, we aim at filling this gap (at least, partially) by focusing on the Early and Middle Pleistocene paleocommunities in Western Eurasia. Our goal is to improve our understanding on

changes experienced by large mammals' interactions during this period, and shed some light on the influence of and on *Homo* species of those changes.

We have constructed up to 25 paleo food-webs from the archaeo-paleontological record of European assemblages, covering from the Middle Villafranchian to the Late Galerian. Only large mammals have been considered, including a couple of *Homo* species that are present in 10 food-webs. In order to address our research questions, we will develop a two-steps analysis. First, we will calculate the main structural features of all the networks, and compare them across geographical areas, periods and cases with and without *Homo* species. Second, we will perform computational experiments on the obtained networks (and, eventually, also on synthetic ones generated from theoretical models) focusing on dynamical aspects of hominin interactions with other large mammals.

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POSTER

POSTER

**THE NEDEMO (NEANDERTHAL DEMISE MODELISATION) PROJECT.**

*Degioanni, Anna (AMU, CNRS, MCC, LAMPEA UMR 7269 - BP 647 5 rue du Château de l'Horloge 13094 Aix-en-Provence Cedex 2, France) anna.degioanni@univ-amu.fr*

*Bonenfant, Christophe (UMR5558 LBBE, Université Claude Bernard, Lyon 1, 43 Bl du 11 novembre 1918, 69622 Villeurbanne, France)*

*Gourjon, Géraud (AMU, CNRS, MCC, LAMPEA UMR 7269 - BP 647 5 rue du Château de l'Horloge 13094 Aix-en-Provence Cedex 2, France) christophe.bonenfant@univ-lyon1.fr*

*Brugal, Jean Philippe (AMU, CNRS, MCC, LAMPEA UMR 7269 - BP 647 5 rue du Château de l'Horloge 13094 Aix-en-Provence Cedex 2, France) brugal@msh.univ-aix.fr*

*Coulon, Mathieu (AMU, CNRS, MCC, LAMES UMR 7305 - BP 647- 5 rue du Château de l'Horloge 13094 Aix-en-Provence Cedex 2, France) coulon@msh.univ-aix.fr*

*Fernandez, Philippe (AMU, CNRS, MCC, LAMPEA UMR 7269 - BP 647 5 rue du Château de l'Horloge 13094 Aix-en-Provence Cedex 2, France) philippe.martin@u-bordeaux.fr*

*Cabut, Sandrine (AMU, CNRS, MCC, LAMPEA UMR 7269 - BP 647 5 rue du Château de l'Horloge 13094 Aix-en-Provence Cedex 2, France) cabut@msh.univ-aix.fr*

*Condemi, Silvana (AMU, CNRS, EFS, ADES UMR 7268 Faculté de Médecine, 51 Bd Pierre Dramard 13344 MARSEILLE Cedex 15, France) silvana.condemi@univ-amu.fr*

The Neanderthals are a typical European Middle and Upper Pleistocene population that emerged at around 400.000 BP and became extinct at around 30.000 years BP. The causes of their demise are the topic of heated scientific debate. Many hypotheses have been advanced to account for it, notably competition with modern humans following their arrival on the European continent, accompanied by major climate changes (OIS 3) that resulted in great changes in the availability of natural resources. Three scenarios have been proposed:

- 1) Modern humans replaced Neanderthals in Europe;
- 2) Modern humans assimilated the Neanderthal population;
- 3) Modern humans replaced and partly assimilated Neanderthals.

In order to test these scenarios, the NEDEMO project intends to create a network of pluridisciplinary research as a means of identifying the demographic parameters (fertility, survival, structure and variation in the size of the population) that brought about the Neanderthal demise. Although the Neanderthal demographic parameters are not known with precision, they can be inferred through the integration of genetic, environmental, fossil and archaeological data.

To determine which of the three proposed scenarios is most likely, we will use an approach based on demographic modeling, which is widely employed in ecology and has provided a powerful tool of strong heuristic value for the study of the dynamics of animal populations.

Each scenario will be translated in terms of mathematical functions (or demographic models). For this purpose, as in all modeling work, we will simplify and interlink biological, social and environmental processes that may explain the disappearance of Neanderthal. This approach will also enable us to test different hypotheses and, in addition, determine the value of *a priori* parameters that are not measurable.

In the framework of this section, we aim to present this resolutely pluridisciplinary project. At present, researchers are involved in diverse disciplinary fields (anthropobiology, genetics, ecology, paleoanthropology, paleoecology and archeozoology) and we hope to stimulate interest in this project among researchers from other disciplines in the hope of enlarging our network of collaboration.

POSTER

## FUNCTIONAL DIVERSITY, A TOOL FOR MODELING ECOSYSTEM RESPONSES TO CLIMATE CHANGES

*Palombo, Maria Rita (Dip. Scienze della Terra, Sapienza Università di Roma, Italy) mariarita.palombo@uniroma1.it*

Functional diversity (the amount of inter-specific variation in functional traits in an ecological community) has been receiving increased attention in ecological studies because it does not treat all species identically, as taxonomical diversity does, but rather according to the role they have within a community. Therefore, functional diversity can provide information capable of revealing the processes that structured past faunal complexes (FCs) (seen as "spatio-temporal" metacommunities) and promoted their dynamic changes. Each FC gathers faunal assemblages from different territories, thus species composition of local fauna may differ from site to site, though the ecological structure may be substantially the same. In such cases, it is appropriate to classify species into functional groups and study the changes in their relative abundance over time. This allows to quantify the functional aspect of biodiversity and to establish its relationships with ecosystem functioning and environmental constraints through changes in the amount of resource partitioning among species.

For analyzing functional diversity, the population density (that is marginally affected by climatic and geographical factors) can be regarded as a proxy for the abundance of individuals of a species in a FC. This approach proposed here has the advantage of avoiding the effects of time averaging on fossil data and other sampling issues that palaeontologists routinely face (e.g. taphonomic biases). During the past two decades, a number of studies have examined the relationship between body mass and population density across a wide variety of habitats and in various animal groups. A number of equations have been proposed to calculate density, trying to resolve inconsistencies in the observed scaling of mammal abundance among ecological and taxonomic groups. I estimated the population density for fossil species by using species-specific predictive equations based on the body-mass calculated for each species by averaging all the body masses obtained by the predictive equations with the lowest predictive errors, and the population density reported for its extant relatives. The research focused on the variation throughout the Pleistocene of the relative abundance of mammalian ecological groups in SW European FCs, examined in the light of climate



and environmental changes and perturbations of biotic interactions.

The analysis hints at different patterns in each studied sub-region (Iberian Peninsula, France and Italy), though some general trends can be detected in the changing ecological structure of FCs. In particular, results obtained show that the biomass of prey was high (especially in Italy and France) shortly before the Jaramillo submagnetochron, during the ensuing Early Pleistocene and, more markedly, during the Middle Pleistocene, following a pattern irrespective of prey and predator richness. Result obtained suggests that, at that time of first hominins appearance in SW Europe, a variety of resources were present for carnivores, reducing the intra-guild competition and giving any advantage to archaic hominins, viewed as opportunistic species with some scavenging behaviour.

A further developing of this analytical approach should help to answering the question about to what extent changes in environments had a role in shaping the dynamics of European hominin populations during the Early and Middle Pleistocene.

# B14 An Archaeology of fuels: social and environmental factors in behavioural strategies of multiresource management

Organiser: Ethel Allué, Llorenç Picornell and Marie Agnès Courty

This session is sponsored by the Repsol Foundation

Tuesday 2nd (9:00 to 13:00 14:00 to 15:00)

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ORAL CONTRIBUTION

ORAL

### 1. A DIACHRONIC REVIEW OF MACROFOSSIL EVIDENCES OF FIREWOOD RELATED TO NEANDERTHAL OCCUPATIONS AT ABRIC ROMANÍ

*Solé, Alex (IPHES) alexsole1@gmail.com*

Travertine sedimentary environment at Middle Palaeolithic layers from Abric Romaní has allowed a particular preservation of firewood remains. These firewood evidences (wood imprints charred wood and charcoal) permits to discuss wood gathering and management among Palaeolithic hunter-gatherers. The sequence dated using U-series (U/Th) spans from 70 to 40 kyrs, wooden remains were recorded from layer H to layer P. This work analyzes from a diachronic perspective how the variations related to the type of occupations, rock-shelter morphology and taphonomical agents along the sequence, could have an effect on the wooden assemblage.

Methodology was based on the typological analyses of the wood remains according to size and distribution patterns. Variables analyzed are mostly related to field data. Field record consisted in the documentation of the category, the stratigraphic setting, the position in the excavation grid, the measurements, the orientation and the inclination. The wooden imprints were also drawn in detail information of location and surface features. We carried out three approaches in spatial analyses: the distance from the wall, the relationship with hearth structures and the density of occupation.

Examination of spatial pattern permits to consider different incidence of natural and anthropic agents in the wood assemblage formation. This incidence can be related with two facts: The outer part of the rock shelter was more exposed to natural agents and the occupation core was located near the wall. There are several typologies of wood assemblages due to its measurements distribution and degree of combustion.

Using spatial distribution patterns and measurements of wood imprints recovered at Abric Romaní we have been able to draw conclusions concerning firewood management among Neanderthal human groups. Abric Romaní's firewood remains, are a useful and innovative tool to discuss issues as the variability of measures and morphologies of wood collected for fuel and the different exploitation patterns depending on the intrinsic characteristics of assemblage and spatial distribution reflecting a differential use of space. As anthropic related assemblage, the wood remains show variability, depending to the type of occupation mode and reflecting different activities and/or different moments of abandonment. Furthermore the changes of rock shelter morphology along the sequence were the main features affecting the incidence and variability of taphonomical agents.

ORAL

### 2. FIRING-RECORDS REVEALING ANCESTRAL PROCESSING OF PEAT-DERIVED ENERGY RESOURCES AND HIGH-VALUE FUEL BYPRODUCTS

*Courty, Marie-Agnès (CNRS) marie-agnes.courty@promes.cnrs.fr*

Ancient firing activities are now commonly investigated by high resolution analysis of charcoal-rich ash microfacies and combustion features. Their diagnostic features relate to the general assumption that fresh biomass fuels have been the major energy sources until the modern shift to fossil combustible. Fresh biomass fuels have been assumed to always produce fair amount of pyroresidues (carbonized charcoal, charred bones, calcinated ash) and combustion features. Therefore, their absence or scanty microcharcoal are commonly related to a loss of palethnological information by taphonomical processes. The common use in ancient times of matured hydrocarbon-rich fuel from transformed biomass sources seems to have been underestimated. Therefore, signatures of these energy resources in the archaeological fire records have remained so far unknown or misinterpreted. We intend here to establish the use for long time periods of peat-like fuel based on early Paleolithic to Middle age firing records.

The integrated field/multi-analytical that we have developed to tracing the unusual pyroresidues with distinctive mineral grains, specific of peat-like fuel, and for characterizing their origin is presented. This includes: films and filaments made of aliphatic polymers with

nano-sized metal inclusions; vitrous glassy carbon with barium sulphate and metal sulphide inclusions; glassy scoriaceous spherules and beads with native metal blebs; polyphased microbreccia, sandstones and angular quartz with refractory inclusions (zircon, rare earth phosphates) and sprayed nanostructured metallic ribbon.

We illustrate the range of peat-like sources with these particular characteristics which might have been easily available to ancient populations along incised valleys, small basins, coastlands or exokarst deposits. We explain how these peat-like geomaterials rapidly accumulated during particular episodes of enhanced cosmic activity, aerosol dust loading, lightning strikes and violent storms. We present the most remarkable properties of the peat-like fuel, i.e. high inflammability due to organic-rich volatile compounds, high calorific capacity, high thermal resistance, mechanical plasticity and high content in native metals, oxides and nanostructured graphite. Various archaeological situations illustrate how their spatial pattern at microscales helps to identify processing areas with particular hearths and material production for various purposes, i.e. constructions (bricks, floors, plastering), ceramics, surface treatment and high-value objects (carbon-rich clay, bitumen, organic ligands, hydraulic cement, organo-mineral-pigments, carbon-rich metals). We deduce from the high quality of the manufactured products and scarcity of the microresidues in living floors that the precious energy resource was meticulously used with minimal loss. We explain how the remarkable mechanical and thermal resistance of the carbonaceous byproducts has played a major role in the long-term preservation of the related living floors. This suggests that the integrity of all archaeological records is closely linked to the use of peat-like fuel. Based on archaeological situations, we present a typology of microresidues and related microfacies from peat-like fuel that is aimed to identify the collect of surface raw resources, from recycling of activity refuse and from the exploitation of subsurface aged sources.

This reveals a wide range of ancestral use of the peat-like fuel from rudimentary technology to well organized energy production systems that were probably under the control of complex pre-industrial societies.

ORAL

### 3. PHYTOLITH STUDIES APPLIED TO COMBUSTION STRUCTURES: THE CASE OF THE MIDDLE PALEOLITHIC SITE OF EL SALT (ALCOY, ALICANTE)

*Rodríguez-Cintas, Àgata (Universitat de Barcelona) agata.roci@gmail.com*

*Cabanes, Dan (Universitat de Barcelona) dancabanes@ub.edu*

El Salt is a Middle Paleolithic site (ca. 60 and 45 Kyr BP) located in Alcoy (Alicante, Spain). The presence of recurrent Neanderthal occupations are recorded by a succession of hearths and other remains derived from human activities. In this sense, the abundance of combustion structures allows to perform a detailed study of the Neanderthal fire technology. Here we present the results of the mineralogical (FTIR) and phytolith analyses for 10 hearths from the layer Xb.

Mineralogical composition was analysed using an iS5 FT-IR Nicolet Thermo Scientific Spectrometer. The phytolith extraction was made using the method of Katz et al. (2010) and identification was carried out using the standard literature and the International Code for Phytolith Nomenclature (ICPN).

Preliminary analyses show that the main mineral components are clay and calcite, with minor presence of quartz and autigenic dahllite. These results indicate that ashes and travertine forming the infilling are well preserved (calcite) with only minor diagenetic alterations (dahllite). The presence of interconnected phytoliths morphologies and the low number of weathered morphotypes indicate that phytolith preservation is good despite the calcitic nature of the deposit.

Phytoliths assemblages are mainly composed by monocotyledonous (C3 grasses), dicotyledonous (wood/bark and leaves), and especially *Celtis sp.* seed morphotypes in different amounts. *Celtis* presence was additionally confirmed by thin section and during the excavation. The phytoliths assemblages show differences between the hearths analysed.

The variability observed can be interpreted as the result of anthropogenic choices made on the vegetal material available at the moment of the combustion structures function. These choices are reflected in changes on the phytoliths morphotypes represented in the combustion structures (dicotyledonous leaves, fruits, etc.).

ORAL

### 4. AN ETHNOARCHEOLOGICAL STUDY OF LIVE-STOCK DUNG FUELS FROM COOKING INSTALLATIONS IN NORTHERN TUNISIA

Portillo, Marta (ERAAUB, Department of Prehistory, Ancient History and Archaeology, University of Barcelona) mportillo@ub.edu

Belarte, M. Carme (ICREA/ Institut Català d'Arqueologia Clàssica, ICAC) cbelarte@icac.cat

Ramon, Joan (GRACPE, Department of Prehistory, Ancient History and Archaeology, University of Barcelona) jrborrell@ub.edu

Kallala, Nabil (Institut National de Patrimoine de Tunisie/ Faculté des Sciences Humaines et Sociales, Université de Tunisie) nabilkallala@yahoo.fr

Sanmartí, Joan (GRACPE, Department of Prehistory, Ancient History and Archaeology, University of Barcelona) rmalbert@ub.edu

Albert, Rosa M. (ICREA/ ERAAUB, Department of Prehistory, Ancient History and Archaeology, University of Barcelona) rmalbert@ub.edu

Livestock dung is a valuable source of fuel in many rural communities around the world. Ethnographic evidence from northern Africa shows that in areas where the woody vegetation is sparse, the use of dung materials is more extended than in areas where there is no shortage of firewood. Such is the situation of our study area, the site of Althiburos and its surroundings, now el Médéina, located in a small fluvial valley on the northern edge of the Ksour massif, in northwestern Tunisia. Within the present-day rural communities in this region, sheep and goat dung is the main source of fuel for domestic use, including daily cooking in mud cylindrical *tannur* type ovens, namely *tabouna*. Mud constructed cooking and baking installations are also common in archaeological contexts belonging to the first millennium BC.

We present a study of cooking installations from the numidian site of Althiburos, primarily from microfossil evidence extracted from well-defined domestic hearths and cylindrical ovens similar to modern *tabounas*, using ethnoarchaeological approaches. Field work included ethnographic observations and interviews (dung production, management, storage, waste disposal and cooking and baking activities), time measurements from the initial fire lighting and the end of cooking and temperature measurements within the burning fuel, as well as modern material sampling for comparative purposes (ovicaprine fresh dung, burned pellets, dung ashes from *tabouna* ovens, trash paths and abandoned installations). Additionally, experimental samples obtained from controlled-burning dung pellets from the same animal producers are also analyzed to better understand taphonomic aspects dealing with dung microfossil preservation.

The results obtained from integrated studies of phytoliths (plant silica cells), dung spherulites (calcitic particles produced in the digestive tract of many animals) and calcitic ash pseudomorphs (primarily originating from wood), provided direct evidence from the type of fuel matter, a mixing of vegetal matter (wood and perhaps grass leaves and stems from agricultural by-products) and dung. Dung was used as source of fuel material across time (from the Ancient Numidian occupation phase, 10<sup>th</sup> century BC to the last centuries BC) and space (in different site areas and type of firing installations).

Such integrated studies demonstrate the value of combining different microarchaeological techniques and the use of ethnoarchaeological material from the site areas.

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## ORAL

### 5. "FIRE-STICK FARMING": THE PLACE OF FUEL WOOD IN A MULTI-RESOURCE FIRE REGIME

Carah, Xavier (The University of Queensland) xavier.carah@uqconnect.edu.au

Clarkson, Chris (The University of Queensland) c.clarkson@uq.edu.au

Marwick, Ben (University of Washington) b.marwick@uw.edu

Fullagar, Richard (University of Wollongong) fullagar@uow.edu.au

Wallis, Lynley (The University of Queensland) lynley.wallis@wallisheritageconsulting.com.au

The tropical savanna of Northern Australia is a complex anthropogenic landscape, which has been dramatically altered through climatic and anthropogenic processes over the last 50,000 years. These changes have been driven by climatic, geomorphic and environmental changes, as well as anthropogenic impacts on flora and fauna. Fire regimes have been observed in Australia since European contact and there is strong evidence for their operation well into prehistory (termed by Jones [1969] as 'fire-stick farming'). The management of fuel wood availability in the landscape was almost certainly an integral part of any fire regime. However, previous research has focused only on the importance of management by fire of landscape productivity and subsistence systems. Research discussed in this paper seeks to address this oversight.

An anthracological analysis of hearth charcoal from the rock shelter site of Madjedbebe (Malakunanja II) in

Northern Australia, offers researchers an opportunity to explore the relationship between hunter-gatherers, climatic changes, and fuel wood selection strategies over the last 20,000 years. The research presented in this paper utilises methods of archaeobotanical recovery and anthracological analysis - techniques still in their infancy in Australia - and ethnographic work conducted with the Mirarr, the traditional custodians of Madjedbebe. The Mirarr continue to live in this landscape and still operate mosaic fire regimes which encourage growth and renewal.

Preliminary anthracological results from Madjedbebe suggest the fuel wood selection strategy at the site was governed by the Principle of Least Effort (PLE).

Fuel wood selection strategies informed by the Principle of Least Effort (PLE) remained relevant during dramatic shifts in vegetation over the last 20,000 years.

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ORAL

## 6. COMBUSTION AND FUELS NEOLITHIC DEPOSITS FROM TIN HANAKATEN CAVE (TASSILI N'AJJER, ALGERIA)

*Amrani, Samira (Université d'Alger) amrani1.samira@gmail.com*

*Aumassip, Ginette (CNRS/CNRPAH) gaumassip@gmail.com*

This communication aims to present the archaeobotanical data and charcoal analysis from the five hearths discovered in Tin Hanakaten archaeological deposits. The archaeological materials from Tin Hanakaten site can address multiple issues, such as: fire-related activities, the management of fuel resource, the fire operating sequence, energy production and fire use, fuel sources, combustion processes, firing products and related residues and domestic hearths.

Tin Hanakaten archaeological cave is located in south-eastern Algeria at 1200 km from Algiers; Neolithic deposits from this site include several sequences of human occupation dated from around 9000 to 2000 B.P. The excavations (1974-1981) show a height of 2 to 3 meters of ash sediments in the eight layers. This study is based on Space archaeology description, from data base of the inventory and all literature description from different reports. For the charcoal analysis: The botanical identification was made using the wood anatomy atlas, and the reference collection of actual sahara woods charcoals. Moreover, an ethnological approach which is

based on our experience and knowledge of the current behaviour of the Touaregs society.

The ash deposits, gray, dark, whitish are probably result of intense activity entire combustion and/or partial; this is the result of a long process and operating production line of fire, for multiple use; The structure of a typical combustion main focus and will supply other areas of secondary firing said lenticular homes for a soft and long cooking.

The presence of twigs, bark and plants in scores of households suggest same behaviour in actual society ; The Touareg nomad, mastery of the territory and its phytogeographical knowledge, took their power measurements in wood especially for good food, therefore, some woods are selected and even picked up remote camping place so the notion of reserve wood. The activities related to fire are multiples including the presence of herbs, bark and wood which provide continuous fire management (fire burning for long time). Anthracological studies reveal that, the hearths are characterized by the presence of several tree species, except, the fire place "domestic hearth" 5, is characterized by fuel consisting on only two species (*Faidherbia albida* (98%) and *Olea laperrini*, (2%)); its best for good fire. Furthermore several domestic homes structures have been uncovered. The cookstoves are reported; most important, is the grasshoppers (*Schistocerca gregaria*) cooking hearth, which twigs and "stubble", appeared among the branches. The analysis of coals cooking indicate the use of several species whose *Olea laperrini* attained 80%. The best wood for make fire and cooking. Actually, in the sahara, Olive is relic specie protected by law ; Touaregs can use only the dry wood part, they reserved its specially for cooking.

Archaeobotanical content with several examples demonstrate behavior change, the type of wood and fire management during the different periods of occupation known in the cave. Ethnographic analogy, support our work by the many testimonies recorded. It shows that the behavior of the Touaregs nomadic society (exploitation of the landscape, culinary practices, heating and lighting) are ancient practices that dating from the Neolithic.

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ORAL

## 7. PLANTS AND CULTURAL ACTIVITIES RELATED TO THE USE OF FIRE IN THE CALDEN FOREST, LA PAMPA, ARGENTINA

*Tapia, Alicia (Instituto de Arqueología, Universidad de Bue-*

*nos Aires) aliciahtapia@yahoo.com.ar*  
*Bogino, Stella (Departamento de Ciencias Agropecuarias, Universidad Nacional de San Luis ) stellabogino@gmail.com*  
*Dussart, Esteban (Facultad de Agronomía, Universidad Nacional de La Pampa) estebangdussart@yahoo.fr*  
*Doval, Jimena (Conicet, Instituto de Arqueología, Universidad de Buenos Aires) jdoval84@hotmail.com*

In this paper we discuss the fuel use of different typical plants of calden forest or caldenal, a particular environment located in the arid lands of central Argentina. In this forest there are species such as legumes like caldén (*Prosopis caldenia*) and algarrobo (*Prosopis flexuosa*), accompanied by a variety of low bushes like piquillín (*Condalia microphylla*) and grassland (*Stipa speciosa*, etc.). This problem is approached through two evidence lines: 1 - analysis and comparison of archaeological carbonized samples of vegetable macroremains, with thermoalteración as without it, corresponding to different human occupations; either hunter-gatherers of prehistoric times as ranqueles chiefdoms, military and early settlers of historical times; and 2 - the interrelationship between data written in documents about fire use by hunter-gatherers and activities of defense by ranqueles (end of the nineteenth century) and the presence of fire marks registered in a dendrochronological series made with calden samples.

First, we used data published by other researchers for taxonomic identification of plants used for light fires by hunter-gatherers, but for the subsequent populations that occupied the area, we used 82 vegetable samples that were recovered from the archaeological record. Such samples come from different types of sites: three ranquel settlements that were contemporaries from desert conquest (1878-1879); b-a military installation from 1883-1885; and c- two sites occupied between 1890 and 1911, where the first colonists settled. Taxonomic results indicate that the low bushes were most frequently used among some groups of hunter-gatherers, this could be linked to the location of settlements in more open areas or peripherals of a forest, where it is more auspicious for the hunting of gregarious animals. By contrast, in the samples recovered from the ranquel site there are more frequently the legumes, in the typical sector of dense forest with low bush and grassland, suitable for grazing and breeding of domestic animals (*Bos taurus* and *Ovis aries*), typical activity of these native groups. For the more recent sites, a close relationship between selected plants as fuel and functionality of settlements is observed. In the case of the early settlers, in addition to native species, are highlighted the introduction of other exotic species

such as *pinotea* and *quebracho colorado*, some of which are carbonized.

Moreover, by analyzing 37 calden samples collected in a forest sector (that was part of the ranquel territory), a dendrochronological series which covers 273 years, from 1738 to 2011, was established. Some marks of fire registered can be linked to intentional fires, that would have made the ranqueles as part of their defensive strategies during the desert conquest.

Finally, the data obtained through this interdisciplinary approach allow to discuss the sociocultural factors that have intervened at differential selections of plants used for combustion, even when they were potentially available species over time.

ORAL

## 8. ANTHROLOGICAL ANALYZES OF HEARTHES DATING FROM THE LATE PLEISTOCENE TO HOLOCENE DISCOVERED IN THE ROCK SHELTERS SANTA ELINA AND THE CIDADE DE PEDRA (CENTRAL BRAZIL, MATO GROSSO).

*Bachelet, Caroline (Museu Nacional, Universidade Federal do Rio de Janeiro) ac.bachelet@gmail.com*

In Central Brazil (Mato Grosso / MT), research in the rock shelters of Santa Elina (Cuiabá) and the Cidade de Pedra (Rondonópolis) revealed an important succession of occupation dating from the late Pleistocene to Holocene. Dating and material remains (lithics, ceramics, adornment, hearth) show that they were occupied continuously by various groups of hunter-gatherers. The discovery of many combustion structures in all levels of occupations indicates that the fire had a significant role in their daily activities.

This work presents the anthracological analysis results performed on several carbonized deposits (hearths, embers, concentrations). From the taxonomic identification of charcoal, the objectives are to highlight the practices of hunter-gatherers related to the collection and use of wood (firewood, fuel properties, medicinal / ritual uses, selection species, procurement areas, etc.) and the environment in which they have evolved for nearly 10,000 years. We also aim to identify modifications in the collection of firewood that could be directly related to climate changes, which occur around 9000 years BP in Brazil.

The results indicate that human groups practiced an opportunistic collection mainly focused on dry wood available in the vegetation around the sites. Woods of good qualities, fruit trees, species with medicinal properties have been identified in various combustion structures. They probably evolved in an environment similar to that currently characterizes the region, a typical flora of the Cerrado Biome.

Ongoing analyzes of hearths in Santa Elina site, dated 10000-9000 years BP, will provide new information on the behavior of the first prehistoric settlements and the environment of the region.

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ORAL

### **9. ANTHRACOLOGY AS MEANS FOR ASSESSING HUMAN-ENVIRONMENT RELATION AT THE EXTREME ENVIRONMENTS DURING THE HOLOCENE: THE CASE OF THE HUNTER-GATHERERS AT CENTRAL WESTERN PATAGONIA.**

*Riquelme Toro, Isabella (CEPAM-CNRS Université de Nice Sophia-Antipolis) isabella.riquelme@cepam.cnrs.fr*

*Méndez Melgar, César (Departamento de Antropología, FACS Universidad de Chile) cmendezm@uchile.cl*

*Théry-Parisot, Isabelle (CEPAM-CNRS Université de Nice Sophia-Antipolis) isabelle.thery@cepam.cnrs.fr*

The relations between the human groups and their environment are of utmost importance when studying regional archaeologies that focus on the assessment of the knowledge and exploitation of the resources by past hunter gatherer societies. Anthracology, as subdiscipline that studies the archaeological wood charcoal, contributes to this research area, through defining operational chains analysis, where both the procurement of raw materials, and the knowledge of the environment and their natural resources, are major components of the human decisions.

The methods in anthracology are based on wood anatomy analysis, the taxonomic identification by comparative anatomy, caliber measurement, as well as other qualitative and quantitative attributes observed microscopically and macroscopically.

The Patagonian territory presents extreme and contrasting environmental characteristics, which offer diverse resources for past human societies. Central Western Patagonia is particular in that it shows biomes ranging from evergreen forests in the west to semiarid

steppes in the east, thereby providing a good case for assessing differential procurement of resources. The Cisnes and Ñirehuao river valleys, are located on an ideal are for studying such a problem since they connect this ecological diversity and yield human occupations starting at the onset of the Holocene.

Archaeological sites are located at different altitudes along the river courses; at the evergreen forest, the forest-steppe transition, and at the steppe. Thus, they are key for understanding differences in resource selection considering the evidences that suggest a connectivity network, at least during a limited period of time in the late Holocene (2800 cal. B. P.). The studied sites suggest some functional complementarity along these river valleys. In this paper we explore anthracological assemblages of El Chueco 1, Alero El Toro, and Baño Nuevo 1, in the evergreen forest and steppe, to analyse resource procurement strategies under the assumption that there must have been different and adaptive to environment for the same human groups.

This study (Fondecyt project 11301258) presents the first approach to the study of combustion of wood raw materials and fuel procurement strategies in Central Western Patagonia during the Holocene. Also, this study aims to discuss these results in the context of the network relations of hunter-gatherers in extreme environments.

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ORAL

### **10. RESULTS OF WOOD CHARCOAL ANALYSIS AT KAMAN-KALEHÖYÜK, CENTRAL ANATOLIA, TURKEY.**

*Wright, Nathan (The University of Queensland) n.wright@uq.edu.au*

*Fairbairn, Andrew a.fairbairn@uq.edu.au*

*Hua, Quan (The Australian Nuclear Science & Technology Organisation) qhx@ansto.gov.au*

Very little is known of the extant woodland of the Bronze and Iron Age in Central Anatolia other than that revealed by regional pollen data and modern analogues. Today the region is a treeless steppe, a product of millennia of agricultural and pastoral use. Yet regional pollen data indicate a climax woodland cover consisting of open oak woodlands existed in the Bronze and Iron Age periods. This study utilises wood charcoal data of the site of Kaman-Kalehöyük in the heart of Central Anatolia to assess whether the local woodland surrounding the site matches that indicated by the pollen data during



the Bronze and Iron Ages and what, if any, changes in woodland composition occurred.

The results of wood charcoal identification and statistical analyses of over 24,000 fragments from 168 contexts are reported in this paper along with the first comprehensive absolute dating of the site. The results indicate both dramatic and more subtle and nuanced changes in the local woodland vegetation coincide with changes in occupation at the site. These changes in vegetation composition are chronologically tied to changes in land use and associated social changes including that of expansion in the use of land required for agricultural and pastoralist purposes. As both woodland and agriculture/pastoralism compete for space this research explores the issues around woodland resource management and woodland clearance for agricultural purposes.

54 pit (midden) contexts, 30 hearth contexts, 34 room fills and 50 in-situ construction contexts (posts, beams etc.). 24,000 wood charcoal fragments.

Taxa richness declines during the Late Bronze Age and into the Iron Age. A shift to pine occurs at the beginning of the Iron Age Oak is dominant throughout the sequence.

Possible detection of an anthracological signature for the Hittite occupation is detected.

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## ORAL

### 11. FUEL USES IN CABEÇO DA AMOREIRA SHELLMIDDEN DURING THE MESOLITHIC: AN INSIGHT FROM CHARCOAL ANALYSES

Diogo Monteiro, Patrícia (ICArEHB Universidade do Algarve)  
patriciaadmonteiro@gmail.com

Bicho, Nuno (ICArEHB Universidade do Algarve) nbicho@ualg.pt

Zapata, Lydia (Universidad del País Vasco/Euskal Herriko Unibertsitatea) lydia.zapata@ehu.es

Cabeço da Amoreira is a shellmidden from the Mesolithic complex of Muge, Santarém, in central Portugal and dated to between c. 8000 and 7500 cal BP. The aim of this study is to provide an overview of the use of fuel, based on the evidence related to gathering of wood and production of fire at the site.

The previous studies provided a diverse set of archeological data allowing extended studies in different

areas of investigation (Ribeiro, 1884; Mendes Corrêa, 1933; Roche, 1972; Rolão et al. 2006; Wollstonecroft *et al*, 2006; Rocksandic, 2006). Since early times, evidence of charcoal has been noted, present most in burial reports. Only by Rolão's fieldwork charcoal had been properly recovered by flotation. Now, within a new research project by Bicho's new team, "The last hunter-gatherers in the Tagus valley", a new area of excavation in the shellmidden has provided new insights on Muge occupation, concerning the social complexity and subsistence of these populations (Bicho et al, 2010, 2011, 2012).

Its strategic location, in the estuarine basin of Tagus River and the access to inland resources, provided the exploitation of different natural resources, aquatic and from the surrounding forests.

The cultural processes related with fuel production are fundamental to understand the human selection and behavior towards the environment, the site organization and therefore the complexity of their economy and society (Piqué i Huerta, 1999).

Charcoal analyses from different contexts of Cabeço da Amoreira will provide an important insight on this matter, showing us the wood used for fuel and the variation of those uses diachronically and functionally.

Charcoal analyses began in 2011 allowing the taxonomic identification of more than 4000 charcoal fragments for Cabeço da Amoreira. The present paper will focus mainly in the burial contexts (Burial 2 and 3), hearths (shellmidden hearth and sand layer hearth) and pits. Other charcoal data, as well as palaeoenvironmental information will be taken into account to compare and discuss our results.

For anatomical identification was used the tree anatomy atlases (Shweingruber, 1990) and reference collection of modern charcoal. Some taphonomical observations were made that could be related with management of wood and fire, important to understand the fuel use within the site (Thery-Parisot et al, 2010).

The following *taxa* have been identified for Cabeço da Amoreira contexts: *Pinus pinaster*, *Pinus pinea/pinaster*, *Pinus tp. sylvestris*, *Pinus sp.*, *Quercus subg. Quercus*, *Quercus ilex/Q. coccifera*, *Quercus sp.*, *Arbutus unedo*, *Pistacia lentiscus*, *Salix sp.*, Monocotylodones, Indeterminate Gymnosperms and Angiosperms.

Preliminary results show us a clear predominance of pine suggesting that was the most used species to produce

fire. The results seem to point to a pattern combination of pine and oak wood to produce fire. Other minor *taxa* are present and have been used as fuel, but their relation with the burials needs further analyses to confirm a special use of these species. Taphonomical analyses have helped us to observe charcoal alterations that might indicate: 1) use of deadwood for fuel, 2) the use of wide calibre wood pieces.

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ORAL

## 12. THE SELECTION OF FIREWOOD FOR DIFFERENT PURPOSES ? THE EXAMPLE OF MONTE MOZINHO (PORTUGAL)

*Costa Vaz, Filipe (CIBIO - Research Center in Biodiversity and Genetic Resources) filipe.mcvaz@gmail.com*

*Tereso, João Pedro (CIBIO - Research Center in Biodiversity and Genetic Resources) jptereso@gmail.com*

Located in the NW of Portugal, Monte Mozinho is a large roman settlement spanning over an area of 20 ha. Its occupation ranges from the beginning of the era until the late 5th century BC. Beginning in 2008, the excavation effort was centered in a new area – sector A-2008 – where several soil samples were collected in 3rd-4th centuries' levels, in order to obtain relevant archaeobotanical data. This communication focuses on the charcoal analysis carried out in four different combustion structures in this sector's compartment A and C.

Compartment A is a large rectangular space with a large stone slab used as a combustion place placed roughly in its center and a storage structure in its southernmost corner. 8 samples were recovered in this compartment in five different stratigraphic units. All but one was related to the stone slab. The other sample, collected in the NW corner of the compartment, was proved to have a different origin (see results). Compartment C is smaller and comprehends two distinct combustion structures: a large oven and a fireplace. The full content of the oven (16 samples) was recovered, while other five samples are related to the fireplace located in the compartment's easternmost corner. The sediment samples were processed through bucket flotation and the charcoal analysis was performed according to the standard methodology. Particular anatomical characteristics of the charcoal were also registered, such as radial cracks, vitrification, ring curvature, reaction wood and xylophages' galleries, among others.

In compartment A, *Castanea sativa* was the dominant species, followed at a great distance by *Quercus deciduous*, *Leguminosae* and *Populus*. In small numbers, several other taxa were identified such as *Erica spp.*, *Frangula alnus*, *Fraxinus*, *Prunus*, *Salix*, *Ulmus* and *Quercus evergreen*. The majority of the fragments analyzed in this compartment had weak ring curvature, indicating the preference of large and medium size wood pieces. In the northernmost corner, was identified a singular moment of combustion. Most of the charcoal collected was from *Pinus pinaster*, a species that was not identified anywhere else in the compartment. The results from compartment C relate to its structures. In comparison with the other compartment, despite the range of species remains roughly the same, its proportion, quantity and the anatomical characteristics of the charcoals were very different. This time, in the oven, *Leguminosae* fragments make up the majority of the analyzed charcoal, followed by the deciduous oak and chestnut. The remaining species show very limited numbers.

In Compartment C's oven it is clear the selective use of shrubby *Leguminosae* in comparison with the other analyzed structures. The architecture of the oven suggests it was used for food and ethnographic data demonstrates that *Leguminosae* was the preferred firewood for such usages. Additionally, the exclusive presence of cluster pine in a single context in Compartment A also demonstrates the selective use of firewood, although for unknown purposes. Hence, the results obtained made possible to verify different trends of usage of firewood depending on the structures and compartments where they were used.

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POSTER

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POSTER

## AN APPROACH TO FUEL MANAGEMENT IN THE CONTEXT OF CENTRAL EBRO BASIN (NE SPAIN) DURING THE VIII-VII MILLENIUM CAL BC.

*Alcolea Gracia, Marta (University of Zaragoza) malcolea@unizar.es*

In this paper we present an approach to the study of fuel management by hunter-gatherer communities during the VIII-VII millenium cal BC in the central Ebro basin (NE Spain). The aim of this work is to value the influence of geographic and climate factors in the availability of firewood and their implications for human strategies

of fuel management. By this way, on the one hand, we propose a state of the current issue of anthracological studies for this territory and this chronology. On the other hand, we provide new data from four settlements with unpublished anthracological sequences located in different areas of this territory.

The object of study of this paper is charcoal remains from four mesolithic shelters: Forcas II (Graus, Huesca), Espanatalobos (Quicena, Huesca), Esplugón (Sabiñánigo, Huesca) and Arenal de Fonseca/Ángel I (Ladruñán, Teruel). The samples were recovered following different strategies for sampling and processing the sediment applied during excavation. For Forcas II, Peña 14 and Arenal de Fonseca/Ángel I charcoal remains were manually selected during excavation. For Espanatalobos and Esplugón we have processed whole sediment by flotation. For the anthracological analysis of charcoal we have used a metallurgical microscope that allows a magnification factors of 40 to 400 times. The anatomical patterns of each wood species are observed on three sections of wood. The botanical identification was possible comparing with anatomy atlases (Schweingruber, 1990; Vernet *et al.*, 2001) and current carbonized woods.

Conifers, especially pine, either in mediterranean (*Pinus halepensis*) in driest trend areas or mountain pines (*Pinus sylvestris/nigra*) in higher elevations, appear as the most widely fuel used at all archaeological layers studied. Consumption of *Quercus* sp. appears intermittently but always with very low percentages. The taxonomic diversity observed in the center of valley (*Acer* sp., *Pistacia* sp., *Fraxinus* sp., *Salix/Populus*, *Prunus* sp., *Buxus sempervirens*, *Rhmanus/Phillyrea*, *Rosmarinus officinalis*, *Leguminosae*, *Monocotiledoneae*) contrasts with the specific poverty in mountainous areas where we have only documented the consumption of pines and oaks.

The mesolithic is the last stage of an exclusively predatory economy based on hunting and gathering and also is a period of environmental change. The last hunter-gatherer communities in the Holocene period seem to use opportunistic strategies of fuel management and consume wood species in expansion. This work provides a picture of the surrounding vegetation to prehistoric settlements and relations between the hunter-gatherer communities and their environment in the context of central Ebro basin (NE Spain) during the VIII-VII millennium cal BC.

## POSTER

### PERSPECTIVES FOR THE STUDY OF FUEL AMONG EARLY PALEOLITHIC HUNTER-GATHERERS BASED ON EXAMPLES FROM THE NE OF IBERIA

Allué, Ethel (IPHES, Institut Català de Paleoecologia Humana i Evolució Social, C/ Marcel·lí Domingo s/n Campus Sescelades URV (Edifici W3), 43007-Tarragona, Spain, 2 Àrea de Prehistòria, Universitat Rovira i Virgili (URV), Av. Catalunya 35, 43002- Tarragona, Spain ) [eallue@iphes.cat](mailto:eallue@iphes.cat)

During prehistoric times humans undoubtedly used all available resources. However the interpretation of these resources as cultural records is impregnated sometimes with closed scientific conceptions. This might be the case in the study of fuel. Although fuel was one of the most important resources for people in the past, as it is at present its study is dispersed. Interest in understanding past fuels emerges from our interest in the study of humans and desire to set up a theoretical framework within which to approach research. Usually study of past human behaviour has focused on human evolution (palaeoanthropology), food remains and technological evolution. Obviously it is clear that fire (technology), culture (human) and nature (environment) interactions and time (evolution) are the ultimate objectives but the aim is to pursue them through fuel evidences. Most archaeological studies on fuel among hunter-gatherer's groups are isolated studies or studies about hearths with fire fuel having an insignificant role. Hence, it is only present day studies that show major interest in fuels with a focus on scarcity, deforestation or health. In the European territory during the Palaeolithic the most common fuel was probably wood; however other types of fuels might be also used due to scarcity of wood or for other specific purposes. The approaches for the study of fuel uses among hunter-gatherer's is mostly directed to the study of charcoal remains and based on anthracology and charcoal taphonomy. Fuel gathering as a major activity had an important role in daily activities and the determination of choices on site locations according to different strategies. In this study we present different examples to illustrate fuel gathering strategies according to different scales, cultural behaviours, wood properties and selection patterns. The sites under are located in different areas from the NE of Iberian Peninsula at altitudes from 900 m asl to the coast with a chronological frame between 60 to 30 kyr. BP. The Anthracological study show a homogeneous pattern related to the preference choice of wood among other possible fuels and this choice is determined by environmental constraints and the

characters of the species exploited. *Pinus sylvestris* type is the most recurrent species, present in 90% of the sites and values of this species are always the highest. The comparison, in some of the sites with burnt bone remains and grasses indicate the presence of other materials that might be forming part of the fuel; however the recurrence of wood clearly the most used fuel used.

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POSTER

**THE ROLE OF TWO 4,000 CAL BP COMBUSTION STRUCTURES AT EASTERN MOROCCO: THE EXAMPLE OF OUED ZA HEARTHES (GUÉFAIT, MOROCCO)**

*Chacón, María Gema (IPHES, URV (Tarragona, Spain) UMR7194, MNHN (Paris,France) gchacon@iphes.cat*  
*Aouraghe, Hassan (FSO, Univ. Mohamed 1er (Oujda, Morocco) aouraghe1@yahoo.fr*

*Allué, Ethel (IPHES, URV (Tarragona, Spain) eallue@iphes.cat*  
*Amrani, Samira (Université d'Alger (Algeria) archeologues@gmail.com*

*Bartrolí, Raül (Àrea de Patrimoni Arqueològic, Ajuntament de Capellades (Barcelona, Spain) bartrolir@capellades.cat*  
*Canals, Antoni (IPHES, URV (Tarragona, Spain) acanals@iphes.cat*

*El Hammouti, Kamal (FSO, Univ. Mohamed 1er (Oujda, Morocco) elhamkam@yahoo.fr*

*El Harradji, Abderrahman (FLSH, Univ. Mohamed 1er (Oujda, Morocco) elharradji@yahoo.fr*

*Expósito, Isabel (IPHES, URV (Tarragona, Spain) iexposito@iphes.cat*

*Gallet, Xavier (UMR7194, MNHN (Paris, France) gallet@mnhn.fr*

*Haddoumi, Hamid (FSO, Univ. Mohamed 1er (Oujda, Morocco) haddoumihamid@yahoo.fr*

*Lebon, Matthieu (UMR7194, MNHN (Paris, France) lebon@mnhn.fr*

*Sala, Robert (IPHES, URV (Tarragona, Spain) robert.sala@urv.cat*

In the frame of archaeological systematic surveys carried out at the Guéfait region (eastern Morocco) two isolated combustion structures were discovered at the Oued Za river bank. The erosion of the Upper Pleistocene terraces made it possible their discovery. Even if a part of them disappeared by fluvial post-depositional processes the good conservation of the remains made possible the whole excavation. They were dated by the C14 AMS method on charcoal remains around 4,000 (Cal BP). These two structures combustion were separate by four meters of distance and each one shows a different morphology

and type of construction. Both show important traces of fire impact, a single lithic tool and some snails associated to them.

An interdisciplinary program of analysis was developed on the archaeological remains in order to identify the specific use of each one of these structures: (1) charcoal, pollen and phytoliths analysis to identify the vegetal resources used as fuel and to reconstruct the environment, (2) malacological analysis to distinguish their possible anthropic origin and also to obtain palaeocological data, (3) mineralogical study performed by X-Ray diffraction and Fourier Transform Infrared Spectroscopy on sediments and on the stones used to structure the hearths in order to detect changes of composition induced by heating, temperatures and to identify fuel and materials burned, and lastly (4) spatial patterning and 3D reconstruction analysis to reconstruct the morphology of both structures specially the parts eroded by the fluvial post-depositional processes.

The preliminary results of the different approaches will be present in this paper to try to identify the fuel used, the activities carried out in them and to contextualize them into the frame of the cultural human activities developed in this geographic area during this chronological moment.

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POSTER

**ZOOARCHAEOLOGY OF THE UPPER PALEOLITHIC SITE OF THE CUZOUL DE VERS: DISTINCTIVE SKELETAL PROFILES AND DIVERSITY OF BONE USE**

*Castel, Jean-Christophe (Muséum de Genève) jean-christophe.castel@ville-ge.ch*

The site of Cuzoul de Vers (Southwest of France) shows an exceptional stratigraphic sequence dated from the end of the Last Glacial Maximum and presenting Recent Solutrean and Badegoulian industries. About 30 archaeological levels were identified over a depth of three meters.

The preservation of faunal remains is excellent for the lower half and decrease thru the top. The faunal spectrum is dominated by the Reindeer, with generally some small ungulates (Chamois, Ibex) and more rarely bigger ones (Horse, Bison, Deer).

The first studies (Castel, 1999) showed an important percentage of identified burnt remains that indicate

a systematic use of the articular regions of the axial skeleton and limbs as secondary fuel. The precise identification of small fragments allowed a more precise reconstitution of the exploitation procedures than previously observed in Upper Paleolithic sites.

The bone assemblage shows other remarkable characteristics, notably associated with the production of bone industry and ornaments. Retouchers and needles are particularly abundant in the Badegoulian levels. The great abundance of incisors is also noteworthy. These elements lead to suspect that some identified secondary species sometimes don't have alimentary status although the identified remains don't show evidences of intentional modifications.

The zooarchaeological data of this site are a reference (i.e. Castel, Costamagno and Théry-Parisot works), but they have never been presented in an international symposium. They are nevertheless fundamental in the framework of discussions on the significance of skeletal profiles and on the real or suspected role played by prehistoric people concerning their origin.

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POSTER

**A 25,000 YRS BP COMBUSTION STRUCTURE OF RIBEIRA DA PONTE DA PEDRA OPEN AIR SITE.**

Ferreira, Cristiana (Universidade de Trás-os-Montes e Alto Douro (UTAD-PT), Centro de Geociências - Grupo Quaternário e Pré-História (UC, Pt), IPHES, Institut Català de Paleoecologia Humana i Evolució Social (Tarragona, Esp) ferreira.cris.00@gmail.com

Cura, Sara (Museu de Arte Pré-Histórica de Mação) saracura0@gmail.com

Pierluigi Rosina - prosina@ipt.pt (Instituto Politécnico de Tomar)

Outside karst system, Upper Palaeolithic sites in Portugal are almost unknown. Particularly in Central Portugal, the few evidences are represented by rock art (Vale do Ocreza) and the open air site at Ribeira de Ponte da Pedra, where a combustion structure was recorded.

The combustion structure was found in/at a colluvium of Ribeira da Ponte da Pedra located in Vila Nova da Barquinha, Central Portugal. This archaeological site presents a long chronology, from ~300000 yrs. BP until ~25000 yrs. BP, located in a fluvial terraces system. The last deposition is represented by colluviums that

cover all the sequence with sediment, abundant lithic implements and burnt material dated at ~25000 Ka BP.

The combustion structure was formed by a sub-circular shape presenting burnt sediments and stone elements. No lithic implements were found in association with the combustion structure, the only exception is represented by a worked pebble. The sampling of the combustion structure has yielded charcoal remains that are the object of this study.

Although the taphonomic alteration of charcoal, results of the antracological analyses show the presence of *Erica sp.*, *Prunus* and *Pinus sp.*. This vegetation should characterize the pre-pleniglacial phase during final Gravettian, just before the HE2. These taxa were probably the wood used for fuel in the hearth.

This association is also described in other Portuguese archaeological contexts with the same chronology. Particularly, the presence of *Pinus pinaster* was described on the Gravettian archaeological site of Porto Marinho (Rio Maior) (Figueiral et al. 1995). These data suggest that in this area (in SW Europe) the presence of a diversity of trees and shrubs/tree cover determined the use of woody fuel, whereas in other areas other fuels such as bone are suggested to be complementary fuels.

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POSTER

**LANDSCAPE PRACTICES AND THE EVERYDAY LIFE IN DOMESTIC SPACES: PERSPECTIVES FOR AN ARCHAEOLOGY OF FUEL AND FIREWOOD IN BRONZE AGE MALLORCA (BALEARIC ISLANDS)**

Picornell Gelabert, Llorenç (Universitat de les Illes Balears) tokelau24@gmail.com

Human societies obtain the material resources necessary for its development and reproduction from natural resources. This is one of the core elements in the establishment of the complex networks of interactions performed in socio-environmental systems. In this context, fuel constitutes a primary element, as it satisfies the energetic social demands. Since the very recent and partial generalization of fossil fuels, wood has been the main energetic resource for human groups. Firewood management and consumption is, thus, a central component of the organization of maintenance and subsistence activities of human societies, but it has to be understood from a contextual perspective that analyzes the relations between firewood practices and all the

other social and environmental elements that plays a role in the socio-environmental system.

This viewpoint points to the construction of a theoretical and methodological perspective that allows analyzing charcoal assemblages not as isolated datasets, but as the result of society-landscape/vegetation interactions performed in its ecological, social and historical backgrounds. In this sense, we propose to explore the perspectives for the study of firewood management and consumption among domestic groups of sedentary pastoralists and agriculturalist societies through the archaeological record. The main goal is to test a theoretical and methodological approach that allows the integration of firewood practices in the context of the economic organization of human groups and the development of the everyday maintenance activities carried out in domestic spaces.

On the one hand, firewood gathering has to be understood as a landscape practice integrated in the organization of the mobility, the sense of place and landscape and the organization of the economic activities of the group. On the other, firewood consumption in domestic structures has to be analyzed as a component of the everyday life related with the different household activities and the creation, use and abandonment of domestic spaces.

In order to discuss and test a theoretical and methodological approach that allows reaching such a contextual comprehension of firewood management and consumption in household organization, different examples from Bronze Age sites of the island of Mallorca (Balearic Islands) will be presented. During this period of the Balearic Prehistory particular domestic buildings were generalized, the so-called *navetiformes*, cyclopean, megalithic buildings with boat-shaped plant. These buildings constitute the material expression of the household groups and the domestic space. A diverse range of everyday, routine activities were organized around the *navetiformes*, which presents a complex organization of the different spaces. In two Bronze Age sites in Eastern Mallorca, Closos de ca'n Gaià and Hospitalet Vell, a systematic sampling strategy for the recovery of bio-archaeological materials have been applied and resulted in the availability of representative charcoal assemblages. The contextual analysis of such charcoal record allows analyzing the role of firewood management and consumption as landscape practices integrated in the structuring of household maintenance activities and the configuration of domestic space.

POSTER

### SELECTION OF WOOD FUELS IN THE SOUTH OF ÁLAVA (BASQUE COUNTRY, N IBERIA): ARCHAEO-BOTANICAL DATA

*Ruiz-Alonso, Mónica (CCHS, CSIC) moruizalonso@hotmail.com*

*Zapata, Lydia (Universidad del País Vasco) lydia.zapata@ehu.es*

*Pérez-Díaz, Sebastián (Université Toulouse-Le Mirail) sebas.perezdiaz@gmail.com*

*López-Sáez, José Antonio (CCHS, CSIC) joseantonio.lopez@cchs.csic.es*

*Fernández-Eraso, Javier (Universidad del País Vasco) javier.fernandeze@ehu.es*

Within the present situation of archaeological research in the Basque Country, archaeobotanical analyses (Plant macro remains, both wood and seeds, pollen and phytoliths) start to be a standard procedure. However, there are still few examples that combine all these archaeobotanical disciplines, not only in the Basque Country but also in nearby regions. However, an integrated approach of the different archaeobotanical analyses offers interesting possibilities. Even if they provide different types of information, they are complementary, an integrated approach being the ideal scenario.

This work presents different case studies from the Sierra de Cantabria (Province of Álava, Northern Iberia) with the aim of establishing the composition and evolution of the vegetation, the anthropic impact as well as the management and use of forest resources by prehistoric communities. The main results focus on three archaeological sites where different types of analyses can be discussed: the rock-shelters of Peña Larga, Peña Parda and San Cristóbal, which span a chronological sequence from the Neolithic to the Iron Age. Significant differences can be seen from what pollen analyses show and the way plant resources were used according to the analyses of plant macroremains –both, wood charcoal and seeds-. Pollen analyses point to a spread of deciduous forest dominated by hazel. However it is mostly deciduous oak that is used for fuel at the sites with a very limited presence of *Corylus*. Besides, from the Neolithic to the Chalcolithic yew wood is the most used wood whereas its presence in pollen data is extremely limited. Together with this, other dynamics can be discussed, such as Beech (*Fagus sylvatica*) that appears very clearly from the Bronze Age.

The remains of crops, wherever they have been found, are also present in these chronologies, both in pollen and plant macros, wild plants being also present.

All these questions will be discussed emphasizing the selection of specific woodland resources in the studied area, as well as the possibilities and limits of using different types of archaeobotanical evidence.

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POSTER

**BURNING BONES ALONG PRE AND PROTOHISTORY.**

*Vidal, Aixa (Universidad Complutense de Madrid) aixa-vidal@gmail.com*

*Estaca Gómez, Verónica (Universidad Complutense de Madrid) vestacag@hotmail.com*

Amongst the myriad of fuels available for human use, the ones of a mineral origin have lately been the most appreciated, whereas firewood has traditionally been standard. However, several fuels derived from animals should not be neglected. Although their properties have some limitations regarding ignition and quick burning, their caloric value and omnipresence in all cultural developments are advantages which were surely not unknown to people in Pre and Protohistory.

Based on the specific properties of animal secondary products (particularly, bones, dung and grease) a diachronic discussion is proposed regarding the many different uses they could have been applied to. From the dawn of Humanity and the manipulation of fires for warmth to metallurgy activities in the Bronze Age, burnt and charred bones has been recorded and in some cases their presence could be link to heat producing processes.

In this sense, the discussion presented here is not case-specific but deals on the possibilities of these materials to satisfy human needs, including their use for heat, lighting, defence, building and crafts such as pottery, rock thermal alteration and wood-hardening. Thus, it aims at been comprehensive and cover most of the activities related to the need for fuel in early societies.

# B15 Social complexity in a long term perspective

Organiser: Joaquina Soares

Friday 5th (14:00 to 19:30)  
B07 Meeting Room



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ORAL CONTRIBUTION

ORAL

## 1. AROUND THE CATEGORY "PRESTIGE" AND THE ARCHAEOLOGY OF THE "SOCIAL COMPLEXITY" IN PREHISTORIC SOCIETIES.

*Pedraza Marín, Diego (Universitat Autònoma de Barcelona)  
diegopedraza.antropos@gmail.com*

Under the paradigms of neoevolucionism, cultural ecology, social functionalism and systemic approaches, since the middle of the last century, the study of the social evolution of societies has been enriched with new methodologies and categories of analysis, for example "social complexity", or the use of descriptive classificatory typologies of this social evolution. Ethnographers and archaeologists looked for evidence of "big men" or "chiefs", among others, who were associated with certain functions and social behaviors, as well as "prestige". We argue that it is necessary to analyze the epistemological and ideological implications of these approaches and categories in the scientific process of knowledge creation. We will also try to provide new perspectives of analysis from historical materialism and feminist studies, focusing on the category "prestige", which is understood as a social production.

ORAL

## 2. KINSHIP ORGANIZATION REFLECTED FROM THE SETTLEMENT OF THE XINGLONGWA CULTURE AT BAIYINCHANGHAN SITE

*Xiyun, Yu (Department of Archaeology School of History  
Wuhan University) yuxiyun@aliyun.com*

Baiyinchanghan site is located in Shuangjingdian town, Linxi County of Inner Mongolia, about 500 meters southwest of Baiyinchanghan village on the hills, and near the north bank of Xar Moron River. The settlement of the Xinlongwa Culture at this site consists of two separate living areas (A and B) surrounded by their own enclosure ditches and each living area has its own cemetery. The age of this settlement is cal.7000BP.

In this paper, the author mainly uses these materials which had already published. Like *Excavation brief report of Baiyinchanghan Neolithic site in Linxi County, Inner Mongolia* (1993), *Excavation brief report of Baiyinchanghan Neolithic site in Linxi County, Inner Mongolia in 1991* (2002). *Baiyinchanghan—Excavation report of the Neolithic site* (2004).

The author mainly adopts the method of settlement analysis to analyse the settlement patterns of Baiyinchanghan site and the method of analogy to make explanations.

Using indigenous villages like Kejara in Rio Vermelho valley of central Brazil in South America as an analogy, which is described as "a primitive culture society unaffected by the modern civilization" and "a strong bastion of indigenous cultures exist independently" settlements of bipartite structure like that of the Xinglongwa Culture at Baiyinchanghan site are reflections of moiety which is the same as phratry of Indians in North America in the nature of social organization. Drawing an analogy with ancient Chinese literature the kinship organization reflected in the settlement of the Xinglongwa Culture at Baiyinchanghan site should be "the surname family".

Settlements of bipartite structure like that of the Xinglongwa Culture at Baiyinchanghan site should be reflections of a village constituted by two stable intermarriage "surname family".

ORAL

## THE SOCIETY OF PRE-YANGSHAO PERIOD IN CHINA (7000BC--5000BC)

*Jinying Cai (Anyang Normal University) caijinying12@hotmail.com*

Pre-Yangshao period belongs to the early Neolithic age in China. Its radiocarbon dates range is 7000BC-5000BC. During this period, there were many cultures in China. The Peiligang culture, the Cishan culture, the Laoguantai culture and the Houli culture were distributed in the Yellow River Valley. The Pengtoushan culture and the Kuahuqiao culture were distributed in the Yangtze River Valley. The Xinglongwa culture was located in the northern region of China. Among those cultures, the Peiligang culture appeared to be the strongest. And the society began to be complicated at this time.

There were many sites and cemeteries excavated in every culture. In this paper, the author mainly uses these materials which had already published. Like *Peiligang Neolithic site in Xinzheng, Henan* (1978). *Excavation of Peiligang site in 1978* (1979). *Wuyang Jiahu* (1999). *Excavation report of Peiligang cultural relics in Tanghu site in 2007, Xinzheng City, Henan* (2010). *Excavation of Cishan Neolithic site in Hebei* (1977). *Cishan site in Wu'an, Hebei* (1981). *The first and second excavation report of Houli*

*site in Linzi, Shandong (1992). The third and fourth excavation report of Houli site in Linzi, Shandong (1994). Excavation report of Xiamengcun site in Bin County, Shaanxi (1960). Lijiacun Neolithic site in Xixiang, Shaanxi (1961). Pengtoushan and Basidang (2006). Excavation report of Xinglongwa site in Aohanqi, Neimenggu (1985). Excavation report of Baiyinchanghan Neolithic site in Linxi County, Neimenggu (1993).*

The research methods are mainly stratigraphy analysis, typology analysis and pedigree analysis. By using the stratigraphy analysis and typology analysis, we can understand the spatial and temporal distribution of each culture. And by using the pedigree analysis, we can analyze the relationships among those cultures.

The analysis shows that the Peiligang culture is the strongest among those cultures in Pre-Yangshao period. Combination of the stratigraphy and typology analysis, the Peiligang culture was divided into three phases. By using the pedigree analysis, the Peiligang culture originated from the Jiahu culture. Because of the early Cishan culture, the Jiahu culture transferred into the Peiligang culture. The Peiligang culture was influenced by the Houli culture in phase ?. It affected the Houli culture, the Cishan culture, the Xinglongwa culture, the Pengtoushan culture and the Laoguantai culture with varying degrees in phase ?. It had less control in phase ?.

During Pre-Yangshao period, the Peiligang culture played a very important role. It was the strongest among those cultures and it had a great impact on surrounding contemporary cultures with different degrees, especially on phase ?. The Peiligang culture were mainly distributed in the central plains region. It played an important role in the foundation of the Chinese Civilization development. Judging from the development of the Peiligang culture, we can say that the society began to be complicated at Pre-Yangshao period. Pre-Yangshao period, especially the Peiligang culture, was a key step in the process of social complexity.

ORAL

#### 4. CRAFT PRODUCTION AND SPECIALIZATION DURING THE THIRD MILLENNIUM IN THE SOUTHWEST OF IBERIAN PENINSULA

*Inácio, Nuno (University of Huelva) nuno.inacio@gmail.com  
Nocete, Francisco (University of Huelva) nocete@dhis1.uhu.es  
Bayona, Moisés R. (University of Huelva) moises.rodriquez@dhis1.uhu.es*

Since Gordon Childe that economic and craft specialization has been analyzed within the historical process that led to the emergence of the so-called "complex" societies. In the Iberian Peninsula, this topic has been preferably debated by technological paradigm, emphasizing the lack of economic and craft specialization during the Third Millennium BCE. In recent years, an intense research about the first specialized mining and metallurgy in southwestern Iberia, highlighting the theoretical and empirical limitations of the postulates based on sophistication or complexity technological criteria. This is the opportunity to discuss the economic and social models of metallurgical and ceramic production during the Third Millennium BCE.

ORAL

#### 5. SOCIAL COMPLEXITY IN THE THIRD MILLENNIUM BC IN SOUTHERN PORTUGAL

*Soares, Joaquina (MAEDS) cea.maeds@mail.telepac.pt*

The author proposes a complex tribal organization model for communities that inherited their social kinship structure from the megalithic societies, at the first half of the III millennium BC, in Southern Portugal. This social and economic model began to collapse in the second half of the same millennium, as a result of the development of the arsenical copper metallurgy (copper-arsenic alloys) and craft specialisation.

The control of metallurgy made it possible for the elites to legitimate the accumulation of the political power, and gave them a coercive capacity to impose an unequal and very hierarchical social structure based on chiefdom. This theoretical construction has been tested in the analysis of the settlement system at Triângulo da Luz (in the middle Guadiana valley), during the III millennium BC. The stratified social organization seems to be preceded by the chiefdom that raise in the second half of the III millennium BC and developed in the Bronze Age.

By the end of this period the chiefdom society reached its most complex structure. In opposition with other authors, that defend the emergence of the state in the III millennium BC with a centre based in the lower Guadalquivir region, this paper proposes that the state took place in the South of the Iberian Peninsula only at early Iron Age, in the context of the orientalising process.

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ORAL

## 6. MATERIAL VS. IMMATERIAL EVIDENCES OF INTERRELATIONS. POPULATION SIZE, MATING NETWORKS AND TECHNOLOGICAL TRANSFER IN SICILY DURING EARLY AND MIDDLE BRONZE AGE

*Cantisani, Matteo (UTAD) matteo.cantisani@gmail.com*

The evaluation of indigenous communities development in southern Italy, through the analysis of the dynamics of interaction with the eastern Mediterranean during the Bronze Age, is one of the most significant issues in the later prehistory for the central Mediterranean. A long tradition of studies (Vagnetti 1983; Peroni 1983; Bietti Sestieri 1985; Kilian 1983; Smith 1987; Jones et alii 2005) influenced by the world system theory and the concept of peer polity interaction, claimed a socio-economic interdependence in structuring indigenous socio-cultural complexity. The preliminary results of on-going research, here presented, provide a complementary perspective, focused on indigenous behavioral patterns' development in structuring socio-cultural complexity in Sicily, since the later early Bronze Age. Through the analyses of settlements and specific ceramic assemblages' as well as observations on exploitation of raw material sources, hypothesis on interaction patterns between local communities are suggested.

Typological analyses carried on RTV-style ceramic assemblage from Mursia, as well as other works, showed coexistence of different stylistic pottery assemblages within the same context, as in Serra del Palco di Milena (Palio 2006), Manfria (Orlandini 1960). Settlement/households spatial analyses have been personally conducted (e.g. Mursia). Other datasets concerning settlement dynamics have been acquired from well-preserved multiphase sites, as Muculufa, by bibliographical tool. Site catchment analysis using fixed-radii method (Higgs et alii 1967) permitted to identify presumably exploited raw material sources within the "exploitation territory".

Typological analysis results suggest interaction phenomena, especially in central-southern Sicily, on the base of co-occurrences of different pottery assemblages within the same site. Mursia datasets show Pantelleria has been involved (see also Secondo et alii 2011). Spatial analysis showed increasing complexity in organizing spaces both between households and within them. Population growth, even difficult to assess, can be proposed for such dynamics. Similarly, scholars hypothesized population growth trends both in Etna

district (Cultraro 1997) and in southern central Sicily at La Muculufa (McConnell and Bevan 1999) in the same chronological framework. On the other hand, buffering zone elaborations demonstrated that several sites could have had easy access to local raw material sources for pottery production.

Although population growth and ceramic assemblages suggest interaction patterns, site catchment analysis results do not appear to support this hypothesis. As provenance studies on pottery vessels from Ramacca district demonstrated, indeed, previously identified RTV-style imported objects were produced instead by using surrounding clay sources (Agodi et alii 2006). Taking into account population dynamics and typology results, this aporia can be solved by hypothesizing interactions involving not only objects but potters themselves and mating strategies. Type-groups variability in ceramic assemblages within the same site shall be interpreted as innovative products of "outlander" potters -likely married to local people- forced to deal with new exploitation strategies. In this perspective, technological changes in pottery production shall be useful to explain socio-cultural complexity by extrapolating behavioral patterns developments related to them, and linked to cultural transmission variability phenomena, affected by modes and contexts of technological transfer, interaction and population size dynamics.

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ORAL

## 7. DYNAMIC SOCIAL CHANGES IN THE BRONZE AGE SOCIETY OF SARDINIA (ITALY)

*Gradoli, Maria Giuseppina (PhD researcher in Ceramics Technology, School of Archaeology, University of Leicester (UK) ggradoli@yahoo.it*

The present work is based on my current PhD research 'Dynamic Social Changes and Identity. A petrological study of Bronze Age ceramics in Nuragic Sardinia' carried out with the aim of investigating the pattern of pottery production, consumption and exchange at an inter-site level on the one hand, and the complex sequence of social changes accompanying the appearance of megalithic towers (nuraghi) during the Middle Bronze Age (1600 BC) and their later complexity during the Recent and Final Bronze Age (around 1000 BC), on the other hand. Major phases of growing settlement complexity in a case-study area are studied in relation to 450 sherds of domestic pottery, looking deeper beneath their apparent 'static cultural homogeneity'

through continuity and change in technology with the help, when possible, of the historical data and the anthropological and ethnographic approaches.

In Sardinia since now, local practices of prehistoric ceramic production and consumption have largely remained understudied, or have only focused on stylistic attributes and their use in assessing a chronological typology. The methodology here used - analysing ceramic fabric variability among selected common vessel forms and domestic architectures - represents thus an innovation. After the adoption of a broad theoretical context, based on both the physical and the social sciences, the process of pottery manufacturing is studied under the petrographic microscope considering: 1) 'pottery fabric' or the arrangement, size, shape, frequency and composition of clay, minerals, and other materials added intentionally to improve the workability and firing performances of ceramic pastes; 2) the concept of 'chaîne opératoire' and its individual steps to reconstruct part or the whole sequence of technical, physical and mental actions performed by potters, starting from the way natural resources were acquired in the area, mixed together, fashioned and then physically transformed by the process of firing; 3) the 'raw material provenance analysis', using analytical and geological approaches, to establish whether the sampled vessels were produced using raw materials obtained from the investigated area or far away from it; 4) the 'experimental archaeology', that provides the opportunity to confirm potential hypothesis and conclusions with multiple trials and repeatable tests in a chemical/mineralogical laboratory and will be used for the reproduction of the ceramic pastes (according with the different proportion of mineral/rock inclusions and clays estimated under the microscope and their comparison with the archaeological ones under study).

The petrographic study, supported by the clay chemical/mineralogical analyses, is helping to investigate whether similar pottery manufacturing, especially during transitional periods, accompanied observable architectural changes. Moreover, the role of technology in shaping social structures, the micro-scale context of production, the cooperative process of vessel manufacture, the expression and passing down of practical knowledge, are being emphasized.

In Sardinia since now, ceramic studies have mainly focused on stylistic attributes and their use in assessing a chronological typology. Analysing ceramic fabric variability among selected common vessel forms and domestic architectures inform on the way mundane pottery were manufactured, used, exchanged or

circulated across the wide landscape through social networks.

ORAL

## 8. MIDDLE BRONZE AGE COMPLEXITY IN SOUTHERN PORTUGAL.

*Tavares da Silva, Carlos (MAEDS) maedscea@gmail.com*

The social inequalities of the Middle Bronze Age societies of Southern Portugal are the main objective of this paper.

The focus will be the funerary record from the second and third quarters of the II millennium cal BC; the social hierarchisation displayed on the burial material culture as well as on the architectural features will be analysed. In accordance to this archaeological evidence it is proposed a chiefdom social organization model. The improvement of the centralisation of the politic power generated a high capacity to rule over large territories, comprehending the Southwest of Iberian Peninsula.

The Bronze Age political structure could create common cultural trends throughout the provinces of Alentejo, Algarve, Badajoz and Cáceres, which can be read mostly in the ceramic style, metallurgical technology, funerary rituals, cemeteries architectures and engraved stone steles.

ORAL

## 9. TECHNIQUE AND SOCIAL COMPLEXITY: DEVELOPMENT TRAJECTORIES OF PEASANT SOCIETIES WITH METALLURGY DURING THE BRONZE AGE OF WESTERN IBERIA.

*Senna-Martinez, João Carlos (Centro de Arqueologia (uni-arq) Universidade de Lisboa) smartinfl@ul.pt*

*Luis, Elsa (Centro de Arqueologia (uniarq) Universidade de Lisboa) elsavluis@gmail.com*

Metallurgical practice from the ancient peasant societies was for a long time perceived as a "motor" for social development. Such a perception revealed itself not only inaccurate but it must also be seen as largely varying according to geographical place and civilization characteristics.

Nevertheless, in ancient peasant societies technological development remains one of the most promising

indicators of the growing of social complexity even if such growth must always be analysed accordingly to regional constraints.

In what concerns the Iberian Peninsula, and particularly its western facade, first metallurgies seem to appear as consequence of socioeconomic developments leading to first social elites coming into being. The metallurgical products can then be perceived to fulfil the need to express social status, lacking real technomic significance. Development of metallurgical technologies and products will, nevertheless, accompany and interact with parallel developments in social complexity from the Chalcolithic to the Early Iron Age when, for the first time, metals seem to assume a technomic role.

# B17

## Shepherds and caves

Organiser: Josep Maria Vergès, Ethel Allué and Marta Fontanals

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ORAL CONTRIBUTION

ORAL

**1. THE PREHISTORIC PEN DEPOSIT OF COVA GRAN DE SANTA LINYA: FORMATION PROCESSES AND PASTORAL PRACTICES IN THE SE PYRENEES AREA**

*Polo Díaz, Ana (Departamento de Geografía, Prehistoria y Arqueología, Euskal Herriko Unibertsitatea, Francisco Tomas y Valiente s/n, 01006 Vitoria-Gasteiz, Spain) anapolo-diaz@gmail.com*

*Martínez Moreno, Jorge (Centre d'Estudis del Patrimoni Arqueològic de la Prehistoria (CEPAP), Facultat de Lletres, Universitat Autònoma de Barcelona, 08193 Bellaterra, Spain) jorge.martinez@uab.cat.*

*Benito Calvo, Alfonso (CENIEH, Paseo Sierra de Atapuerca s/n, 09002 Burgos, Spain) alfonso.benito@cenieh.es*

*Mora Torcal, Rafael (Centre d'Estudis del Patrimoni Arqueològic de la Prehistoria (CEPAP), Facultat de Lletres, Universitat Autònoma de Barcelona, 08193 Bellaterra, Spain. Program ICREA-Academia) Rafael.Mora@uab.cat*

Pastoralism, a way of life followed by many groups in the present day as well as in the past, has encompassed an extraordinary variety of relationships between animals and humans across time and space that have been an expression of social and territorial organisation.

Prehistoric pen accumulations in rockshelters and caves can provide rich evidence of pastoral practices from the Neolithic through to the Chalcolithic/Bronze period.

Given the specific cultural and environmental dynamics involved in the formation processes of these sites high-resolution analysis of sediments and particularly micromorphology, has become a remarkably reliable tool for the identification and characterisation of early livestock-keeping practices.

The objective of this paper is to characterise the stabling practices and the syn/postdepositional formation processes of sediments from Cova Gran de Santa Linya through a combination of microstratigraphical analyses, macroscopic observations and radiometric dating of the Late Neolithic-Chalcolithic/Bronze pen deposits recorded at the site.

Samples for sedimentological and micromorphological analyses and radiocarbon dating were collected from stabling accumulations and interspersed runoff sediments. The stratigraphic sequence was recorded using aerial photography and lithostratigraphic

descriptions of the sediment texture, structure and composition.

In the laboratory, bulk samples were sieved and subjected to XRD and the organic content were calculated.

Thin sections for micromorphological analysis were manufactured from hardened blocks of undisturbed sediments and observed with a petrographic microscope at magnifications between 10x and 400x using Plane Polarised Light (PPL), Crossed Polarised Light (XPL) and Oblique Incident Light (OIL) applying international standard terminology.

To obtain a chronometric record for the sequence points that were linked to stratigraphic markers that corresponded to the roof and the base of the pen accumulations were selected. When possible, samples for radiocarbon dating were collected adjacent to block samples for micromorphology to temporally correlate the microfacies identified.

Sedimentological and micromorphological data enabled characterisation of the formation processes of a sequence holding two superimposed stabling accumulations and interbedded runoff episodes between 5.050-4.620 calBP/3.320-2.720 calBP.

Penning of sheep/goats has been documented at the site, mainly in the form of completely and partially combusted residues.

Postdepositional physico-mechanical features as bio-reworked sediments, erosive contacts and traits of water circulation allow assessment of the patterns of occupation at the site and the palaeoenvironmental dynamics involved in the degree of preservation of the stratigraphical record.

This study confirms the cyclical stabling of ovicaprids in the rockshelter. Other activities, such as the repeated burning of residues, add to our understanding of pen management and the upkeep of pen deposits in the past. The topographic characteristics and extensive use of the site over a long period of time, along with contextual data from other cave sites in the South-Eastern Prepyrenees where pen deposits have also been documented, allow discussion of the role played by Cova Gran in the establishment of long distance transhumant herding between the Ebro Basin and the Pyrenees during the Prehistory.

ORAL

## 2. INTEGRATING MICROSTRATIGRAPHICAL AND PALAEOBOTANICAL ANALYSES FOR THE STUDY OF PREHISTORIC PEN DEPOSITS: THE CASE OF SAN CRISTOBAL (NORTHERN IBERIA)

*Fernández Eraso, Javier (Departamento de Geografía, Prehistoria y Arqueología, Euskal Herriko Unibertsitatea, Francisco Tomás y Valiente s/n, 01006 Vitoria-Gasteiz, Spain) javier.fernandeze@ehu.es*

*Polo Díaz, Ana (Departamento de Geografía, Prehistoria y Arqueología, Euskal Herriko Unibertsitatea, Francisco Tomás y Valiente s/n, 01006 Vitoria-Gasteiz, Spain) anapolodiaz@gmail.com*

*Alonso Eguíluz, Monica (Departamento de Geografía, Prehistoria y Arqueología, Euskal Herriko Unibertsitatea, Francisco Tomás y Valiente s/n, 01006 Vitoria-Gasteiz, Spain) monicalonsoe@gmail.com*

*Ruiz, Mónica (Grupo de investigación en Arqueobiología. Instituto Historia. centro de ciencias Humanas y sociales. GSIC. Albasanz 2GT. 28037 Madrid, Spain) monica.ruiz@cchs.csic.es*

*Pérez, Sebastián (Departamento de Geografía, Prehistoria y Arqueología, Euskal Herriko Unibertsitatea, Francisco Tomás y Valiente s/n, 01006 Vitoria-Gasteiz, Spain) Sebastian.perez@cchs.csic.es*

*Albert, Rosa M<sup>a</sup> (Departament de Prehistòria, Història Antiga i Arqueologia, Universitat de Barcelona, Montalegre 6-8, 08001, Barcelona, Spain) rmalbert@ub.edu*

The particular dynamis involved in the formation processes of prehistoric pen deposits documented in caves and rockshelters entails that interdisciplinary approaches coupling microstratigraphical and palaeobotanical analyses have the potential to provide highly reliable and detailed results regarding the activities carried out and the settlement patterns of the sites in their palaeoenvironmental context.

Investigation of stabling practices through interdisciplinary analyses addressing the study at microscopic level of sedimentary accumulations during the Chalcolithic period in the Iberian Peninsula have remained scarce or lacking until now. This paper presents the first results of the micromorphology, phytolith, charcoal and pollen analyses of the chalcolithic layers IV-VIII (4.470 ± 40 BP - 4.030 ± 40 BP) recorded at the site of San Cristóbal (Upper Ebro Basin, Spain).

Micromorphological data provide evidence of penning activities, management of waste material through fire and discontinuity in the occupation of the site.

Phytolith analysis indicates strong presence of grass-related phytoliths together with much weaker evidence of leaves and woody plant fragments, which have been documented through all the sequence investigated.

Charcoal analysis suggests a clear contrast in the plant remains preserved between the earliest and the later archaeological layers: layer VIII is mainly represented by Pine wood while Quercus genus overtakes in layer VII and becomes strongly predominant in layer V.

Assessment of microstratigraphical and palaeobotanical results within their broader archaeological and chronological context allow interpretation of the use of the space, management of residues, palaeoenvironment and occupation patterns of rockshelters in the Western Pyrenees area during the Chalcolithic period.

ORAL

## 3. EL ABRIGO DE LA CASTAÑERA (OBREGÓN. VILLAESCUSA. CANTABRIA). A CATTLE STABLE?

*Vega Maeso, Cristina (Universidad de Cantabria) cvega-maeso@gmail.com*

*Carmona Ballester, Eduardo (Universidad de Burgos) educarmonaball@gmail.com*

*Sierra Sainz-Aja, Alejandro (Universidad de Cantabria) asierasainzaja@hotmail.com*

*Marín Arroyo, Ana Belén (Universidad de Cantabria) anabelen.marin@unican.es*

The work is aimed to describe the archaeological record site of El Abrigo de la Castañera. This site, situated in a little rock shelter, is known since the middle of the sixties and, after more than a decade, the site was excavated by a team of the "Sanz de Sautuola Archaeological Seminar". Since 2011 a team, headed by C. Vega-Maeso and E Carmona-Ballester, is working in this site and in its immediate surroundings, with the support of the Consejería de Cultura, Turismo y Deporte of the Cantabria Government.

Until now, we have conducted two sounding campaigns (2011-2012) and a regular excavation (2013) that covers an area of 10 m<sup>2</sup>. The excavation procedure has followed the stratigraphic principles enunciated by Harris and developed by Carandini. This method provides a well-defined sequence of events that have formed the site.

This is essential in sites like La Castañera' shelter with a complex stratigraphic sequence. Besides fieldwork, some



specific studies are been carried out in order to know better the people who lived and were buried within the shelter. One of them is focused on the faunal remains collected since 2011, which preliminary conclusions will be presented here.

This new research has demonstrated the existence of extraordinary of Bronze Age deposits, with funerary practices, and a Chalcolithic previous occupation with evidence of livestock corrals and living areas in the site. The Chalcolithic strata are formed by little lenses of gray or black ash rich in charcoal and organic matter. This kind of sedimentation is usual in caves or shelters that served as stables and where burning dung is a common practice, repeatedly done, to avoid parasites. Under these strata there are a hearth and some postholes that suggest a cabin was constructed. In consequence, a complex stratigraphic sequence is preserved. The preliminary results of the zooarchaeological study show that the cattle is the dominant species, followed by pig. One of the most remarkable results is the low representation of ovicaprines remains identified until now.

There is no doubt that site was used as stable during the Chalcolithic. The livestock composition is similar to what Sainz de Sautuola Seminar previously documented in their Chalcolithic level. Nevertheless, this is not an isolated case in the region, cattle were also very important during the Chalcolithic in the nearby Miron Cave, a site with a similar stratification to La Castañera. But, the high representation of cattle is not usual in the caves used as stable in the Iberian Peninsula, where is more common the ovicaprines. The research will resolve this matter and others such as livestock managing or the relationship between livestock and deposits formation.

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ORAL

#### **4. PERINATAL OVICAPRINE REMAINS AND EVIDENCES OF SHEPHERDING ACTIVITIES IN ENCLOSURE CAVES. THE CASE OF EL MIRADOR CAVE (SIERRA DE ATAPUERCA, SPAIN).**

*Martín Rodríguez, Patricia (IPHES/URV) patrimr9@gmail.com  
García-González, Ricardo (Instituto Pirenaico de Ecología (IPE) rgarciag@ipe.csic.es*

During Early Holocene, some caves were used like livestock enclosures. In these archeological contexts, sheep and goat remains are very abundant and the study of their remains can help to reconstruct shepherding activities at these sites.

El Mirador cave (Sierra de Atapuerca, Burgos) was used like stable cave and present early Holocene succession with a high number of ovicaprine remains (NR: 1987).

This work reports the analysis of El Mirador cave ovicaprine remains, in particular, the study of perinatal postcranial bones and decidual fall teeth. The aim is to study shepherding practices developed inside the cave and to study their evolution during Neolithic and Bronze Age.

Firstly, we identified perinatal and decidual fall teeth. Fetal bones are difficult to distinguish from neonatal ones. For this reason we have employed three identification methods: comparative osteological collection of Raza Rasa Aragonesa (current domestic sheep breed), osteometric analysis of postcranial elements and different bone ontogeny sequences works.

When it was possible, we have distinguished sheep bones from goat ones. Results were interpreted by quantification units: number of identified specimens (NISP) and minimum number of individuals (MNI).

In total, perinatal individuals were identified in 26 levels. Fetal and neonatal individuals show shepherding practices inside the cave. El Mirador cave was used to enclose ovicaprine herds, at least during the last gestation weeks, births and the first month of life of the offspring.

Few decidual fall teeth were identified. These teeth usually falls in graze areas, while the herd graze or chew. Considering fall teeth shortage, El Mirador cave could be used like livestock enclosure each night but during the daylight livestock would be moved to outdoors graze areas.

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ORAL

#### **5. THE USE OF WOOD FODDER AT EL MIRADOR CAVE (ATAPUERCA, BURGOS). A STUDY BASED ON ANTHRACOLOGY AND DENDROLOGY**

*Euba, Itxaso (1 ICAC, Institut Català d'Arqueologia Clàssica. Plaça Rovellat s/n 43003 Tarragona, Spain. 2 Arrel. Arrel SCP. Cultura i Arqueologia. C/Caputxins 25, 7º 2ª; 43001 Tarragona) itxasoeba@gmail.com*

*Allué, Ethel (3 IPHES, Institut Català de Paleoecologia Humana i Evolució Social, C/ Marcel·lí Domingo s/n Campus Sescelades URV (Edifici W3), 43007-Tarragona, Spain 4 Àrea de Prehistòria, Universitat Rovira i Virgili (URV), Av. Cata-*

*lunya 35, 43002- Tarragona, Spain ) eallue@iphes.cat*  
*Burjachs, Francesc (1 IPHES, Institut Català de Paleoecologia Humana i Evolució Social, C/ Marcel·lí Domingo s/n Campus Sescelades URV (Edifici W3), 43007-Tarragona, Spain. 2 ICREA, Institució Catalana de Recerca i Estudis Avançats. Barcelona, Catalonia, Spain ) francesc.burjachs@icrea.cat*

Wood fodder is an important income of food for herds in agro-pastoral communities. It is usually grazed and some species are specially appreciated by goats or sheep. The identification of wood charcoal in archaeological contexts has been suggested as part of woody fodder to feed animals inside caves overall during winter periods. El Mirador cave has yielded a continuous sedimentary deposit of burnt sediments identified as "fumier" layers, corresponding to burnt sheep and goat dung. The study of the charcoal assemblage from El Mirador has been based on an anthracological traditional approach and a dendrological analysis. This multiapproach has permitted to characterize the charcoal assemblage. The anthracological analyses is based on the study of 3868 charcoal remains from 16 layers covering a chronological span from 7030 ±40 to 4760 ±40 yrs BP. Layers 6 to 24 correspond to the Neolithic whereas layers 3 and 4 correspond to the Bronze age. The results of the anthracological analyses show that oaks (evergreen and deciduous oaks) were the most used species along the sequences showing >60% in all layers. Other taxa were also present in low percentages *Pinus sylvestris* type, *Fraxinus*, *Corylus* among others showing a more humid environment. At the top of the sequence evergreen oaks show higher values, with lower values of *Fraxinus* and *Corylus* indicating an increase of aridity. Finally, *Fagus* and Fabaceae are only present in the Bronze Age layers. The dendrological analyses could be only applied to a small sample, as charcoal fragments are usually small and number of rings needed for the study is not always available. The results show that most of the analyzed samples show much curved growth rings and mean value of 6 to 10 rings. These results suggest that the used wood corresponds to young branches and tree rings rapid growth rhythm which might be indicating that trees have been pruned regularly. Both analyses suggest that oak was probably used for woody fodder and was burnt during the combustion process that was carried out repeatedly.

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ORAL

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**6. PASTORAL PATHS AND THE HERDING WORLD: THE ROUTES OF THE SHEPHERDS FROM ANTIQUITY TO MODERN AGE ACROSS THE MOUNTAINS OF SICILY.**

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*Forgia, Vincenza (Università di Palermo, R-Evolution) vincenza.forgia@gmail.com*  
*Vergès, Josep Maria (Universitat Rovira i Virgili, IPHES) jmverges@iphes.cat*  
*Ollé, Andreu (Universitat Rovira i Virgili, IPHES) aolle@iphes.cat*  
*Di Simone, Giovanni (Università di Ferrara) giovannidisimone86@gmail.com*

One of the topics of the Madonie research project is the origin and development of pastoralism in the island. The possibility to cross archaeological, archaeo-zoological and palaeobotanic record is giving an idea of the development of pastoralism since its establishment in Sicily and in its developing.

After years of field survey we are finally able to process the different types of data using a GIS platform, particularly useful in the computation of least-cost paths. Our attention is focusing over one particular topic: the possibility to virtually draw the local trails followed in prehistoric and historic times, by pastoral groups.

Traces of pastoral activity are scattered all around the mountains. They embrace:

- 1) caves or rock shelter used, or (more rarely) still in use by shepherds or as resting place for herds.
- 2) Modern "pagliai" with a single or multiple pens
- 3) Modern building of cheese making.

Caves, "pagliai" and pens offer the possibility to analyse the development of pastoralism in this part of the Island with a diachronic approach. Since the study of Brochier, Villa and Giacomarra, it was clear that pastoral sites of Madonie offered a good opportunity to study pastoralism traditions and way of life.

Our work is documenting, within all altimetric zone, every pastoral place indicated by aerial photography or historical and recent cartography, by toponomastic layer, by direct survey, dedicating a particular attention to still in use places, where it's possible to recognize also the human passage in the past, as in the case of caves, showing stratified deposits and/or polished walls or signs that recall pastoral uses.

The chronological and cultural grid we are documenting within one of the pastoral rock shelter, at Vallone Inferno, is giving us the possibilities to contextualize the territorial pattern.

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## 7. INTERDISCIPLINARY STUDY ON THE HISTORY OF PASTORALISM ON LA GOMERA (CANARY ISLANDS, SPAIN): ARCHAEOLOGICAL SOUNDS

*Hernández-Marrero, Juan Carlos (Museo Arqueológico de La Gomera (Cabildo Insular de La Gomera) museoarqueologico@lagomera.es*

*Navarro-Mederos, Juan Francisco (UDI de Prehistoria, Arqueología e Historia Antigua. Universidad de La Laguna) jnavarro@ull.edu.es*

*Trujillo-Mora, José Miguel (Museo Arqueológico de La Gomera (Cabildo Insular de La Gomera) josemigueltrujillo@gmail.com*

*Jeannine Cancel, Sandra (Servicios Integrales de Patrimonio Histórico SL.) dsaanr@yahoo.es*

The present study is aimed at charting the historical development of pastoralism on the island of La Gomera (Canary Islands), from prehistoric times through to the present, from socio-economic, cultural and territorial perspectives.

This project allows for the interplay of three different subject areas: ethnography, documental history and archaeology. This overlap of historical research allows for significant areas of existing demand to be covered, not only from the purely historical perspective but also from the viewpoint of cultural heritage management.

In particular, archaeological research is aimed at a deeper perception of the problems of management, transformation and consumption of livestock and derived products from prehistoric times. We should, thus, be able to respond to the question: ¿How can archaeology traces data that derive from this activity? So it was proposed to study the habitat caves which are significant since, to date, there are no studies on these archaeological contexts on the island.

Other kind of work relating to the aim of the project, and approached from varying perspectives, include: the zooarchaeological analysis, above all, the remains of domestic fauna such as goats, sheep, pigs and dogs; archaeological survey and territorial analysis of husbandry to reconstruct bridel paths and grazing grounds; paleodiet studies, archaeoastronomical research and studies relating to symbolic sphere, as funeral and sacrificial places.

The initial difficulties encountered when excavating was to locate caves that had not been subject to

serious transformation and yet were easily accessible for an extensive study, given the natural and historic characteristics of the island. The constant use of caves through to our present times has caused a marked lack of archaeosedimentary matrices that have not undergone substantial perturbation and, to a much more marked extent, the extreme scarcity of powerful stratigraphic records. Therefore, we decided to carry out a first wave of sounds previous to extensive excavation which is still pending. The pre-excavations were spread over four campaigns (2009 and 2010) with thirteen sounds or probes carried out over eight archaeological sites in cave, distributed over the whole of the island of La Gomera.

The results were much more than what had been initially expected, since six of the sites offered fine perspectives for extensive excavation. Sedimentary samples were taken from the same together with archaeological material which, as yet, has not been duly registered and far less stratigraphically referenced. There were many outstanding examples of sheep and goat coprolites plus bone remains of domestic fauna and organic matter which may have formed part of the manure which is typical of barns and pens. Likewise, there were elements that seemed to have been common to cave settlements such as vertical and horizontal post holes.

One of the sites of greatest interest for an extensive excavation is the area formed by the site Las Cuevas de Herrera González (Vallehermoso), where we have located an important stratigraphic package that dates from prehistoric times through to the period of contact between the natives of the island and europeans at the end of the XVth century.

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## 8. APPLICATIONS OF ARCHAEOMAGNETISM TO THE STUDY OF BURNT ANTHROPOGENIC CAVE SEDIMENTS

*Carrancho Alonso, Ángel (Área de Prehistoria, Dept. Ciencias Históricas y Geografía, Universidad de Burgos, Edificio I+D+I, Plaza Misael Bañuelos s/n, 09001 Burgos, Spain) acarrancho@ubu.es*

*Villalaín, Juan José (Dpto. Física, Universidad de Burgos, Escuela Politécnica Superior, Avda. Cantabria s/n, 09006 Burgos, Spain) villa@ubu.es*

*Vergès, Josep Maria (IPHES, Institut Català de Paleoecologia Humana i Evolució Social, C/ Marcel·lí Domingo s/n, Campus Sescelades (Edifici W3), 43007 Tarragona, Spain / Àrea*

*de Prehistoria, Universitat Rovira i Virgili (URV), Avinguda de Catalunya 35, 43002 Tarragona, Spain.) jmverges@iphes.cat*  
*Straus, Lawrence (Dept. of Anthropology MSC01 1040, University of New Mexico, Albuquerque, NM 87131-0001, USA) lstraus@unm.edu*

*González Morales, Manuel Ramón (Instituto Internacional de Investigaciones Prehistóricas de Cantabria, Universidad de Cantabria, Avda. de los Castros s/n, 39071 Santander, Spain) moralesm@unican.es*

*Carretero, José Miguel (Laboratorio de Evolución Humana, Departamento de Ciencias Históricas y Geografía, Universidad de Burgos, Edificio I+D+I, Plaza de Misael Bañuelos s/n, 09001 Burgos, Spain) jmcarre@ubu.es*

Burnt anthropogenic cave sediments of holocene age (fumiers) represent a great source of data to reconstruct agro-pastoral human occupations since the Neolithic, mainly in the Mediterranean area. The diversity of techniques applied to their study is allowing the compilation of valuable archaeological, environmental and chronological data about these prehistoric communities. The particular succession of burnt levels at these sites (ash – carbonaceous couplets), well-preserved in more or less continuous sequences and usually well-dated, is proposed as a suitable context for archaeomagnetic studies. The information that can be obtained has both geophysical and archaeological interest. Archaeomagnetism is mainly known as a dating method. It is based on the small (few degrees) directional and intensity variations undergone by the Earth's magnetic field at regional scale (palaeosecular variation, PSV) and also on the ability of burnt archaeological materials to record such variations during heating through the acquisition of a thermoremanence (TRM). However, it also has many other applications of archaeological interest such as determination of palaeotemperatures, reconstruction of environmental conditions during burning (e.g.: type of atmosphere) or evaluation of post-depositional processes in burnt materials, among others. Here we report different examples of these applications from our research in anthropogenic cave sequences.

First, we present the results obtained from the study of multiple burnt levels at three caves from Northern Iberia, reporting 26 new archaeomagnetic directions ranging from ~ 5.500 to 2.000 yr BC. These data represent the oldest archaeomagnetic directions currently existing in Western Europe. Their combination with Mid-Holocene Eastern European archaeomagnetic records has allowed the design of the first directional European PSV curve, thus extending back-in time the use of archaeomagnetism as a dating method until Neolithic times. Dating

resolution of this curve reaches precision comparable to radiocarbon, making it a tool of great interest for the archaeological community. Second, a case-study about the application of archaeomagnetism as a tool to assess post-depositional mechanical processes in cave fires is shown from two burning events at El Mirador Cave (Sierra de Atapuerca, Burgos). Finally, it will be shown how the identification of maximum unblocking temperatures ( $T_{UB}$ ) of partial thermoremanences (p-TRM) can be used as a method to estimate the last heating temperature undergone by burnt archaeological materials. Despite its versatility, archaeomagnetism has barely been explored to study burnt anthropogenic cave sequences and this contribution aims to show its applications and limits to the study of this type of contexts.

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## 9. AN EXPERIMENTAL PROGRAM FOR THE OBTAINING OF DATA FROM HERD FOLDS FOR THE STUDY OF PREHISTORIC LIVESTOCK PRACTICES: THE CASE OF THE CORRAL MAS DEL PEPET (MONTBALNC, TARRAGONA)

*Vergès, Josep Maria (IPHES: Institut Català de Paleoecologia Humana i Evolució Social. C/ Marcel·li Domingo, s/n, 43007, Tarragona, Spain. URV: Àrea de Prehistòria, Facultat de Lletres, Universitat Rovira i Virgili. Av. Catalunya, 35, 43002, Tarragona, Spain.) jmverges@iphes.cat*

*Allué, Ethel (IPHES: Institut Català de Paleoecologia Humana i Evolució Social. C/ Marcel·li Domingo, s/n, 43007, Tarragona, Spain. URV: Àrea de Prehistòria, Facultat de Lletres, Universitat Rovira i Virgili. Av. Catalunya, 35, 43002, Tarragona, Spain.) eallue@iphes.cat*

*Burjachs, Francesc (IPHES: Institut Català de Paleoecologia Humana i Evolució Social. C/ Marcel·li Domingo, s/n, 43007, Tarragona, Spain. URV: Àrea de Prehistòria, Facultat de Lletres, Universitat Rovira i Virgili. Av. Catalunya, 35, 43002, Tarragona, Spain. ICREA: Institut)*

*Cabanes, Dan (UB: Universitat de Barcelona, Departament de Prehistòria, Història Antiga i Arqueologia. Montalegre 6-8, 08001, Barcelona, Spain.) fburjachs@iphes.cat*

*Carrancho, Ángel (UBU: Área de Prehistoria, Dept. Ciencias Históricas y Geografía, Universidad de Burgos. Edificio I+D+I, Plaza Misael Bañuelos s/n, 09001, Burgos, Spain.) acarrancho@ubu.es*

*Expósito, Isabel (IPHES: Institut Català de Paleoecologia Humana i Evolució Social. C/ Marcel·li Domingo, s/n, 43007, Tarragona, Spain. URV: Àrea de Prehistòria, Facultat de Lletres, Universitat Rovira i Virgili. Av. Catalunya, 35, 43002, Tarragona, Spain.) iexpósito@iphes.cat*

*Martín, Patricia (IPHES: Institut Català de Paleoecologia Hu-*

*mana i Evolució Social. C/ Marcel·li Domingo, s/n, 43007, Tarragona, Spain. URV: Àrea de Prehistòria, Facultat de Lletres, Universitat Rovira i Virgili. Av. Catalunya, 35, 43002, Tarragona, Spain. ) patrimr9@gmail.com*

*Morales, Juan Ignacio (IPHES: Institut Català de Paleoecologia Humana i Evolució Social. C/ Marcel·li Domingo, s/n, 43007, Tarragona, Spain. URV: Àrea de Prehistòria, Facultat de Lletres, Universitat Rovira i Virgili. Av. Catalunya, 35, 43002, Tarragona, Spain. ) jmorales@iphes.cat Vallverdú, Josep (IPHES: Institut Català de Paleoecologia Humana i Evolució Social. C/ Marcel·li Domingo, s/n, 43007, Tarragona, Spain. URV: Àrea de Prehistòria, Facultat de Lletres, Universitat Rovira i Virgili. Av. Catalunya, 35, 43002, Tarragona, Spain. ) jvallverdu@iphes.cat*

*Viñas, Ramon (IPHES: Institut Català de Paleoecologia Humana i Evolució Social. C/ Marcel·li Domingo, s/n, 43007, Tarragona, Spain. URV: Àrea de Prehistòria, Facultat de Lletres, Universitat Rovira i Virgili. Av. Catalunya, 35, 43002, Tarragona, Spain. CIAR: Centre d) rvinyas@iphes.cat*

The obtaining of referential data from present day herders is the basis to contribute to the correct interpretations of archeological records from prehistoric livestock spaces. In February 2014, we have started an experimental program in a fold where a herd is kept for the cleaning of the undergrowth in the frame of a fire prevention control program at Parc Natural d'Interès Nacional de Poblet (Tarragona). This herd was selected because, concerning its management, is similar to those from prehistoric periods and it is not fed with any other supplementary food as industrial fodder. The herd is mainly composed by goats with a small quantity of sheep. The herd is kept in the enclosure which is attached to a rocky wall, and has a roof and an open-air area, which provides contextual variability for this case study. The protected area is limited by walls and is covered with a roof and a small natural rock-shelter. In the frame of the experimental project we have agreed not to clean up the excrements, as we are burning them periodically with the aim to reproduce the management observed in the prehistoric folds. One of the main aspects of this research are the botanical studies with the aim of documenting the representativeness of the botanical content of these dung deposits in relation to the surrounding vegetal cover and the pasture areas. For this, we are developing a vegetation catalog of the pasture areas and the nearby surroundings, then we study the herd choices and we record the actual pollen deposition in the different areas of the shelter. Afterward, we aim to compare this data with the results of the dung analysis in relation to the presence of different plant species and their percentages in relation to the ones in the environment.

Another objective is related to the formation processes of the deposit. With this aim, we are documenting the increase of the total excrement deposition and by activity areas in relation to the number of animals and the time the herd is inside the enclosure. The periodical burning of the excrement permits also to estimate the volume reduction due to this activity, and the temperature and chromatic changes. We are carrying out periodical samplings to characterize different aspects of the deposits using micromorphology related with season or activity changes. In the frame of the formation processes we are studying the horizontal and vertical movements related to the fold activity of different materials (lithic tools, ceramic, bones, etc.). Furthermore we are studying the taphonomy of the natural and cultural materials of the deposit. Also, in relation to the burning activity of the excrement, we are sampling the combustion episodes to obtain data to contextualize the data obtained by the archeomagnetic studies. Finally we are documenting the development of polish of the rock produced by the herd. In this communication we are presenting the methodology and the experimental protocols used in the designing and control of the experimental program and the results obtained during the firsts months of development.

POSTER

POSTER

**1. LJUBI EVA CAVE (CROATIA, ISTRIA): EXCAVATIONS 2008-2011**

*Percan, Tihomir (Croatian Conservation Institute) tpercan@h-r-z.hr*

*Plestina, Ivica (Croatian Conservation Institute) iplestina@h-r-z.hr*

*Jerbic Percan, Katarina (Archaeological museum of Istria, Pula) katarina.jerbic@gmail.com*

Due to its exceptional geographical position on the crossroads of ancient paths, the Istrian Peninsula was an important link between east, west, north and south ever since the prehistoric times. The Ljubi eva cave is situated in southern Istria (Croatia) near the village Marana and only 15 kilometres east of Pula, the peninsula's largest city. The cave itself is positioned on the bottom of a large sinkhole, making itself almost unnoticeable in the peaceful landscape. Sinkholes are very common in a karst region such as Istria. In the area around the Ljubieva cave there are many other recorded caves and pits. One of the most important Late Paleolithic sites in the northern Adriatic, the Šandalja cave, is also situated nearby.

Since 2008 to 2011 archaeological excavations were carried out in cooperation between Musée d'Anthropologie préhistorique de Monaco (Principality of Monaco) and The Croatian Conservation Institute (Croatia). Four trenches were excavated: two in the deepest part of the cave (inside of a pit), one in the largest hall and another in a smaller room (Room 2, trench B). The surface of this trench was ultimately 10 m<sup>2</sup>. The entire excavated sediment was carried to a secondary location where the water sieving and flotation were carried out. The large and small fractions were later analysed in a laboratory. The reason for this rather complicated chain of actions was the cave's very moist and wet sediment and the lack of daylight, making it very difficult to notice all the findings. Measurements and other usual archaeological recordings were taken to those artefacts that we were able to find on site.

Using these methods, we collected and analyzed a large number of valuable data related to nutrition, husbandry and lifestyle. These analyses were executed by a range of scientific experts like archaeologists, geologists, zooarchaeologists, speleologists. By collecting all the scientific research, we were able to reconstruct that the cave was continuously in use from Late Paleolithic (Epigravettian) until the Bronze age. This thesis was confirmed with radiocarbon dates (C14) and the archaeological material that can typologically be placed in the mentioned periods. Recorded findings, specially ones from the Neolithic period, implied that some activity connected to husbandry was held in the cave. Different kind of seeds and nuts were found, as well as a grindstone with a pestle which was used for processing the grains.

These findings are showing that in the Neolithic period the fields around the cave were used for husbandry and that was one of the most important food sources for the people that were inhabiting the Ljubieva cave and nearby caves. By continuing with a variety of different scientific approaches and with future researches, this site has the potential to become one of the significant reference sites for the Epigravettian and Neolithic period of Northern Adriatic.

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POSTER

**2. VESSELS OF THE SHEPHERDS: THE NEOLITHIC POTTERY SEQUENCE AT EL MIRADOR CAVE (SIERRA DE ATAPUERCA, SPAIN) C. 6300 - 4760 BP**

*Oms Arias, F. Xavier (SERP Universitat de Barcelona) xaviroms@gmail.com*

*Marsal, Roser roser.marsal89@gmail.com*  
*Moral, Sergio sergiomoral@hotmail.com*  
*Fontanals, Marta (IPHES) mfontanals@iphes.cat*  
*Vergès, Josep M. (IPHES) jmverges@iphes.cat*

El Mirador cave has a sequence comprising the Early Neolithic period to the Bronze age. Most of this wide occupation was dedicated to the livestock keeping. In this work we will focus on analyzing the ceramic Neolithic equipping of the site (MIR6 to MIR23) with a double aim: (a) to determine the type and measurement of ceramic vessels to establish functional possibilities and (b) to initiate the decorative-formal study of the remains to establish a cultural affiliation of each chronological phase.

The whole of the pottery record (c.2300 fragments) has been analyzed to establish the minimum number of vessels (plain and decorated). From a macroscopic analysis, type of finished, mineral inclusions and cooking have been studied. Furthermore decorative matrices of the available sample have been analyzed.

Greater number of ceramic vessels have been observed in the layers of Early Neolithic and Late Neolithic than the intermediate phase. Also subtle differences in the volumes between the phases and morphologies have been observed. This would imply the possibility that the occupations had unequal intensities and at the same time the duration was also different.

In turn, the decorations are documented mostly in the earliest levels, while they are anecdotal from the Middle Neolithic. This fact indicates that the same tendency is followed in the peninsular Neolithic than the center of the Iberian Peninsular sites.

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POSTER

**3. LANDSCAPES AND PLANT USES DURING THE NEOLITHIC AND BRONZE AGE BASED ON PLANT MACROREMAINS FROM EL MIRADOR (ATAPUERCA, BURGOS)**

*Allué, Ethel (1 IPHES, Institut Català de Paleoecologia Humana i Evolució Social, C/ Marcel·lí Domingo s/n Campus Sescelades URV (Edifici W3), 43007-Tarragona, Spain, 2 Àrea de Prehistòria, Universitat Rovira i Virgili (URV), Av. Catalunya 35, 43002- Tarragona, Spain ) eallue@iphes.cat*  
*Euba, Itxaso (1 ICAC, Institut Català d'Arqueologia Clàssica. Plaça Rovellat s/n 43003 Tarragona, Spain. 2 Arrel. Arrel SCP. Cultura i Arqueologia. C/Caputxins 25, 7º 2ª; 43001 Tarragona, Spain) itxaso@icac.cat*

gonal) itxasoeba@gmail.com

Rodríguez, Anna (IPHES, Institut Català de Paleoecologia Humana i Evolució Social, C/ Marcel·lí Domingo s/n Campus Sescelades URV (Edifici W3), 43007-Tarragona, Spain ) an.rodriguez.cruz@gmail.com

Plant macroremains including charcoal, fruits and seeds from El Mirador contribute to the study of different aspects related to human groups using the cave. The study of the plant assemblage contributes to uses of this type of evidence that were probably related to different activities. Food, fuel and fodder are the main uses of plant evidences identified at El Mirador. For the study all sediments recovered during the field work were sieved using a flotation machine or bucket flotation using 4, 2 and 0,5 mm meshes. Between 166 and 0,5 liters per sample were floated since 1999 when we first started the excavation. The anthracological study is based on the identification of 3868 charcoal remains from 16 layers (MIR3 to MIR24). The study of seeds and fruits are based on a sample from square Q22 including layers from MIR6 to MIR24. A total of 2061 remains were recovered. The anthracological results shows a continuous sequence where oaks are dominant along the deposit. At the bottom of the sequence the assemblage show more important values of humid environments such as deciduous oaks, *Fraxinus*, *Corylus*, *Cornus* as well as *Pinus sylvestris* type. At the top of the sequence evergreen oaks had more significant values and there is a decrease of *Fraxinus* and *Corylus*. According to the seed and fruit analyses results the most significant crops are *Triticum aestivum/durum* and *Triticum diccocom*; other taxa such as *Avena*, *Hordeum*, *Pisum* and *Vicia* are also present. Overall at the bottom of the sequence there is an important number of rachis and the spikelet forks remains mostly related to crop threshing activities. Synanthropic vegetal species (adventives and ruderals) are also abundant along the sequence. Finally, fruit seeds such as *Cornus*, *Rubus*, *Quercus*, *Prunus* and *Sambucus* are also present in low values. These results suggest that crop fields were probably close to the site and, in some cases, activities related to harvesting and crop processing were developed in the cave. According to this data and taking into account pollen and phytolith records, the landscape at the surrounding areas was a mosaic of woody areas, crop fields and open prairies. Along the sequence there are no critical changes, however charcoal data show a decrease of humid environment taxa and an increase of aridity along the sequence. This would be related to environmental variation that might occur along the mid-Holocene. The increase of the intensity of anthropic activity could be affecting landscape changes.

POSTER

#### 4. EL MIRADOR CAVE (SIERRA DE ATAPUERCA, BURGOS, SPAIN): THE VEGETAL MICROREMAINS

Expósito, Isabel (1 IPHES, Institut Català de Paleoecologia Humana i Evolució Social, C/ Marcel·lí Domingo s/n Campus Sescelades URV (sector W3), 43007 - Tarragona, Spain.) iexposito@iphes.cat

Cabanes, Dan (3 ERAAUB / GEPEG, University of Barcelona, Department of Prehistory, Ancient History and Archaeology.) dancabanes@gmail.com

Burjachs, Francesc (4 ICREA, Institució Catalana de Recerca i Estudis Avançats. Barcelona, Catalonia, Spain.) IPHES, Institut Català de Paleoecologia Humana i Evolució Social, C/ Marcel·lí Domingo s/n Campus Sescelades URV (sector W3), 43007 - Tarragona, Spain.) fburjachs@iphes.cat

Alonso Eguiluz, Mónica (5 UPV / EHU, Universidad del País Vasco, Departamento de Geografía, Prehistoria y Arqueología, C/ Tomás y Valiente, s/n, 01006 Vitoria-Gasteiz.) monicalonsoe@gmail.com

The uppermost layers of El Mirador Cave infilling are formed by a succession of burnt dung accumulations. Dung was accumulated during the Neolithic and Bronze Age (6320 ±50 to 3040 ±40 BP) when the cave was used as a pen and the dung was periodically burned for hygienic reasons. These activities produced an exceptional accumulation of vegetal microremains, including phytoliths, pollen and non-pollen palynomorphs.

The detailed sampling strategy and high resolution analyses allowed us to reconstruct formation processes, human activities, palaeoecology and the nearby landscape of the site through vegetal microremains.

Both disciplines palynology and phytolith analysis agree with the anthropic origin of the deposit and with the landscape degradation related with the development of pastoralism and agricultural practices.

POSTER

#### 5. EL MIRADOR CAVE (SIERRA DE ATAPUERCA, BURGOS, SPAIN): A WHOLE PRESPECTIVE.

Vergès, Josep Maria (IPHES, Institut Català de Paleoecologia Humana i Evolució Social, C/ Marcel·lí Domingo s/n Campus Sescelades URV (Edifici W3), 43007-Tarragona, Spain. Àrea de Prehistòria, Universitat Rovira i Virgili (URV), Av. Catalunya 35, 43002- Tarragona, Spain.) jmverges@iphes.cat

Allué, Ethel (IPHES, Institut Català de Paleoecologia Hu-

*mana i Evolució Social, C/ Marcel·li Domingo s/n Campus Sescelades URV (Edifici W3), 43007-Tarragona, Spain. Àrea de Prehistòria, Universitat Rovira i Virgili (URV), Av. Catalunya 35, 43002- Tarragona, Spain ) eallue@iphes.cat*  
Carrancho, Ángel (Àrea de Prehistoria, Dept. Ciencias Históricas y Geografía, Universidad de Burgos, EdificioI+D+, Plaza Misael Bañuelos s/n, 09001 Burgos, Spain.) acarrancho@ubu.es

Euba, Itxaso (ICAC, Institut Català d'Arqueologia Clàssica. Plaça Rovellat s/n 43003 Tarragona, Spain. Arrel. Arrel SCP. Cultura i Arqueologia. C/Caputxins 25, 7º 2ª; 43001 Tarragona) itxasoeba@gmail.com

Expósito, Isabel (IPHES, Institut Català de Paleoecologia Humana i Evolució Social, C/ Marcel·li Domingo s/n Campus Sescelades URV (Edifici W3), 43007-Tarragona, Spain. Àrea de Prehistòria, Universitat Rovira i Virgili (URV), Av. Catalunya 35, 43002- Tarragona, Spain ) iexpósito@iphes.cat

Fontanals, Marta (IPHES, Institut Català de Paleoecologia Humana i Evolució Social, C/ Marcel·li Domingo s/n Campus Sescelades URV (Edifici W3), 43007-Tarragona, Spain. Àrea de Prehistòria, Universitat Rovira i Virgili (URV), Av. Catalunya 35, 43002- Tarragona, Spain ) mfontanals@iphes.cat

Lozano, Marina (IPHES, Institut Català de Paleoecologia Humana i Evolució Social, C/ Marcel·li Domingo s/n Campus Sescelades URV (Edifici W3), 43007-Tarragona, Spain. Àrea de Prehistòria, Universitat Rovira i Virgili (URV), Av. Catalunya 35, 43002- Tarragona, Spain ) mlozano@iphes.cat

Marsal, Roser (IPHES, Institut Català de Paleoecologia Humana i Evolució Social, C/ Marcel·li Domingo s/n Campus Sescelades URV (Edifici W3), 43007-Tarragona, Spain. Àrea de Prehistòria, Universitat Rovira i Virgili (URV), Av. Catalunya 35, 43002- Tarragona, Spain ) roser.marsal89@gmail.com

Martín, Patricia (IPHES, Institut Català de Paleoecologia Humana i Evolució Social, C/ Marcel·li Domingo s/n Campus Sescelades URV (Edifici W3), 43007-Tarragona, Spain. Àrea de Prehistòria, Universitat Rovira i Virgili (URV), Av. Catalunya 35, 43002- Tarragona, Spain ) patrimr9@gmail.com

Morales, Juan Ignacio (IPHES, Institut Català de Paleoecologia Humana i Evolució Social, C/ Marcel·li Domingo s/n Campus Sescelades URV (Edifici W3), 43007-Tarragona, Spain. Àrea de Prehistòria, Universitat Rovira i Virgili (URV), Av. Catalunya 35, 43002- Tarragona, Spain ) jmorales@iphes.cat

Oms, Xavier (SERP, Seminari d'Estudis i Recerques Prehistòriques, Dept. de Prehistòria, Història Antiga i Arqueologia, Universitat de Barcelona, C/ Montalegre 6-8, 08001 Barcelona, Spain.) xavieroms@gmail.com

Rodríguez, Anna (IPHES, Institut Català de Paleoecologia Humana i Evolució Social, C/ Marcel·li Domingo s/n Campus Sescelades URV (Edifici W3), 43007-Tarragona, Spain. Àrea de Prehistòria, Universitat Rovira i Virgili (URV), Av. Catalunya 35, 43002- Tarragona, Spain ) an.rodriguez.cruz@gmail.com

The archaeological site of *El Mirador* is located in the southern slope of the *Sierra de Atapuerca*. The works developed at the site are providing a substantial set of data from the Upper Palaeolithic and Early Neolithic to the Middle Bronze Age. Throughout these at least about 4000 years of occupations, the cave was used for various activities, among burial, habitation and animal stalling. The practices related with this last use is at the moment, the main origin of the archaeological deposit, mainly composed by burnt animal dung with vegetal, potsherds, lithic and faunal remains. Also it is characterized by elevated high sedimentation rate that has enabled an individual and clear record of different episodes, providing a high chronological resolution data. Due to these particularities, we have developed a specific methodology of excavation and interdisciplinary study of the archaeological data in order to understand the genesis of this archaeological sequence and, at the same time provide information about the introduction and development of the production economy in the *submeseta norte* region.

## POSTER

### 6. ORIGIN AND DEVELOPMENT OF PASTORALISM IN THE MEDITERRANEAN AREA: THE CASE OF VAL-LONE INFERNO, SCILLATO (PALERMO), SICILY.

Forgia, Vincenza (Università di Palermo, R-Evolution) vincenza.forgia@gmail.com

Martín, Patricia (Universitat Rovira i Virgili, IPHES) patrimr9@gmail.com

López, Juan Manuel (Università di Ferrara) lpzjmn@unife.it  
Ollé, Andreu (Universitat Rovira i Virgili, IPHES) aolle@iphes.cat

Vergès, Josep Maria (Universitat Rovira i Virgili, IPHES) jmverges@iphes.cat

Allué, Ethel (Universitat Rovira i Virgili, IPHES) eallue@iphes.cat

Angelucci, Diego E. (Università di Trento) diego.angelucci@unitn.it

Arnone, Massimo (Progetto CARG) vincenza.forgia@gmail.com

Blain, Hugues-Alexandre (Universitat Rovira i Virgili, IPHES) hablain@iphes.cat

Burjachs, Francesc (Universitat Rovira i Virgili, IPHES) fburjachs@iphes.cat

Expósito, Isabel (Universitat Rovira i Virgili, IPHES) iexpósito@iphes.cat

Messina, Andrea (vincenza.forgia@gmail.com)

Picornell, Llorenç (Universitat de Barcelona) tokelau24@gmail.com



*Rodríguez, Anna Universitat Rovira i Virgili, IPHES) an.rodriguez.cruz@gmail.com*  
*Scopelliti, Giuseppa -Evolution) gscopelliti@excite.it*  
*Sineo, Luca Università di Palermo) luca.sineo@unipa.it*  
*Virruso, Giovanni MUSE) vincenza.forgia@gmail.com*  
*Alessi, Enrico vincenza.forgia@gmail.com*  
*Di Simone, Giovanni Università di Ferrara) giovannidisimone86@gmail.com*  
*Morales, Juan Ignacio Universitat Rovira i Virgili, IPHES) jmorales@iphes.cat*  
*Pagano, Enrico Università di Agrigento, R-Evolution) erico.s.pagano@gmail.com*  
*Belvedere, Oscar Università di Palermo) oscar.belvedere@unipa.it*

Since the work of Brochier, Villa & Giacomarra (JAA 1992) the use of caves and rock shelters, for pastoral purpose, in this area of Sicily since antiquity, has been attested, but the attention of the mentioned study focused mainly on recent and subrecent deposits and the lack of an archaeological record within the sites presented, reduces the impact of it, with respect to our investigation, despite an accurate sedimentological analysis. Today we want to present and discuss the results of an interdisciplinary investigation of a site that, up to date, is the first pastoral settlement of the area covering the entire history of pastoralism development, from Neolithic to modern age (with some gap, of course) in one of the main Mediterranean islands: Sicily. Our research documents the born and the development of pastoralism from different point of view: chronological, technical and cultural.

We are documenting the interest for a mountain range, dating back to Neolithic until present. The site shows a stratigraphy that embraces the whole Holocene. The deposit was covered by a subactual level of use, with a modern pastoral pen and goes back to Neolithic, crossing medieval, late roman, middle and early Bronze age levels.

Up to date, actually, Vallone Inferno rock shelter and the Neolithic painted pottery found here represent the first stage of a constant and uninterrupted mountain exploitation (mainly for pastoral purpose, we suggest) opening this extreme range to human peopling from all over the region. Even if the rock shelter is sited in a mountainous context, the place is opened directly on one of the main fluvial valley of the Island – the Himera river valley, connecting, with the Southern Himera river, the Northern coast of Sicily to the inner and Southern part of the region.

This geographical feature and the altitude reached by these mountains, the only real mountains (except Mt. Etna) of the Island, are the more probable explanations for

the presence in the site of cultural element coming from all over Sicily, especially during recent prehistory, when the pastoral activity probably involved both horizontal (North-South and East-West) and vertical (from valley to the top of the mountains) shifts of livestock. Our speech aims to show a detailed report of an interdisciplinary analysis, as knew by the ongoing excavation, with particular attention to the dynamics of formation of the archaeological deposit and to the technical choices linked to the pastoral activity we can interpret by data of anthropic and natural derivation, originating by different chrono-cultural stages. Vallone Inferno rockshelter is a rare place where herding activity and its socio-cultural features can be seen in their evolution from the first stage of Holocene until contemporary days, that's a unique chance! Our attention will be focused on seasonality of the site (suggested from analysis of carpological remains), cultural provenance of herding groups (with some implication for regional culture and economy development), technical choices resulting by intra-site spatial analysis at a diachronic level of investigation, especially of pens and areas or levels of burnt manure.

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POSTER

**7. POLISHED WALLS: INDIRECT EVIDENCES OF USE OF CAVITIES AND STONE CONSTRUCTIONS AS LIVESTOCK FOLDS**

*Vergès, Josep Maria (IPHES: Institut Català de Paleoecologia Humana i Evolució Social. C/ Marcel·li Domingo, s/n, 43007, Tarragona, Spain. URV: Àrea de Prehistòria, Facultat de Lletres, Universitat Rovira i Virgili. Av. Catalunya, 35, 43002, Tarragona, Spain.) jmverges@iphes.cat*

*Morales, Juan Ignacio (IPHES: Institut Català de Paleoecologia Humana i Evolució Social. C/ Marcel·li Domingo, s/n, 43007, Tarragona, Spain. URV: Àrea de Prehistòria, Facultat de Lletres, Universitat Rovira i Virgili. Av. Catalunya, 35, 43002, Tarragona, Spain.) jmorales@iphes.cat*

In prehistoric caves or shelters used as a livestock folds, flock uses to scrape continuously against the rocky walls generating, in many cases, wide polished surfaces. The polish development degree and its distribution depend on the size of the flock, the animal species variety, the time spent on the fold, the wall topography or the rock lithology among others.

The study of this kind of evidences derived from the uses of caves as folds could provide us relevant information about the place history, especially in those cases where the sedimentary filling related with the livestock activities

has not been preserved. Sometimes cave sediments are not preserved, either by natural causes or anthropic interventions, but normally walls are always remaining. In this work we present historical and ethnographic observation used to characterize this kind of rock polishes, and subsequently we use this information to hypothesize about the absence of the sedimentary record of the most recent occupation episodes of Cueva de El Mirador site (Atapuerca, Burgos).

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POSTER

**8. BONE ALTERATIONS IN FUMIERS: EXPERIMENTAL APPROACH AND ARCHAEOLOGICAL USE**

*Martín Rodríguez, Patricia (IPHES/URV) patrimr9@gmail.com*

*Vergès, Josep Maria (IPHES/URV) jmverges@iphes.cat*

Dung and vegetal remains burning was an usual practice in Early Holocene stabling caves. By burning the caves were cleaned from parasites due to livestock penning. El Mirador cave (Sierra de Atapuerca, Burgos) is one example of this sort of sites and present an important Neolithic and Bronze Age archaeological succession of stabling burnt layers with abundant faunal remains.

The first aim of this work is to analyze the alterations that this burning process causes in the macromammal bones, buried in the dung. Another point of interest is to observe the relationship between these bones and its archaeological context. Finally, experimental results were compared with El Mirador cave archaeological patterns.

With this purpose, we have developed two experimental works that consisted in goat's dung piles burning. Different bone fragments were introduced into these dung piles, placed to different layers. Bone fragments were from different sheep, goat and pig skeletons and presented different treatments: fresh, dry and boiled bones.

Experimental resulting sample was analyzed macroscopically and microscopically, following the same methodology used in archaeological sample analysis. Finally, experimental and archaeological results were compared.

We observed different burning, color and fragmentation stages on bone surfaces. These different stages were dependent on three variables: previous bone treatment, bone positioning into the dung pile and dung features. Bone burning stage is directly linked with dung burning stage. Nevertheless, in El Mirador cave, we observed that

non burned bones located in non thermal altered "facies" and just like the inverse pattern. These observations let us to set out different interpretations:

- Burned bones, located in non burned layers, could be interpreted like cooking process remains.
- Non burned bones, located in burned layers, could be the result of movements of the remains, caused by herd trampling or by the dung pile volume loss, produced during the burning process.

This is a preliminary study that precedes futures experimental works that consider other new variants.

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POSTER

**9. EARLY TO MIDDLE HOLOCENE SHELTER DEPOSITS IN NORTHERN MOROCCO ? A MICROSCOPIC PERSPECTIVE**

*Kehl, Martin (Institute of Geography, University of Cologne) kehl@uni-koeln.de*

*Linstädter, Jörg (Institute of Prehistoric Archaeology, University of Cologne) joerg.linstaedter@uni-koeln.de*

*Weniger, Gerd-Christian (Neanderthal Museum) weniger@neanderthal.de*

The transition from hunter-gatherers to early food producing communities in Northwestern Africa is documented in few archaeological sites. Recently the sediment sequence of Ifri Oudadane gave insights into Late Epipalaeolithic/Early Neolithic occupations at the Moroccan coast documenting the onset of livestock penning in the area (e.g., Linstädter and Kehl 2012). New excavations at the rock shelter of Ifri N'etsedda yield information on contemporaneous occupations in the Moroccan hinterland. We here present results of micromorphological investigations on both sequences, which shed light on mineral and organic constituents of the sediment sequence, as well as processes of sediment formation and post-depositional alteration. This information should help elucidating the usage of these rock shelters and subsistence practices during the early to middle Holocene.

Undisturbed sediment samples were extracted from selected profiles of both sequences and thin sections of 6 cm x 8 cm prepared. Micromorphological analyses included standard procedures using a petrographic microscope. A thin section reference collection of herbivore dung from Northern Africa was prepared to improve identification of different dung types.

Subsistence practices at the coast included the consumption of sea mollusks as documented in abundant seashell fragments, local occurrences of external skeletons of diatoms and bryozoans as well as the penning of ovicaprids proved by the presence of dung pellets including calcite spherulites. At Ifri N'Etsedda, land snails were the dominant part of the diet, whereas evidence for animal husbandry in the shelter is sparse and remains of marine mollusks are generally lacking. At both sides, the degree of compaction of the shell-rich deposits and shell preservation vary considerably, indicating differential intensities of trampling and the presence of living floors or dumping of shells in small heaps. Gypsum precipitates at Ifri Oudadane probably relate to import of sulfate by sea-spray.

Micromorphology facilitates the identification of stratigraphic boundaries as well as the types, source and nature of sedimentary components and supports the findings of palaeobotanical and faunistic analyses. The shelters document diachronic and regional differences in subsistence strategies and land use in coastal and interior areas of Northeastern Morocco. While mollusks were important dietary components in both areas, the penning of animals could be testified for the coastal area only.

# B18

## State of the art of the multi-disciplinary research at Middle Pleistocene Qesem Cave, Israel

Organiser: Ran Barkai and Avi Gopher

Friday 5th (9:00 to 13:30 15:00 to 19:30)

A03 Meeting Room



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ORAL CONTRIBUTIONS

ORAL

**1. GOPHER AND BARKAI: QESEM CAVE IN RETROSPECT ? A SHORT SUMMARY (OPENING THE SESSION)**

*Gopher, Avi (Tel Aviv University) agopher@post.tau.ac.il*  
*Barkai, Ran (Tel Aviv University) barkaran@post.tau.ac.il*

Qesem Cave is a Middle Pleistocene site in Israel dated to 420,000-200,000 kya (Barkai et al. 2003; Gopher et al. 2010) and assigned to the Acheulo-Yabrudian Cultural Complex (AYCC) of the late Lower Paleolithic. The cave reveals a rich and well-preserved array of lithic and faunal remains as well as human teeth. It provides a good context in which to test hypotheses concerning the intriguing liaison between the environment, culture, and biology. We summarize our research in the cave suggesting that the unique cultural transformation seen at Qesem Cave might actually be related to local human evolutionary processes and the appearance of a new hominin lineage.

The 9.5 m stratigraphy of Qesem Cave offers a detailed background of sediment deposition that occurred as the karstic chamber cave was aging. The AYCC is a unique, local cultural entity clearly differing from the preceding Acheulian and the preceding Mousterian. It shows a suite of innovative behaviors including: the habitual use of fire; hearth-centered activities and functionally distinct activity areas; sophisticated raw material acquisition (flint quarrying); intensive and systematic blade production employing an innovative, and thoughtful technology involving meticulous raw material selection; a noticeable presence of 'ahead of their time' Quina scrapers; and intensive flint recycling activities.

The faunal *chain* indicates cooperative hunting targeted mainly at prime age fallow deer followed by transportation of selected body parts to the cave after which was conducted on-site butchering by use of a tool kit comprising blades and small recycled flakes before eventual consumption. Patterns of cut marks seem to indicate unique habits of on-site butchering and meat sharing.

The study of human dental remains concluded that these mostly resemble the Skhul-Qafzeh samples of the Middle Paleolithic Levant while a *Homo erectus* assignment is clearly not tenable (Hershkovitz et al. 2011). Assuming this is the case, two questions arise – why did this evolution

occur in the Levant, and why ca. 420 kya ago. Based on a newly developed bio-energetic model conjoined with the cultural developments demonstrated at Qesem Cave, we offer an explanation accounting for the demise of *Homo erectus* and the appearance of a new hominin lineage some 400 kya (Ben Dor et al. 2011). The model suggests that the disappearance of elephants from the human diet around this time triggered selection in favor of those who were better adapted to the hunting of larger numbers of smaller, faster animals. Consistent with a recent evolutionary model concerning Pleistocene human populations of Europe, the Levant appears to be a Central Area of Dispersals of Eurasia, an "origin region" for human species biodiversity (Bermúdez de Castro and Martínón-Torres 2012). Acknowledging we are challenging a well-established paradigm, our (as yet) insufficiently comprehensive hypothesis is offered with the intention of opening new vistas for discussion.

ORAL

**2. NEW ESR/U-SERIES DATES IN YABRUDIAN/AMUDIAN LAYERS AT QESEM CAVE, ISRAEL**

*Falgueres, Christophe (CNRS) falguere@mnhn.fr*  
*Mailys, Richard (MNHN) mailys.richard@mnhn.fr*  
*Gopher, Avi (Tel Aviv University) agopher@post.tau.ac.il*  
*Ran, Barkaran - (Tel Aviv University) barkaran@post.tau.ac.il*

Qesem cave is a Middle Pleistocene site situated 12 km east of the Mediterranean coast of Tel Aviv, Israel. It is attributed to the Acheuleo-Yabrudian Cultural Complex, (AYCC) of the late Lower Paleolithic period, dated to ca. 420-200 ky (Gopher et al. 2010; Mercier et al., 2013). This site exhibits a unique prehistoric sequence where the Amudian blade dominated industry is the main cultural component, however the scraper-dominated Yabrudian industry is also represented in distinct contexts at the cave, The chronology established by TL applied on burnt flints, ESR/U-series on herbivorous teeth and U-series dates on sphenothems, suggests that Qesem cave is one of the oldest sites yielding such an early blade industry.

This work presents new ESR/U-series dates on four animal teeth unearthed from a central hearth recently published (Shahack-Gross et al. 2014) which presents an Amudian industry and four other teeth from the shelf area in which a Yabrudian industry was found.

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published (Shahack-Gross et al. 2014) which presents an Amudian industry and four other teeth from the shelf area in which a Yabrudian industry was found.

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ORAL

### 3. ON ANACHRONISM, OR STONE BALLS IN THE AMUDIEN: THE STRANGE PRESENCE OF SPHEROIDS/POLYHEDRONS AT QESEM CAVE, ISRAEL

*Barkai, Ran (Tel-Aviv University) barkaran@post.tau.ac.il*  
*Gopher, Avi (Tel-Aviv University) agopher@post.tau.ac.il*

The Acheulo-Yabrudian cultural complex (AYCC) is represented at Qesem Cave by two major lithic industries: The blade-dominated Amudian and the scraper-dominated Yabrudian. The typological and technological characteristics both lithic industries were thoroughly studied, as well as the very interesting phenomenon of lithic recycling which is significantly present at all assemblages of both industries.

In this presentation we would like to add another aspect, yet unpublished, of the Qesem Cave lithic assemblages, which is rather surprising and in our opinion deserve special attention.

Within one of the Amudian horizons of the lower stratigraphic sequence of Qesem Cave, a group of stone balls was discovered. Another stray stone balls, one or two, were found within other Amudian assemblages of the cave, however this specific Amudian assemblage exhibits an unprecedented number of such remarkable items.

In this presentation we would like to describe the stone balls (spheroids, polyhedrons) found at Qesem Cave, discuss the archaeological context of these items and explore the significance of their presence within the AYCC in terms of continuity and change that characterize this interesting cultural complex of the terminal Lower Paleolithic period in the Levant.

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ORAL

### 4. SPATIAL ASPECTS AS SEEN FROM A DENSITY ANALYSIS OF LITHIC CATEGORIES AT QESEM CAVE

*Gopher, Avi (Tel Aviv University) agopher@post.tau.ac.il*  
*Barkai, Ran (Tel Aviv University) barkaran@post.tau.ac.il*

This paper focuses on the results of a preliminary study of flint items density in different areas of Qesem Cave and different parts of the stratigraphic column.

Qesem Cave is a chamber cave with a 9.5 m stratigraphic sequence assigned to the Acheulo-Yabrudian Cultural Complex (AYCC) of the late Lower Paleolithic in the Levant. After a brief introduction presenting the 420-200 ka Qesem Cave, we show the range of lithic densities in the cave.

Significant differences in lithic densities are shown for both the total number of lithic items per volume or for selected artifact categories within these assemblages.

These densities are tested against and incorporated with other sets of data, mainly horizontal (spatial) distribution aspects, assemblage composition, functional data on different categories in the assemblages, and the relation of these densities to natural or human made features.

One example of our results is that the highest flint density is directly related to a constructed hearth in the center of the cave. Moreover, while some parts around the feature show a blade-dominated industry (Amudian), another part shows a Quina scraper dominated industry (Yabrudian). This may indicate functionally related differences between areas around this feature and may be significant in understanding variability within the AYCC.

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ORAL

### 5. PRELIMINARY EVALUATION OF RAW MATERIAL CHOICES IN THE AMUDIEN VERSUS THE YABRUDIEN AT QESEM CAVE.

*Wilson, Lucy (University of New Brunswick in Saint John) lwilson@unbsj.ca*  
*Agam, Aviad (Tel Aviv University) aviadkra@post.tau.ac.il*  
*Barkai, Ran (Tel Aviv University) barkaran@post.tau.ac.il*  
*Gopher, Avi (Tel Aviv University) agopher@post.tau.ac.il*

The lithic assemblages recovered from Qesem Cave can be divided into two distinct industries, the Amudian and the Yabrudian, based on different uses of raw materials to produce different proportions of end products (blades vs. scrapers, for instance). The goal of our study is to try to determine whether those differences extend to different uses of the landscape and its resources. Do the two assemblages differ only in terms of technology and typology, with the same raw materials being used

for both, or do they also differ in terms of raw materials used, either in proportions or in sources exploited? Starting in summer 2013, we have undertaken a petrographic examination of a large sample of the pieces in each assemblage, categorizing each distinct raw material. Different raw materials are identified on the basis of rock type, and, since most of them are varieties of flint, of criteria such as colour, cortex characteristics, homogeneity, any visible fossils, etc. Our goal is to separate the raw materials into as many defined types as possible, with the full knowledge that some types are varieties of each other which will be regrouped later. Each lithic piece examined is therefore recorded as to typological category, assigned a raw material type, and weighed. We are thus able to examine the differences in proportions of use of the raw material types in each assemblage, by typological category, and in terms of number of pieces and of weight of material used. In addition, we have started field work aimed at locating the sources of the flint varieties, comparing samples from geologic sources with samples from the site assemblages.

This will give us a view of the extent of the territory exploited by the hominins at Qesem, and will show us for instance whether different territories were used by the hominins who created the two assemblages, or whether different raw material qualities were preferentially exploited in creating the industries.

We will be presenting the results of our work to the end of the summer 2014 field season in the Special Session on Qesem Cave.

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ORAL

## **6. THE TRANSMISSION OF KNOWLEDGE AND APPRENTICE FLINT-KNAPPERS IN THE ACHEULO-YABRUDIAN CULTURAL COMPLEX: A CASE STUDY FROM QESEM CAVE, ISRAEL**

*Assaf, Ella (Tel-Aviv University) ellaassa@gmail.com*  
*Barkai, Ran (Tel-Aviv University) barkaran@post.tau.ac.il*  
*Gopher, Avi (Tel-Aviv University) agopher@post.tau.ac.il*

In recent years, researchers have been showing great interest in issues relating to knowledge transmission among early humans. Being an important component of the general picture of the Acheulo-Yabrudian Cultural Complex (AYCC), the site of Qesem Cave provides an opportunity to address these issues in the context of an early human occurrence in the Levant.

During the 2009-2011 excavation seasons in "The southern area", Amudian assemblages were recovered.

Following the special characteristics of these assemblages and beyond presenting a detailed analysis of the techno-typological characteristics of the assemblages, we decided to search for evidence concerning lithic knowledge transmission in these assemblages. This is attempted through a detailed analysis of cores from the southern area assemblages and a comparison of this data to two Amudian assemblages from other parts of the cave.

The results of the study suggest that processes of learning and knowledge transmission were indeed present in the southern area. The techno-typological analysis indicates that in contrast to other areas, knapping activities focused on the production of "simple" items (like flakes). The analysis of cores indicates that various levels of knapping skills are represented in the assemblages including skilled and unskilled knappers, or knappers who were in the process of learning. It is likely that knowledge transmission has taken place in other areas of the cave too and was not restricted to a single area of the cave. However, a comparative analysis of these results to cores originating from two other Amudian assemblages in the cave shows that the transmission of knowledge related to knapping (following our criteria) was more prominent in the southern area than in other areas of the cave, thus indicating a spatial pattern.

The number of studies attempting to identify lithic learning processes in Lower Palaeolithic assemblages is very low. As for today, there are no studies that explore knapping skills in AYCC sites. This study sheds some light on the subject and expands our understanding of knowledge transmission mechanisms in early human societies – an issue that might be of significance and relevance for our present time.

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ORAL

## **7. AMUDIEN VERSUS YABRUDIEN UNDER A ROCK SHELF: A STUDY OF TWO LITHIC ASSEMBLAGES FROM QESEM CAVE, ISRAEL**

*Parush, Yoni (Tel-Aviv University) yoniparush@gmail.com*  
*Gopher, Avi (Tel-Aviv University) agopher@post.tau.ac.il*  
*Barkai, Ran (Tel-Aviv University) barkaran@post.tau.ac.il*

In this presentation we will present new results from two distinct lithic assemblages from Qesem Cave - A Yabrudian and an Amudian assemblage. The two assemblages originated from the same location within the cave - underneath a rock "shelf" located at the north-western part of Qesem Cave, and are dated to older than 299 kyr. Both assemblages exhibit clear

stratigraphic relations, as the Yabrudian layer is on top of the Amudian layer and thus at this part of the cave and in this stratigraphic unit the Yabrudian is later than the Amudian.

In this presentation we will present the general characteristics of the two assemblages (both assemblages include a total of ca. 30,000 artifacts) and will focus on the similarities and differences in lithic characteristics between the two assemblages. In addition, the results of a technological analysis of hundreds of recycled items will be presented.

In all, it seems that the Yabrudian and Amudian of the "shelf" area are part of the same technological system - sharing the same techno-typological features; differ mainly in frequencies as well as in densities. It seems that the differences might be related to human activities that took place at the different strata of this area and not to different technological operations, conceptions or choices.

In addition, flint recycling at Qesem Cave seems to represent a significant technological component that is a constant and repetitive mode of production within the technological repertoire aimed at the production of distinctive flakes/blades, most probably for specific purposes. Reconstructing the Chaîne Opératoire of the production of these items helps understanding human behavior at the cave. It appears that products of lithic recycling at Qesem Cave reflect a decision-making scenario that follows a repetitive set of rules and conceptions.

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ORAL

## 8. CONTINUITY AND CHANGE IN AMUDIEN BLADE PRODUCTION THROUGHOUT THE QESEM CAVE SEQUENCE

*Shimelmitz, Ron (The David Yellin Academic College of Education and University of Haifa) ronishim@gmail.com*

*Barkai, Ran (Tel Aviv University) barkaran@post.tau.ac.il*

*Gopher, Avi (Tel Aviv University) agopher@post.tau.ac.il*

Amudian blade production at Qesem Cave reflects a predetermined debitage technology in which blade production is both systematic and serial. The rich lithic assemblages of the almost ten meters stratigraphic column of Qesem Cave are all attributed to the Acheulo-Yabrudian cultural complex, dating to ca. 420-200 kyr. Although the Amudian is found in several Acheulo-Yabrudian sites in the Levant, only at Qesem Cave it constitutes the dominant industry throughout the stratigraphic sequence. Significantly, while the

technological variation in the Acheulo-Yabrudian Cultural Complex is predominately manifested by its three industries (Amudian with a dominant blade production, Yabrudian with flake production and Quina scrapers, and Acheulean with numerous handaxes), the long sequence of Amudian layers at Qesem Cave makes it an ideal candidate to examine diachronic changes in the late Lower Paleolithic by tracking variations within a very particular technology - blade production. This is of importance since one of the features differentiating the Lower Paleolithic Acheulean and the Middle Paleolithic Mousterian is an assumed faster rate of technological changes in the Mousterian. In order to shed new light on this issue we present a comparative study addressing characteristics of blade production from five Amudian assemblages retrieved from different areas and different elevations within the stratigraphic sequence of Qesem Cave. The results indicate that blade production intensity differs in Amudian assemblages and while many of its characteristics are quite stable, some significant changes are witnessed as well. This suggests that the Amudian blade production of the Acheulo Yabrudian Cultural Complex and that of Qesem Cave in particular can provide a yardstick for measuring the pace of change in late Lower Paleolithic technologies and may indicate flexibility in decision making and technological choices at this early, pre-Mousterian stage as well.

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ORAL

## 9. A SCRAPER LIFE HISTORY: USE WEAR ANALYSIS OF YABRUDIEN AND AMUDIEN SCRAPERS FROM QESEM CAVE (ISRAEL)

*Lemorini, Cristina (Universita' La Sapienza di Roma) cristina.lemorini@uniroma1.it*

*Bourguignon, Laurence (INRAP) laurence.bourguignon@inrap.fr*  
*Zupancich, Andrea (Tel Aviv University - TAU) a.zupancich@gmail.com*

*Gopher, Avi (Tel Aviv University - TAU) agopher@post.tau.ac.il*

*Barkai, Ran (Tel Aviv University - TAU) barkaran@post.tau.ac.il*

Quina and demi-Quina scrapers are well represented at Qesem Cave, mostly associated to the Yabrudian levels of the site, dated between 420,000 and 230,000 years ago.

These types of tools are characterised by a long retouched edge, where invasive scars are generally visible over the dorsal surface. The retouched edge is characterised by scars exhibiting different length, where shorter ones are superimposed to the earlier longer ones, thus generating different lines of retouch.



Here we propose the results generated by the application of an integrated approach, including both a techno-morpho-functional analysis of the samples and use wear analysis of these latter.

The former takes into consideration the overall tool morphology, including the blank features and the edge retouch characteristics in order to provide an evaluation of the technological choices involved within the production, use and re-use of Yabrudian and Amudian scrapers at Qesem Cave.

The use wear analysis of the tools is performed throughout the exploitation of both a low and high power approaches. Through the analysis of edge removals, polishes, abrasions and striations, present on the tool we are able to determine the worked materials and the activities carried out with these tools at Qesem Cave.

Throughout the application of a techno-morpho-functional approach it is possible to investigate the use of Quina and demi-Quina scrapers within their life history, underlining the possible use and re-use of these tools to performing different activities and processing various materials, in relation to the different retouch steps to which the tools have been subject to during their life cycle.

Furthermore, this latter aspect will take in consideration the fact that several of these tools represent distinct recycling phenomena, where the tools are modelled on throughout the exploitation of older patinated blanks.

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ORAL

## 10. ON SCRAPERS HANDLING: PRELIMINARY RESULTS FROM THE LOWER PALAEOOLITHIC SITE OF QESEM CAVE (ISRAEL)

*Zupancich, Andrea (Tel Aviv University - TAU) a.zupancich@gmail.com*

*Lemorini, Cristina (Universita' La Sapienza di Roma) cristina.lemorini@uniroma1.it*

*Barkai, Ran (Tel Aviv University - TAU) barkaran@post.tau.ac.il*  
*Gopher, Avi (Tel Aviv University - TAU) agopher@post.tau.ac.il*

Most of the studies carried out so far, related the function of lithic tools have merely focused on the worked materials and the activities performed with these latter. Very few works (eg. Rots 2010) included, other than the investigation of the processed materials and the activities performed, an analysis of the traces related to handling and prehension of the tools.

Here we propose the results coming from an experimental frameworks related to this matter, focused

on the prehension and hafting of different types of flint scrapers (eg transversal, double, Quina, demi-Quina etc.), associated to the ones unearthed at the late Lower Palaeolithic site of Qesem Cave (Israel).

Throughout the microscopic analysis of experimental replicas, used both as hafted and hand held implements we underline the efficiency of different types of prehension (hafted, hand held and wrapped), isolating diagnostic wear related to each adopted solution.

We are able to personally test the efficiency of the hafted tools to perform various activities (hide working, wood working etc). Different types of hafting and prehension solution are adopted, in accordance to the ones observed on a scraper sample coming from Qesem Cave.

The experiments allow to define edge removals or micro wear related to different handling solutions, creating a hafting and prehension use wear replicas collection, to be compared to the traces identified on the archaeological sample included in this study.

Thus, it is possible to define the prehension and hafting solutions adopted by the human groups at Qesem Cave, in regard to the use of flint scrapers underlining the overall high level of technological knowledge characterising the Middle Pleistocene inhabitants of Qesem Cave.

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ORAL

## 11. WHO LIVED IN THE QESEM CAVE? THE DENTAL PERSPECTIVE

*Hershkovitz, Israel (Department of Anatomy and Anthropology, Sackler Faculty of Medicine, Tel Aviv University) anatom2@post.tau.ac.il*

*Sarig, Rachel (Department of Orthodontics, The Maurice and Gabriela Goldschleger School of Dental Medicine and the Department of Anatomy and Anthropology, Sackler Faculty of Medicine, Tel Aviv University) sarigrac@post.tau.ac.il*

*Weber, Gerhard (Department of Anthropology, University of Vienna) gerhard.weber@univie.ac.at*

*Fornai, Cinzia (Department of Anthropology, University of Vienna) cinzia.fornai@univie.ac.at*

*Gopher, Avi (Institute of Archaeology, Tel Aviv University) agopher@post.tau.ac.il*

*Barkai, Ran (Institute of Archaeology, Tel Aviv University) barkaran@post.tau.ac.il*

When the first study on the Qesem Cave human teeth was published (eight teeth, deciduous and permanent; Hershkovitz et al. 2010), it initiated a debate on questions such as: To whom did these teeth belong?

Were they some form of AMHs, Neanderthals, *Homo heidelbergensis*, or *Homo erectus*? Apart from a quite clear negative answer concerning their assignment to *Homo erectus*, one could find at least some support for any of the other possibilities. Continued work at Qesem Cave in recent years revealed additional human teeth at the site. These include an upper right deciduous canine, a lower right first deciduous molar, a lower right first permanent molar, a lower left third molar, an upper right first permanent premolar, and an incomplete tooth (represented by a single root). The current study presents new metric and morphological data on these additional teeth from Qesem cave. We will argue that the Qesem teeth manifest a mosaic combination of archaic and modern traits and, in fact, cannot be attributed with reasonable certainty to any of the above-mentioned morphs. Furthermore, teeth from different layers at the cave vary in size and shape. Therefore, the answer to the question of who occupied the Qesem Cave during the late Lower Paleolithic will have to await further discoveries and analyses of human remains.

Acknowledgments: This research was financially supported by the Dan David Foundation, and the Tassia and Dr. Joseph Meychan Chair for the History and Philosophy of Medicine.

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ORAL

## 12. HOW DID THE QESEM PEOPLE USE THEIR TEETH?

*Sarig, Rachel (Department of Orthodontics, The Maurice and Gabriela Goldschleger School of Dental Medicine and the Department of Anatomy and Anthropology, Sackler Faculty of Medicine, Tel Aviv University) sarigrac@post.tau.ac.il*

*Gopher, Avi (Institute of Archaeology, Tel Aviv University) agopher@post.tau.ac.il*

*Barkai, Ran (Institute of Archaeology, Tel Aviv University) barkaran@post.tau.ac.il*

*Weber, Gerhard (Department of Anthropology, University of Vienna) gerhard.weber@univie.ac.at*

*Hershkovitz, Israel (Department of Anatomy and Anthropology, Sackler Faculty of Medicine, Tel Aviv University) anatom2@post.tau.ac.il*

The study of dental wear can be an important source of information regarding dietary habits, methods of food preparation, and human behavior.

Studying the dental wear patterns of the Qesem Cave teeth has led to several observations that may shed light on the habitual behavior of the occupants of this cave.

Five wear types were identified on the Qesem teeth:

- The first is represented by fine, non-oriented scratches located on the buccal surface of the crown. These features are usually considered to be micro-wear elements resulting mainly from the introduction of external ingredients in to the food.
- The second appears in the form of vertical grooves (small furrows), semicircular in cross-section, on the interproximal wear facets.
- The third, coarser scratches were noted on the labial aspect of the root.
- The fourth is occlusal wear.
- The fifth is interproximal wear facets that appear in the proximal contact area of adjacent teeth.

These wear categories comprise different elements with unique characteristics such as groove (scratch) length, depth, location and orientation, and they represent different etiologies. Occlusal and buccal micro-wear scratches may reveal dietary habits and food consistency; vertical grooves and interproximal facets relate to the force of mastication; and the coarser scratches can be the result of hand tools used for food cutting and processing. The picture obtained from the analyses of all wear types on the Qesem Cave teeth is of people with a strong masticatory system who were exposed to unprocessed food, and who used small flints to cut pieces of flesh.

Acknowledgments: This research was financially supported by the Dan David Foundation, and the Tassia and Dr. Joseph Meychan Chair for the History and Philosophy of Medicine.

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ORAL

## 13. THE QESEM CAVE HOMININ MATERIAL (PART 1): A MORPHOMETRIC ANALYSIS OF THE MANDIBULAR PREMOLARS AND MOLAR.

*Weber, Gerhard W. (University of Vienna, Department of Anthropology) gerhard.weber@univie.ac.at*

*Fornai, Cinzia (University of Vienna, Department of Anthropology) cinzia.fornai@univie.ac.at*

*Gopher, Avi (Tel Aviv University, Institute of Archaeology) agopher@post.tau.ac.il*

*Barkai, Ran (Tel Aviv University, Institute of Archaeology) barkaran@post.tau.ac.il*

*Sarig, Rachel (Tel Aviv University, Sackler Faculty of Medicine, Department of Anatomy and Anthropology) rachel.sarig@gmail.com*

*Hershkovitz, Israel (Tel Aviv University, Sackler Faculty of Medicine, Department of Anatomy and Anthropology) anatom2@post.tau.ac.il*

A first description of eight hominin teeth from the Middle Pleistocene Qesem Cave (QC) in Israel has been published by Hershkovitz et al. (2011). Based on qualitative assessments and linear measurements they pointed out the ambiguous morphological affinities to anatomically modern humans (AMH) and Neanderthals (NEA). The teeth were associated with an Acheulo-Yabrudian Cultural Complex. Since then, some other teeth have been found. Of particular interest for the present paper here are the mandibular P3 and P4 (from the same individual) dated to ~350ka, and a lower M2, at least post-dating 300ka, because they represent the oldest material from the cave falling in a time period when the two lineages leading to NEA and AMH would differentiate or could already show different traits.

The QC teeth and comparable material were  $\mu$ CT scanned at the Vienna Micro-CT Lab, other comparable material was obtained from existing data bases. Enamel and dentine surfaces were segmented and surface models created. Data were collected from these 3D models of dental crowns. We used Geometric Morphometric methods based on landmarks and semilandmarks to analyse shape and form of three different traits: 1) the enamel-dentine-junction (EDJ), 2) the cervical outline, and 3) the crown outline.

Morphometric analysis shows that QC premolars are quite small compared to Mauer (*H. heidelbergensis*) and NEA, but they are in the range of modern humans. NEA and AMH separate well in terms of size. The QC molar, to the contrary, is large and in the size range of NEA and Mauer. Turning to shape (no size considered), the QC premolars are intermediate between NEA and AMH, and similar to Mauer. The QC molar is in all features very close to NEA (different to Mauer), and features a grade 3 trigonid crest on the EDJ, described as being absent in modern humans (Bailey et al. 2011). Molar EDJ shape generally separates extremely well AMH and NEA.

We find a dissociation of shape and size for premolars – an intermediate shape between NEA and AMH combined with a significant size reduction. Martinon-Torres et al. 2013 also found Neanderthal-like shape and sapiens-like size in Sima des los Huesos material, though in upper M1s. With the current data, we cannot assign the oldest QC remains to any existing taxon, nor exclude that it belongs to one of them, nor that it is a new taxon. However, premolars and molar show different trends. If they are representative for this past population, there are two hypotheses possible. H1: they are from different populations inhabiting QC at slightly different times.

Nevertheless, culturally (including lithic economy, technology, hunting and butchering patterns, or faunal composition) QC context provides no reason to support this hypothesis. H2: if they are from the same population, premolars show a clear tendency towards size reduction, at the same time featuring an intermediate shape between NEA and AMH, while molars are similar to NEA in size and shape. This represents a pattern of postcanine dentition that is neither NEA nor AMH. Supported by A.E.R.S.DentalMedicineOrganisationsGmbH, DanDavidFoundation.

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#### ORAL

### 14. THE QESEM CAVE HOMININ MATERIAL (PART 2): A MORPHOMETRIC ANALYSIS OF I/12A DECIDUOUS LOWER SECOND MOLAR

*Fornai, Cinzia (Department of Anthropology, University of Vienna) cinzia.fornai@univie.ac.at*

*Benazzi, Stefano (Department of Cultural Heritage, University of Bologna; Department of Human Evolution, Max Planck Institute for Evolutionary Anthropology) stefano.benazzi@unibo.it*

*Gopher, Avi (Institute of Archaeology, Tel Aviv University) agopher@post.tau.ac.il*

*Barkai, Ran (Institute of Archaeology, Tel Aviv University) barkaran@post.tau.ac.il*

*Sarig, Rachel (Department of Anatomy and Anthropology, Sackler Faculty of Medicine, Tel Aviv University) rachel.sarig@gmail.com*

*Hershkovitz, Israel (Department of Anatomy and Anthropology, Sackler Faculty of Medicine, Tel Aviv University) anatom2@post.tau.ac.il*

*Weber, Gerhard W. (Department of Anthropology, University of Vienna) gerhard.weber@univie.ac.at*

The Qesem Cave Middle Pleistocene hominin site (QC) has yielded a well preserved lower second deciduous molar (dm2) labeled I/12a, among several other teeth. The latter has been previously qualitatively described by Hershkovitz et al. (2011) as a rather large, taurodontic tooth, with mesial cusp tips inclined inward and a rather expanded talonid, presenting an anterior fovea but lacking a mid-trigonid crest. The authors pointed out that some of these characteristics typical of Neanderthals (NEA) are shared also with other Late Pleistocene Homo (e.g. Qafzeh), while the lack of a mid-trigonid crest would differentiate it from NEA. Since a definitive taxonomic assessment for I/12a dm2 has not yet been made, we carried out a comparative geometric morphometric (GM) analysis of crown and cervical outlines from 3D

surface models in order to contribute to this issue. I/12a was compared to a sample of 31 anatomically modern human (AMH) and NEA specimens. 3D surface models for the dental crowns were obtained from  $\mu$ CT data. The virtual crowns were oriented on the bases of their best-fit plane (parallel to the X-Y-plane) and lingual margin (parallel to the X-axis) before crown and cervical outlines could be collected (Benazzi et al., 2012). Each outline was resampled using 24 pseudo-landmarks placed at the intersection between the outline itself and equiangularly spaced radii originating from the centroid of the outline. After superimposition of the landmark configurations, we ran a Principal Component Analysis for the cervical and crown outlines separately, both in shape and form space.

Our GM analyses of crown (PC1=38.45%; PC2=28.43%) and cervical outlines (PC1= 37.76%; PC2=22.86%) distinguished AMH from NEA in shape space. Only Qafzeh 15 represents an exception for its crown outline, and plots within the NEA distribution, while Skhul I is always within the range of variability of AMH. I/12a allied with NEA for both outlines. The main crown outline variation responsible for the separation between the two hominin groups is in the relative dimension of the distal and mesial regions, where NEA and I/12a possessed a relatively broader distal aspect. NEA cervical outline is rather squared, while in AMH the bucco-distal aspect is reduced. The between groups separation is less clear in form space (crown outline' PC1=87.04%; cervical outline' PC1=83.78%). I/12a and Qafzeh 15 plot at the highest end of the size range of variability for the very large sizes of both outlines.

Based on the shape and size of both crown and cervical outlines, I/12a showed morphological affinities to NEA. This is in line with Weber et al. (2014) who found similar results for QC permanent lower second molar. Yet, other results in shape and form space for the QC premolars, but also our results showing Qafzeh 15 dm2 crown outline' closeness to NEA, suggest caution in interpreting Middle Pleistocene dental morphological variability. The investigation of further dental features and the inclusion of more Middle Pleistocene specimens in our sample would possibly provide clearer insights on the taxonomic assessment for QC hominin material.

ORAL

## 15. THE MINUTIAE OF LIFE. DIET AND LOCAL ENVIRONMENT AT QESEM CAVE FROM MATERIAL ENTRAPPED IN DENTAL CALCULUS

*Hardy, Karen (ICREA at Universitat Autònoma de Barcelona) khardy@icrea.cat*

*Radini, Anita (University of York) ar116@leicester.ac.uk*

*Buckley, Stephen (University of York) sb55@york.ac.uk*

*Sarig, Rachel (Tel Aviv University) rachel.sarig@gmail.com*

*Hershkovitz, Israel (Tel Aviv University) anatom2@post.tau.ac.il*

*Barkai, Ran (Tel Aviv University) barkaran@post.tau.ac.il*

*Gopher, Avi (Tel Aviv University) agopher@post.tau.ac.il*

*(modificado en mail 01/08 17h. Mer)*

Dental plaque is formed by the activity of bacteria which are energised by sugars in carbohydrates. If it is not removed, it rapidly calcifies. Adhering strongly to the tooth, it can survive indefinitely and is common on archaeological skeletons from all periods. Samples of material were found adhering to three human teeth from Qesem Cave. These were extracted and, following characterisation, two of these samples were found to be dental calculus.

Two samples were degraded to extract microfossil material embedded in the calculus. Samples were processed according to standard techniques, using low concentration HCl before being centrifuged at room temperature. An Olympus IX 71 inverted microscope was used at between 50-200 magnifications for viewing and imaging was conducted using a Colour View camera and Cell D imaging system. One sample was analysed by sequential thermal desorption-gas chromatography-mass spectrometry (TD-GC-MS) and pyrolysis-gas chromatography-mass spectrometry (Py-GC-MS). This technique facilitates the identification of both free/unbound and bound/polymeric organic components.

Analysis of the material embedded in the calculus has revealed a range of items including micro traces of charcoal, starch granules, and other plant microfossils, all of which may be evidence for plant ingestion, as well as paleo-environmental indicators. Evaluation of the potential for survival of chemical compounds, offers markers for their endurance in dental calculus over extended time periods.

Even at the extensive time depth of Qesem Cave, a range of material was found in the dental calculus. Here we present these findings and we explore the pathways, including food items, which may have led to the ingestion of this material.

ORAL

**16. WHAT HAPPENS AROUND A FIRE: FAUNAL PROCESSING SEQUENCES AND SPATIAL DISTRIBUTION AT QESEM CAVE (300 KYA), ISRAEL**

*Blasco, Ruth (Gibraltar Museum) rblasco@rblascoperez@gmail.com*  
*Rosell, Jordi (Universitat Rovira i Virgili (URV)-IPHES, Institut Català de Paleoecologia Humana i Evolució Social) jordi.rosell@urv.cat*  
*Sañudo, Pablo (Universitat Rovira i Virgili (URV) pablo.sañudo@bolomor.com*  
*Gopher, Avi (Tel-Aviv University) agopher@post.tau.ac.il*  
*Barkai, Ran (Tel-Aviv University) barkaran@post.tau.ac.il*

The technological innovation involving the controlled use of fire represents a decisive change in the hominin subsistence. Hearths and the spatial distribution patterns associated with them constitute a valuable element to deepen our knowledge about human behaviour and its evolution. Studies focussed on the use of fire are approached by different disciplines and through different points of view. Thus, hearths were studied for their meaning in the diet, the caloric and light capacity, spatial organisation and their role as communication and socialization focal points. The site of Qesem Cave (Israel) shows evidence of the controlled use of fire as early as 400 kya. A particular superimposed central hearth that was repeatedly used as a focus for human activities ca. 300 kya is the topic of this presentation. This succession of hearths at the same location in the cave yields dense faunal and lithic remains as well as evidence for spatial differentiation of activities around it. Here, we present faunal taphonomical data from this specific archaeological context, which includes not only the hearth area (approximately 4 m<sup>2</sup>), but also surrounding areas (approximately 11 m<sup>2</sup>). The most common prey species is the Mesopotamian fallow deer (*Dama cf. mesopotamica*), whose wide age range and anatomical profile (marrow-rich bones such as long limb bones) led us to propose the development of social hunting techniques and seasonal occupations. Here, we will provide data on human subsistence behaviour during the formation of this archaeological unit as well as compare it to other areas from a taphonomical point of view. Elements such as taxonomical attribution, size (length) of bone fragments and intensity of burning are used for spatial differentiation of activities around the hearth. This study is designed to contribute to our understanding of subsistence strategies and hominin behaviour during the Acheulo-Yabrudian Cultural Complex in the Levant.

ORAL

**17. THE MICROVERTEBRATES OF QESEM CAVE: A COMPARATIVE STUDY OF THE TWO MAIN CONCENTRATIONS AND THEIR MODE OF ACCUMULATION**

*Smith, K.T. (Senckenberg Research Institute) krister.smith@senckenberg.de*  
*Maul, Lutz Christian (Senckenberg Research Institute) lutz.maul@senckenberg.de*  
*Barkai, Ran (Dept. of Archaeology, Tel Aviv University) barkaran@post.tau.ac.il*  
*Gopher, Avi (Dept. of Archaeology, Tel Aviv University) agopher@post.tau.ac.il*

At Qesem Cave, huge numbers of small vertebrates have been excavated from two main concentrations: (1) an eastern concentration in quadrats L-N/13-15, and (2) a western concentration in quadrats H/16-17. The density of finds reaches 10,000 per excavation unit of 50x50x5 cm. Thus far, ca. 10,000 specimens (of more than 233,000 microvertebrate remains in total) have been identified at least to the genus level.

The faunas of the two concentrations are quite similar, with the exception of a few taxa present in only one of the areas (indicated below with (1) or (2)). The following taxa have been identified: Actinopterygii indet.; Amphibia - Anura indet. (three species); Reptilia - *Stellagama stellio*, *Chamaeleo chamaeleon*, *Gekkonidae* indet., *Lacertidae* indet. (two species), *Scincidae* indet., *Pseudopus apodus*, *Colubroidea* indet. (at least three species); Mammalia (micromammals) - *Suncus etruscus*, *Crociodura cf. leucodon*, *Crociodurinae* indet. (large form), *cf. Roussettus sp. (2)*, *Rhinolophus ferrumequinum*, *R. euryale*, *R. mehelyi*, *Miniopterus cf. schreibersii*, *Myotis blythii (1)*, *Procyon sp.*, *Lepus cf. capensis*, *Sciurus cf. anomalus*, *Eliomys cf. melanurus (2)*, *Cricetulus cf. migratorius*, *Microtus guentheri*, *Nannospalax ehrenbergi*, *Dipodillus cf. dasyurus*, *Meriones cf. tristrami*, *Gerbillidae* indet. (large form), *Mus cf. musculus*, *Rattus cf. haasi (2)*, and *Apodemus cf. flavicollis*. Judging from the faunal content and from morphometric data on molars of Guenther's Vole (*M. guentheri*), the remains of the two areas were not accumulated at the same time, and concentration (2) is older than concentration (1).

The taphonomic data obtained thus far suggest a Barn Owl as the predominant accumulator, although natural history observations on Barn Owls and chameleons are strongly at odds with this actualistic inference: Barn Owls are nowhere recorded as a major predator on chameleons. We argue that this represents an example of non-analog behavior in the extinct Barn Owl populations and propose a scenario that harmonizes actualism and

natural history. We further pinpoint a possible owl roost in Qesem Cave, the first time such a roost has been identified in a collapsed cave setting.

ORAL

### 18. PALAEOECOLOGICAL AND BIOSTRATIGRAPHICAL IMPLICATIONS OF THE MICROVERTEBRATES OF QESEM CAVE

*Maul, Lutz Christian (Senckenberg Research Institute) lmaul@senckenberg.de*

*Smith, K.T. (Senckenberg Research Institute) krister.smith@senckenberg.de*

*Barkai, Ran (Tel Aviv University) barkaran@post.tau.ac.il*

*Gopher, Avi (Tel Aviv University) agopher@post.tau.ac.il*

Extant species of microvertebrates are eminently suited for drawing inferences on past environmental conditions, because their remains are closely bound (for ecological and taphonomical reasons) to the areas in which they lived. The ecological preferences of the nearest living relatives of the microvertebrate taxa recorded at Qesem Cave allow us to infer a palaeoenvironment with a mosaic of open and woodland habitats. Additionally, palaeoenvironmental conditions have been inferred from climatic parameters of the current distribution areas. Most overlaps of recent geographic ranges of the species recorded at Qesem Cave have been found in the northern Levant. Additional range overlaps can be seen in areas in recent Turkey, Marmara region and East Anatolia. The data suggest slightly higher precipitation for the time range covered by the microvertebrate-bearing layers than at present around Qesem Cave. A comparison of the Qesem Cave microvertebrate-bearing layers to one another suggests more forested conditions in the upper part of the stratigraphic microvertebrate-bearing sequence in comparison to the lower part. However, to some extent taphonomical influences could be responsible for these fluctuations (e.g., selective prey intake of the raptors responsible for the fossil accumulation) too.

It cannot always be assumed that a species' present habitat requirements are reflective of the entire history of a lineage. The *Sheltopusik*, *Pseudopus apodus*, is a case in point. The lineage *Pseudopus* arose in the early Neogene in more mesic environments in Europe, before the extant species spread southward. Its present habitat preferences are an autapomorphy of the species. Qesem Cave contains the earliest records of the lineage in the Levant, documenting a time of range-expansion and habitat shift. Accurate palaeoenvironmental estimation

on the basis of these early fossil populations of *Pseudopus apodus* will first require appraisal of their phylogenetic position with respect to the crown.

Among microvertebrates, micromammals are most suitable for biostratigraphic purposes. With the exception of *Rattus cf. haasi*, the small mammal fauna of Qesem Cave comprises only taxa that live today in the Levant. However, *Rattus haasi* occurred in Israel in the Early and Middle Pleistocene, and its latest known record is from the site of Oumm Qatafa. Morphometric data on molars of Guenther's Vole from Qesem Cave show that it was similar to Middle Pleistocene populations of this species in other faunas. The data further indicate a more primitive state of the *Microtus* finds in the western (older) concentration at Qesem Cave (quadrats H/16–17) than in the eastern one (quadrats L–N/13–15).

ORAL

### 19. ANCIENT DNA ANALYSIS OF MIDDLE PLEISTOCENE FAUNAL REMAINS FROM QESEM CAVE, ISRAEL

*Slon, Viviane (Department of Evolutionary Genetics, Max Planck Institute for Evolutionary Anthropology, Leipzig, Germany) viviane\_slon@eva.mpg.de*

*Barkai, Ran (Department of Archaeology and Ancient Near East Cultures, The Lester and Sally Entin Faculty of Humanities, Tel-Aviv University, Israel) barkaran@post.tau.ac.il*

*Gopher, Avi (Department of Archaeology and Ancient Near East Cultures, The Lester and Sally Entin Faculty of Humanities, Tel-Aviv University, Israel) agopher@post.tau.ac.il*

*Glocke, Isabelle (Department of Evolutionary Genetics, Max Planck Institute for Evolutionary Anthropology, Leipzig, Germany) isabelle\_glocke@eva.mpg.de*

*Hershkovitz, Israel (Department of Anatomy and Anthropology, Sackler Faculty of Medicine, Tel-Aviv University, Israel) anatom2@post.tau.ac.il*

*Meyer, Matthias (Department of Evolutionary Genetics, Max Planck Institute for Evolutionary Anthropology, Leipzig, Germany) mmeyer@eva.mpg.de*

*Pääbo, Svante (Department of Evolutionary Genetics, Max Planck Institute for Evolutionary Anthropology, Leipzig, Germany) paabo@eva.mpg.de*

Recent developments in ancient DNA extraction and library preparation methods have enabled the generation of sequencing data from Middle Pleistocene samples. In Qesem Cave (Israel), dated to 420-200kya, large numbers of faunal remains and a small number of hominin teeth have been found. The abundance of faunal remains offers the opportunity to study ancient

DNA preservation in different areas of the cave. This preliminary study could then be used to select hominin remains for further genetic analysis, thus diminishing destructive sampling of these valuable fossils. Moreover, many of the faunal remains from Qesem Cave are too fragmentary to enable identification at the species level based on their morphology. Identification of species based on their genetic material would help shed light on the environment and hunting patterns of the inhabitants of Qesem Cave.

Forty-two faunal remains from six distinct areas in the cave were selected for this study. 25-50mg of bone/tooth were removed from each sample. DNA was extracted, converted into libraries and enriched for mammalian mitochondrial DNA using the most sensitive techniques currently available. Mammalian sequences longer than 30bp were identified and evaluated for the presence of C to T substitutions, which derive from deaminated cytosines and constitute a signal typical of ancient DNA. Most sequences detected originated from contaminating modern mammalian DNA, such as human and pig. However, a small number of libraries showed sequences similar to Persian fallow deer (*Dama mesopotamica*), a species found abundantly in Qesem Cave, albeit with inconclusive deamination signals.

A secondary stage of screening, focused on these "promising" libraries, is now being carried out in order to detect whether DNA is differentially preserved in different layers of the site. Deeper sequencing of these libraries and further analysis of the reads will be beneficial to assess the feasibility of extracting ancient DNA from hominin and faunal remains from Qesem Cave.

# B19 Aquatic resource consumption by prehistoric humans

Organiser: Dorothée G. Drucker & Yuichi I. Naito

Monday 1st (14:00-19h30)

A12 Meeting Room



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ORAL CONTRIBUTORS

ORAL

**1. THE PROCUREMENT OF THE CLAM *DONAX SERRA* RÖDING (BIVALVIA: DONACIDAE) DURING THE MIDDLE STONE AGE OF SOUTH AFRICA.**

Jerardino, Antonieta (ICREA/ Spanish National Research Council (CSIC) [amsjerardino@gmail.com](mailto:amsjerardino@gmail.com)

Navarro, Rene (University of Cape Town) [rene.navarro@uct.ac.za](mailto:rene.navarro@uct.ac.za)

Galimberti, Mariagrazia (University of Cape Town) [mgrazia.galimberti@gmail.com](mailto:mgrazia.galimberti@gmail.com)

South Africa Middle Stone Age coastal sites have played a prominent role in documenting early evidence of systematic shellfish collection and adaptation to aquatic environments in the context of anatomically modern humans. Pinnacle Point 13B cave is important among these Middle Stone Age sites not only because it holds the earliest yet known evidence for human use of marine resources (~162 ka), but because shellfish observations have been integrated more fully into discussions of Middle Stone Age adaptations. This is particularly the case of *Donax serra* procurement on sandy beaches, where skills that are usually indicative of an aspect of behavioural modernity (in the context of hunting) were apparently used.

*Donax serra* from 110-91 ka old assemblages have been studied in detail by way of metrical analyses and relevant biological and ecological literature of this species. Existing seasonality studies derived from Oxygen isotope analyses on the same molluscs are incorporated into this reconstruction.

Shellfish appear to have been collected in winter over many millennia when *Donax serra* are most nutritious due to high gonad content. A dramatic change in collecting strategies took place during this millennia-long period. Earliest systematic collection of *Donax serra* consisted of almost unselective procurement of animals in terms of shell size along the tidal gradient and beach depth. In later visits, people collected mostly larger individuals by narrowing their collection to the mid-intertidal. This change increased the efficiency of *Donax serra* collection which reflects a positive adaptive behaviour that endured into Later Stone Age times.

ORAL

**2. FROM ARCHAEOLOGICAL FRAGMENTS TO SUBSISTENCE STRATEGIES. BIOMETRICAL STUDIES OF MARINE INVERTEBRATES: THE COMMON MUSSEL (*MYTILUS EDULIS*) AND THE VIOLET SEA URCHIN (*PARACENTROTUS LIVIDUS*)**

Mougne, Caroline (University of Rennes 1) [caroline.mougne@free.fr](mailto:caroline.mougne@free.fr)

Dupont, Catherine (University of Rennes 1) [catherine.dupont@univ-rennes1.fr](mailto:catherine.dupont@univ-rennes1.fr)

Some biometrical studies have been realized on the common mussel (*Mytilus edulis*) and on the violet sea urchin (*Paracentrotus lividus*), which are regularly discovered on archeological sites along the French Atlantic coast. The fragmentation rate of the mussel valves and of the sea urchin test is generally high in archaeological contexts. In fact, their mineralogical nature, their shape and their thickness did not resist to a mechanical pressure of sediments and the shells and the tests are regularly found crushed. In order to reconstruct the original lengths of these two marine invertebrates from archeological fragments, a specific methodology has been settled.

As far as the *Mytilus edulis* is concerned, a series of measures has been carried out on 2500 valves (1250 right and 1250 left). Those valves come from four archeological sites and from six stations located on the present seashore. The shape of the mussel changes according to its environment, that is why the shells studied have been collected on several areas localized all along the French Atlantic coast, in various environments (rocky and muddy) and at different tidal ranges (middle and low seashore). Three measures allow to reach a correlation statistically reliable in order to reconstruct the original size of this bivalve: the width, the length of its hinge and a small part near the teeth.

Another series of measures has been taken on 55 individuals of *Paracentrotus lividus* coming from the present seashore of the western part of France. Four measures allow to obtain a high correlation in order to reconstruct the original diameter of the test: the length and the width of its rotula, the total length of the hemipyramid and a intermediary length of the hemipyramid.

These biometrical approaches aim to reconstitute the subsistence strategies of archeological human populations. Their application allows to describe the gathering methods, the diet and economical practices.

ORAL

### 3. SHELLS ARE A GIRL'S BEST FRIENDS: A BIOMOLECULAR GUIDE TO EATING, DATING AND CHOOSING YOUR JEWELLERY

*Demarchi, Beatrice (University of York) beatrice@palaeo.eu*  
*Wilson, Julie (University of York) julie.wilson@york.ac.uk*  
*Penkman, Kirsty (University of York) kirsty.penkman@york.ac.uk.*  
*O'Connor, Sonia (University of Bradford) S.OConnor@bradford.ac.uk*  
*Sheridan, Alison (National Museums Scotland) a.sheridan@nms.ac.uk.*  
*Hancock, Y (University of York) y.hancock@york.ac.uk*  
*Rocha Ponzoni, Andre (University of York) alexandre.lucquin@york.ac.uk*  
*De Almeida Rocha Ponzoni, Raquel (University of York) beatrice@palaeo.eu*  
*Collins, Matthew (University of York) matthew.collins@york.ac.uk*

Mollusc shells and avian eggshells found in archaeological sites represent direct evidence of how people in the past chose to exploit their environment. Aquatic resources in particular appear to have played an important role in the development of early human behaviour. However, molluscs (and eggs) were not only exploited as a food resource; their shells were valued for their aesthetic qualities and material properties, and were therefore used (and traded) for making personal ornaments, or useful tools.

Taxonomic identification of the raw material is key for reconstructing the selection process and the network of exchange of these prehistoric goods, but morphological identification is often hampered by degradation and/or working processes (e.g. for shell beads). Here we present a new methodological approach for the identification of these materials, based on ancient protein analyses.

Shells and eggshells are biominerals that are able to retain a stable fraction of proteins trapped within the calcium carbonate crystals (intra-crystalline). We target this fraction and analyse it by mass spectrometry (MS/MS) and liquid chromatography (RP-HPLC) to obtain information on both protein sequence and bulk amino acid composition.

We report the use of pattern recognition methods on a large dataset (777 samples) of bulk amino acid compositions from mollusc shells to demonstrate that taxonomic identification can be achieved at genus level.

This has important implications for the interpretation of large and fragmentary shell assemblages, as well as for shell personal ornaments, including worked shell beads from the Early Bronze Age site of Great Cornard, UK.

Furthermore, we present the first in-depth proteomics study on avian eggshell; this comprises more than twenty bird taxa (both wild and domestic), and allows unprecedented insights into the patterns of eggshell protein preservation, enabling not only taxonomic identification of the shell, but also an understanding of the role of proteins in the process of biomineralization itself.

The stable intra-crystalline fraction of proteins is shown to be preserved in archaeological shells and eggshell. Protein sequence and composition can be used for the taxonomic identification of these materials and therefore increase our understanding of the patterns of exploitation of natural resources in prehistory.

ORAL

### 4. PREHISTORIC AQUATIC RESOURCE USES IN THE SCOTTISH NORTH ATLANTIC ISLANDS: INTEGRATING DATASETS.

*Jones, Jennifer Rose (Instituto Internacional de Investigaciones Prehistóricas de Cantabria) jenniferrose.jones@unican.es*  
*Mulville, Jacqui (Cardiff University) mulvilleja@cardiff.ac.uk*

The Mesolithic-Neolithic transition in the Scottish islands has been a major focus of interest. Past human isotopic evidence demonstrated a sharp shift away from consuming marine foods with the arrival of farming to the islands in the Neolithic. Aquatic resources were thought to be abandoned until the Vikings arrived in the Norse period. These original models were based solely on human isotopic evidence, and little attention had been paid to the zooarchaeological data, or to the faunal isotopic baseline. Specifically the direct and indirect uses of aquatic resources such as their role in animal foddering is little understood. This paper presents a chronological overview of the importance and uses of marine food from the Neolithic to the Norse period in the Scottish Islands combining isotopic and traditional zooarchaeological techniques.

Carbon and nitrogen analysis of 622 faunal specimens was undertaken from the Neolithic, Bronze Age, Iron Age and Norse Period sites in Orkney and the Western Isles. These values were compared statistically to generate

a baseline and to characterise faunal diets. These results were compared to human isotopic values and zooarchaeological datasets to determine the changing importance of aquatic resources within these islands through time.

During the Neolithic human isotopic evidence and zooarchaeological data shows aquatic resources were not being consumed directly at this time. However, faunal isotopic evidence demonstrates that some animals were being grazed on the shorefront. During the Bronze Age there is a small increase in fish bones in the Outer Hebrides, although it was not being consumed in sufficient quantities to register in human bone collagen. Marine consumption may have been infrequent, or occasional. During the Iron Age in the Outer Hebrides there is an increase in fish bones present in the archaeological record, and humans at the Broch site of Dun Vulcan exhibit marine isotopic signatures. Similarly pigs at Dun Vulcan have isotopic signatures consistent with being fed fish. This is possibly linked to the high status of Brochs, and the role of fish in feasting activities at the site. During the Norse period there is evidence of extensive fish consumption in both Orkney and the Western Isles as seen isotopically. Zooarchaeological evidence demonstrates that herring were the main species exploited in the Western Isles, whereas cod and saithe were more commonly exploited in Orkney, showing differences in the economic strategies employed.

An integrated approach toward is crucial to understand nuances of aquatic resource use. Combining human and faunal isotopic evidence with zooarchaeological data allows an holistic understanding of aquatic resource use. Despite not being directly consumed aquatic resources were utilised in animal management during the Neolithic and Bronze Age. During later prehistory greater evidence of marine food consumption is observed within both human and animals, indicating their increasing importance through time.

## POSTERS

### POSTER

#### **5. DO FISH ACCUMULATIONS IN CAVES REPRESENT HUMAN FISH CONSUMPTION? A SYNTHETIC APPROACH.**

Guillaud, Emilie (Muséum national d'Histoire naturelle (UMR 7209) [eguillaud@mnhn.fr](mailto:eguillaud@mnhn.fr))  
Béarez, Philippe (Muséum national d'Histoire naturelle

(UMR 7209) [bearez@mnhn.fr](mailto:bearez@mnhn.fr)

Primault, Jérôme (Ministère de la Culture et de la Communication, DRAC de Poitou-Charentes/Service Régional de l'Archéologie (UMR7041) [jerome.primault@culture.gouv.fr](mailto:jerome.primault@culture.gouv.fr))

Fish remains are abundant in some upper Pleistocene sites, but the origin of such assemblages is generally poorly known. Potential accumulators of fish bones include humans as well as other kinds of predators, such as birds and carnivores, separately or together.

*Quantification:* Information on the number of fish represented by the remains is important in other analyses, such as subsistence evaluations.

These would include establishing known element representation, element fragmentation and bone surface modification.

*Spatial distribution:* Spatial distribution can be used to show if the fish remains are concentrated near human activities areas or if the accumulation is exogenous.

*Weight and size estimation:* Estimates of the original size and weight of fish represented in archaeological samples are used to reconstruct the relative contribution of fish to the overall diet.

The size of fish acquired depends on fishing technique and the carrying capacity of the predator.

*Traces of predation and digestion:* Fish remains preserved in archaeological contexts have the potential to inform us about past diets, but it is essential to identify the agents of accumulation by their taphonomic signature based on surface modifications, breakage and digestion traces, as well as element representation.

*Season of capture:* With the aid of a modern reference collection and standardized measurements, sclerochronology can be applied to archaeological scales or bones. This method allows us to reconstruct the season when fish were captured.

This methodological framework has been applied on the fish remains found at the cave "Le Taillis des Coteaux" (Vienne, France). This had permit to develop a methodology consisting to identify the part of freshwater resources in human diet during paleolithic period.

POSTER

**6. ISOTOPIC EVIDENCE (C, N, S, O) FOR A HIGH AQUATIC DIETARY CONTRIBUTION FOR A PRE-DORSET MUSKOX HUNTER FROM UMINGMAK (BANKS ISLAND, CANADA)**

*Bocherens, Hervé (Department of Geosciences, Biogeology, University of Tübingen) herve.bocherens@uni-tuebingen.de*

*Drucker, Dorothee G. (Department of Geosciences, Biogeology, University of Tübingen) dorothee.drucker@ifg.uni-tuebingen.de*

*Haidle, Miriam N. (Research Centre ) miriam.haidle@uni-tuebingen.de*

*Naito, Yuichi I. (Department of Geosciences, Biogeology, University of Tübingen) yuichi.naito@ifg.uni-tuebingen.de*

*Münzel, Susanne C. (Institute for Archaeological Science, Archaeozoology, University of Tübingen) susanne.muenzel@uni-tuebingen.de*

*Müller-Beck, Hansjürgen (Institut für Ur- und Frühgeschichte und Archäologie des Mittelalters, Dept. Ältere Urgeschichte und Quartärökologie, University of Tübingen) hansjuergen.mueller-beck@uni-tuebingen.de*

Carbon, nitrogen and sulphur stable isotopes differ among different food resources in the high arctic (terrestrial, freshwater, marine) and these variations are recorded by humans according to their diet and thereafter preserved in fossil bone collagen.

Basis of this study is a human mandible associated to the Pre-Dorset site of Umingmak (Banks Island, N.W.T., Canada) and directly dated to 3875±45 BP (GrA-38561). The carbon, nitrogen and sulphur isotopes of the bone collagen of this individual were measured, together with those of coeval fauna (muskox, reindeer, polar fox, wolf, geese) as well as modern ones (polar bear, reindeer). The main species in the Umingmak kill site is the muskox. The intra-tooth variations of carbon and oxygen isotopes were measured on several individuals to test whether they were killed in one or several episodes.

The C and N isotopes of the human bone collagen are consistent with a high marine dietary contribution, with values close to those of polar bear. Using a Bayesian mixing model (SIAR), the contribution of marine resources ranges from 60 to 75% depending on the values estimated for freshwater resources. However, the S isotopes are much closer to the terrestrial/freshwater range, and when S isotopes are incorporated in the SIAR model, the contribution of marine resources decreases to 50-60%, while the contribution of freshwater resources increases. In any case, the contribution of terrestrial

resources ranges from 20 to 40%, significantly lower than the 50% estimated from archaeological remains. The C and O isotopic data of muskox teeth indicate that the different individuals lived under different environmental conditions, precluding them to have lived as one herd. Therefore the accumulation of muskox corresponds to several hunting episodes. The tooth eruption of the muskox calves give evidence of hunting during the cold season, around November/December.

The multi-isotopic approach used on human and faunal remains of Umingmak allowed a precise dietary reconstruction of a Pre-Dorset human living in arctic conditions around 4000 years ago. The contribution of aquatic resources appears higher than expected, with a significant contribution of freshwater resources usually difficult to evaluate from zooarchaeological remains only. The ungulate bones correspond to an accumulation lasting several years, probably providing limited amount of meat to the humans in this environment.

POSTER

**7. USE OF AQUATIC RESOURCES IN THE BOTHNIAN BAY, NORTH BALTIC SEA? A CASE STUDY AT IIN HAMINA**

*Lahtinen, Maria (Durham University) m.lahtinen@durham.ac.uk*

The use of bulk collagen isotope analysis in archaeology has been based on differences in isotope signals between marine and terrestrial diets. However, little is known of the carbon and nitrogen isotope ratios of the north Baltic Sea, the Bothnian Bay. Furthermore, evidence of organic sediment and fish muscle carbon isotope ratios from the Bothnian Bay area suggests that the marine signature is not as distinctive as in oceans. As part of this study, seal bones were analysed from various archaeological sites in the Bothnian Bay coastal area in order to estimate the marine signal. For comparison, wild and domesticated terrestrial animals were also measured for  $\delta^{15}\text{N}$  and  $\delta^{13}\text{C}$  values. The identification of the marine signal is important, because fish are very likely to be a significant protein source in northern latitudes, where the growing season is short. This is because fish are available year round and productivity of farming is low. As already known from Europe, the freshwater signal can overlap with the carbon isotope ratios of a terrestrial diet. This is a dilemma in isotope bulk collagen reconstruction and is especially problematic in Fennoscandia, an area with a great number of lakes and

ivers. The use of coastal resources was studied with bulk collagen isotope analysis from a case study site at Iin Hamina, a cemetery in Northern Finland, where people might have used both marine and freshwater fish as a main protein source. This would be logical considering the location of the site: it is situated in the mouth of the river Ii on the coast of Bothnian Bay. The results of the bulk collagen analysis from Iin Hamina support this assumption. However the human data from Iin Hamina range across the range expected for terrestrial and marine diets. The study investigates whether the bulk collagen nitrogen and carbon isotope ratios of human bone are simply not enough to reconstruct diet in the northern Fennoscandia.

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POSTER

**8. ZOOARCHAEOLOGY OF THE RIVERINE SHELL MOUNDS CARAÇA, ESTREITO, TATUPEVA AND LAGEADO IV: A READING OF THE SAMBAQUI LANDSCAPE IN THE REGION OF ITAOCA RIBEIRA VALLEY OF IGUAPE.**

*Tognoli, Anderson (Museu de Arqueologia e Etnologia da Universidade de São Paulo MAE-USP) ar.tognoli@gmail.com*

The Caraça (1607-1300 years BP), Estreito (4124-3655 years BP), Tatupeva (4800-4770 years BP) and Lageado IV (1500-1280 years BP) riverine shell mounds – called Sambaquis – are located in the Ribeira Valley, in the South portion of Brazil, specifically in the Itaoça area. This region has a great spatial partitioning and micro-environment, and a prevailing warm and humid climate, characteristics that contributed to the existence of a great diversity of fauna and flora. In this sense, the purpose of this communication is to present the preliminary results of this Archaeofaunistic analysis in order to identify the diet of these groups based on Archaeofaunistic remains, and thus its main catchment areas, as well as understanding the paleoenvironmental conditions in which they were inserted.

The Archaeofaunistic analysis showed that the materials that compose the sambaquis are formed of bones, teeth and shells, in different proportions. These samples were subject to two primary methods of analysis for quantification and identification. The Number of Identified Specimens (NISP), that in one hand, allowed us to identify the taxonomic classes present at each site, the anatomical part, the degree of fragmentation, processing marks, and the rate of change of the material, and in

the other hand, the Minimum Number of Individuals (NMI) that allowed us to estimate the number of species present in each of the sambaquis, and their contribution into the diet.

During the analysis specimens of vertebrate animals belonging to the *mammals*, *birds*, *reptiles*, *amphibians* and *actinopterygii* classes were identified, besides the invertebrates animals of *gastropoda* and *bivalvia* classes.

The Archaeofaunistic samples of these sites have a high degree of fragmentation and thermal alteration marks, resulting from the use of fire in the process of preparing these animals for consumption.

From these results it was possible to develop a framework for analysis of animal species present in these sambaquis, and so, understanding the behavior of these groups in relation to the environment, and possible areas of resource catchment.

In terms of identified species of animals, the noteworthy presence of the *actinopterygii* at the Tatupeva and Estreito sambaquis are related to the proximity of these sites with the Ribeira river. Already the Caraça and Lageado IV sambaquis that are located further away from Ribeira, showed a high rate of Mammals remains. The fragmentation of these materials are the result of both processing activities of animals for consumption, as well as the modification by thermal action, which weakened the remains, besides the post-depositional processes such as trampling by historical reoccupations.

The Archaeofaunistic configuration demonstrates that these groups have developed certain types of adaptability in these diverse environments, with a strictly generalist and opportunistic behavior.

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ORAL

**9. FISHING IN THE MESOLITHIC-NEOLITHIC DANUBE GORGES: ARCHAEOLOGICAL, ARCHAEOZOOLOGICAL AND ISOTOPIC EVIDENCE.**

*Živaljević, Ivana (Laboratory for Bioarchaeology, Department of Archaeology, Faculty of Philosophy, University of Belgrade) ivana.zivaljevic@f.bg.ac.rs*

*Jovanovic, Jelena (Laboratory for Bioarchaeology, Department of Archaeology, Faculty of Philosophy, University of Belgrade) jelena.jovanovic@f.bg.ac.rs*

*de Becdelièvre, Camille (Laboratory for Bioarchaeology, Department of Archaeology, Faculty of Philosophy, University*

*of Belgrade) c.debecdelievre@gmail.com*

*Goude, Gwen elle (Laboratoire M diterran en de Pr his-  
toire Europe Afrique, UMR 7269, CNRS) goude@mms.h.univ-  
aix.fr*

The aim of this paper is to present and integrate new and existing archaeological, archaeozoological and isotopic data from the Mesolithic-Neolithic sites in the Danube Gorges of the Balkans. It has been hypothesised that fishing must have played a significant, if not crucial role in the prolonged stay of human communities in this region in the Early Holocene (10<sup>th</sup>-8<sup>th</sup> millennium BC), and consequently in the formation of first (semi) sedentary settlements (c. 7.300-5.900 cal. BC). The significance of aquatic resources in this particular context is amply manifested in the archaeological record - namely by considerable amounts of fish remains, isotopic signatures of human remains, and by distinctive sculpted sandstone boulders displaying elements of fish anatomy. However, even though the economic and social role of fishing has been recognised and emphasised in previous archaeological publications, a detailed archaeozoological analysis of fish remains had not been undertaken. Consequently, the great potential of cross-referencing archaeozoological and isotopic data has not been exploited.

This research employs a multidisciplinary approach which includes ichthyoarchaeology, stable isotope analysis of human remains, archaeological indicators of fishing and its importance (i.e. fishing and fish processing gear, sculpted and engraved representations of fish), and landscape studies which focus on the location of sites within the wider landscape. Case studies utilised in our research include the sites of Lepenski Vir, Padina and Vlasac, which were located on river terraces in the vicinity of whirlpools and small river tributaries, and could have therefore been recognised as attractive fishing spots.

The results of ongoing archaeozoological analysis of fish remains from these sites suggest that its inhabitants were oriented towards fishing freshwater species (large catfish, carp, roach, huchen), but also very large anadromous sturgeons (beluga, Russian sturgeon, stellate sturgeon) during their spawning migrations to and from the Black Sea. Existing isotopic data ( $\delta^{13}\text{C}$ ,  $\delta^{15}\text{N}$ ,  $\delta^{34}\text{S}$ ) show that the diet remained largely based on aquatic resources throughout the sequence, with no dramatic shifts documented in other European transitional populations. However, an ongoing study suggests that the dietary patterns were much more complex than previously thought, considering that different socio-biological

categories might have had various preferences and/or access to aquatic resources.

By integrating various disciplinary approaches, this research aims to provide new insights into the strategies of fish procurement and consumption - species selection and availability, the size of caught specimens, seasonality and fishing techniques, the role of fish in human diet and among different categories of the population, as well as the relationship between humans and the aquatic environment in this particular context. On a larger scale, the Danube Gorges sites, occupied by (semi)sedentary fishermen over a long time span between the 10<sup>th</sup> and 6<sup>th</sup> millennium BC, offer great possibilities for studying and understanding various aspects of Mesolithic-Neolithic transformations.

ORAL

## 10. SULPHUR-34 AS A TRACKER OF AQUATIC RESOURCES CONSUMPTION: INSIGHTS FROM THE LATEGLACIAL AND EARLY HOLOCENE OF NORTH-WEST EUROPE

*Drucker, Doroth e G. (Department of Geosciences, Biogeologie, University of T bingen, Germany) dorothee.drucker@ifg.uni-tuebingen.de*

The aquatic dietary resources are considered as high quality food that provided ancient humans with beneficial nutrients to brain development and alternative subsistence advantages. Due to its low archaeological visibility, the contribution of fish and other aquatic preys to the diet of past populations has been investigated using direct trackers such as carbon and nitrogen isotope abundances in bone collagen. In contrast with marine resources, freshwater resources cannot always be distinguished from terrestrial ones based on carbon-13 and nitrogen-15 abundances. To go beyond this limitation, sulphur-34 analysis of collagen has been recently applied to archaeological remains.

In continental context, collagen sulphur-34 abundances have been proved to be a potential tracker of freshwater contribution to the diet as well as a marker of the geographical origin. These two aspects were explored in the context of the Epipaleolithic and Mesolithic cultures extending from about 14,000 to 8000 years cal BP in northwest Europe. Those late hunter-gatherers were living in a changing environment with a succession of warm and cold episodes. During the Epipaleolithic, the Lateglacial interstadial (ca. 14,700-12,800 cal BP)

was a period of global warming with the progressive replacement of some emblematic species of the Pleniglacial, such as reindeer, by more temperate species, such as red deer. At that time, human populations seemed to have broadened their dietary spectrum to small game as well as aquatic resources. After the last major cold event of the Younger Dryas (ca. 12,800-11,600 cal BP), the environment witnessed a global warming leading to the early Holocene climatic optimum around 9000 cal BP. During this temperate phase, hunter-gatherers had access to a high diversity of terrestrial and aquatic resources, while their land use pattern was suggesting a reducing mobility over time.

The isotopic results ( $^{13}\text{C}$ ,  $^{15}\text{N}$ ,  $^{34}\text{S}$ ) obtained so far on human and faunal remains from Epipaleolithic and Mesolithic sites in northern France, eastern France, Luxembourg and Germany were examined to decipher the potential of sulphur-34 to identify the consumption of freshwater resources. A significant difference in sulphur-34 abundances between terrestrial and freshwater ecosystems was confirmed in the late Mesolithic context of northern France. In contrast, evidence or strong suspicion of aquatic-based diet was not reflected by a clear pattern in sulphur-34 in the studied Epipaleolithic and early Mesolithic cases. Finally, sulphur-34 appeared as a promising tracker of mobility in the context of terrestrial-based subsistence in the middle part of the Mesolithic.

The possibility to discriminate between freshwater and terrestrial resources using sulphur-34 abundances in collagen is not systematic as underlined by previous works and case-by-case studies are necessary. So far, the end of the Lateglacial interstadial and the transition to the early Holocene provided negative results on the use of sulphur-34 as an aquatic consumption tracker. The temperate context of the early Holocene seems more promising for the application of  $^{34}\text{S}$  either for diet or mobility tracking.

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ORAL

## 11. MODELLING SUBSISTENCE STRATEGIES AT LAKE BURTNIEKS, LATVIA, USING RADIOCARBON AND STABLE ISOTOPES

*Meadows, John (Centre for Baltic and Scandinavian Archaeology (ZBSA), Schleswig-Holstein State Museums Foundation) jmeadows@leibniz.uni-kiel.de*

*B rzi', Valdis (Institute of Latvian History at the University of Latvia) valdis-b@latnet.lv*

*Lübke, Harald (Centre for Baltic and Scandinavian Archaeology (ZBSA), Schleswig-Holstein State Museums Foundation) harald.luebke@schloss-gottorf.de*

*Schmölcke, Ulrich (Centre for Baltic and Scandinavian Archaeology (ZBSA), Schleswig-Holstein State Museums Foundation) ulrich.schmoelke@schloss-gottorf.de*

*Zagorska, Ilga (Institute of Latvian History at the University of Latvia) ilga.zagorska@gmail.com*

*Zarina, Gunita (Institute of Latvian History at the University of Latvia) gunitaz@latnet.lv*

Aquatic food resources (fish and molluscs) were exploited intensively at Rinnukalns, a Neolithic shell midden at the outlet of Lake Burtnieks, north-eastern Latvia (Berzins et al. in press). Stable isotope data from a rich fish-bone assemblage (Schmölcke et al. submitted) and isotope data from a wide range of terrestrial species complement results on faunal samples from the prehistoric settlement and cemetery at Zvejnieki, on the opposite shore of the lake (Eriksson et al. 2003; Eriksson 2006). Stable isotope data from human remains at Zvejnieki and Rinnukalns indicate that freshwater food resources made substantial but varying contributions to human diets throughout the Mesolithic and Neolithic.

Our results also show significant radiocarbon reservoir effects in aquatic species from Lake Burtnieks, which must be reflected in the radiocarbon ages of human remains, and may explain some unexpected dates from Zvenieki burials (Meadows et al. 2014). Radiocarbon is therefore another dietary proxy, albeit one which can only be used if the date of burial is constrained by other evidence: radiocarbon dates of organic grave goods, radiocarbon ages of other individuals buried simultaneously (but having different diets), and radiocarbon ages of different components of the same individual, if these are isotopically labelled by individual dietary history or the metabolism of different nutrients. We consider examples of the first two situations, and argue the inconsistencies between dietary reconstructions based on stable isotopes alone and those incorporating radiocarbon evidence may be due to mobility patterns rather than the use of incorrect local isotopic baseline values.

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ORAL

## 12. AMINO ACID $^{13}\text{C}$ ANALYSIS OF HAIR BY LC/IRMS: IMPROVED RESOLUTION IN DETECTING AQUATIC FORAGING

*Mora, Alice (Department of Archaeology, Environment and*

*Community Planning, La Trobe University, Melbourne, Australia) amora@students.latrobe.edu.au*

*Arriaza, Bernardo T. (Instituto de Alta Investigación, Universidad de Tarapacá, Arica, Chile) barriaza@uta.cl*

*Standen, Vivien G. (Departamento de Antropología, Universidad de Tarapacá, Arica, Chile) vstanden@uta.cl*

*Smith, Colin (Department of Archaeology, Environment and Community Planning, La Trobe University, Melbourne, Australia) colin.smith@latrobe.edu.au*

Hunter-gatherer societies have lived along the coast of the Atacama Desert in northern Chile for millennia. The complexity of these early sedentary societies (notably the Chinchorros) was manifested in the manifold practices of mummification given to the dead. The archaeological evidence suggests that these coastal populations were highly specialized in exploiting aquatic resources (especially marine), with only minimal use of terrestrial resources.

We have employed a novel stable isotope approach, taking advantage of the exceptional preservation of the mummies, to investigate individual subsistence patterns using liquid chromatography – isotope ratio mass spectrometry (LC/IRMS) analysis of sequential hair samples. LC/IRMS enables the analysis of  $\delta^{13}\text{C}$  values from amino acids of protein acid hydrolysates from small samples and the results can be interpreted to discriminate between terrestrial and aquatic resources, and further distinguish between marine and freshwater resources. Single hair strands sampled from seven mummies from the Late Archaic Period (~6000-4000 BP) to the Late Intermediate Period (~950-1476 AD) were cut into 0.5cm lengths and analysed to provide detailed fortnightly discrete palaeodietary profiles of these individuals. We will discuss the results in terms of how the individual amino acid results from hair keratin are interpreted and discuss the advantages and disadvantages to our approach. The subsistence strategies of individuals from different time periods and different locations (inland and coastal) will be discussed and what the implications are for the persistence of aquatic resource exploitation in pre and post-agricultural periods in the region.

ORAL

### **13. DETECTION OF AQUATIC RESOURCE CONSUMPTION BY PREHISTORIC HUMANS BASED ON NITROGEN ISOTOPIC COMPOSITION OF COLLAGEN AMINO ACIDS.**

*Naito, Yuichi I. (University of Tübingen) ynaito0825@gmail.com*

*Wißing, Christoph (University of Tübingen) christoph.wissing@uni-tuebingen.de*

*Drucker, Dorothee G. (University of Tübingen) dorothee.drucker@ifu.uni-tuebingen.de*

*Bocherens, Hervé (University of Tübingen) herve.bocherens@uni-tuebingen.de*

*Yoneda, Minoru (The University of Tokyo) myoneda@um.u-tokyo.ac.jp*

*Chikaraishi, Yoshito (Japan Agency for Marine-Earth Science and Technology) ychikaraishi@jamstec.go.jp*

*Ohkouchi, Naohiko (Japan Agency for Marine-Earth Science and Technology) nohkouchi@jamstec.go.jp*

Stable isotope analysis of human remains enables an estimation of food habits in ancient times. Among others, aquatic resource consumption is especially important as it is considered to be a recent innovation in hominid evolution thus providing insights into the adaptive strategies of modern humans. However, studies of bulk collagen have showed that nitrogen isotopic composition could significantly vary even within the same animal species depending on environmental conditions, making a dietary reconstruction of human remains difficult without enough number of referential prey animal specimens. Nitrogen isotope analysis of individual amino acids in bone collagen has recently been proposed as a potentially useful tool for the detection of not only marine resources but also freshwater ones. In this paper, we further test its applicability to human populations in a variety of regions and chronological time periods in the world and discuss whether it is possible to detect aquatic resource consumptions based on the isotopic composition of human remains only.

We compiled published and unpublished data of nitrogen isotopic composition of amino acids for more than 150 archaeological samples from 23 sites located in various environments (e.g. temperate and cold regions in Japan, mammoth steppe in Europe, inland and coastal regions in South Africa) to decipher a general trend in the terrestrial  $\text{C}_3$ -plant-based, terrestrial  $\text{C}_4$ -plant-based, freshwater, and marine ecosystems and compare them with the human realms. Furthermore, a generalized linear model was developed based on those data in addition to isotopic compositions of bulk collagen in order to blindly assign a human remain to either of the above categories. Finally, we applied these models to published literature data to test their robustness and to see how human remains are categorized.

Major findings are: independently of climatic conditions, nitrogen isotopic compositions of glutamic acid and phenylalanine of terrestrial animals group similarly; these



two amino acids are particularly useful to detect marine or freshwater resource consumptions; the developed models successfully distinguish freshwater, marine and terrestrial animals though separations between freshwater and marine ecosystems could be imperfect; most of the human remains were assigned to predicted categories while only a few of them were not.

Nitrogen isotopic composition of amino acids is useful for the detection of aquatic resources. In the future, it would be possible to more precisely categorize human remains by combining other indicators such as sulphur isotopic composition and carbon isotopic composition of individual amino acids.

Contexts without definition,  
definitions without context. Ar-  
guments for the characterization  
of the (Pre)historic realities during  
**B20** the neolithisation of the western  
mediterranean

Organisers: Iñigo García-Martínez de Lagrán, Esther López-Montalvo and Claire Manen)

Thursday 4th (9:00-13h30)  
B26 Meeting Room



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ORAL CONTRIBUTION

ORAL

**1. ARGUMENTS FOR THE CHARACTERIZATION OF THE (PRE)HISTORIC REALITIES DURING THE NEOLITHISATION OF THE WESTERN MEDITERRANEAN: AN INTRODUCTION TO THIS DEBATE.**

*Manen, Claire (CNRS) clairmanen@univ-tlse2.fr*

From an historical point of view, the Neolithic transition constitutes a fundamental period during which people changed their relationship with the environment, establishing – in diverse ways – an economy based on farming and agriculture. In archaeology, the approaches to the study of this 'Neolithisation' process are extremely varied, since what changed was the entire range of elements making up the human-environment system. For Europe, the study of Neolithisation has focused on the vectors of this change (i.e. cultural diffusion via the indigenous hunter-gatherer societies vs. demic diffusion by the migration of a population from the Near East, where most of the animal and plant species in question had been domesticated). Equally, the study of Neolithisation in Europe involves examining the rhythms of emergence of novel techno-economic traits (considering the greater or lesser favorability of the natural and cultural milieu within which such novelties appeared).

Thanks to multidisciplinary researches, data of the last years have shown that the Mesolithic-Neolithic transition in the western Mediterranean is a very complex phenomenon that linear models cannot explain. Indeed, relations between the latest hunting societies and the earliest agro-pastoral societies may have had an impact on the dynamics of the spread of the agro-pastoral economy and on the reshaping of cultural expressions. Furthermore, the first farmers appear to have regularly transformed their technical and economic systems (thanks to adaptation to new environments, to social dynamics...). Even more, if we widen the perspectives and consider the southern shores of the Mediterranean, the situation is further complicated by the fact that the model of the diffusion of the Neolithic package does not fit to the archaeological situation.

Thus the restrictive duality between a world of mobile hunter-gatherer and a world of sedentary agriculturalists is no longer valid. And a lot of intermediary situation have to be taken into account to draw a patchier picture. But from an archaeological point of view, it must be

recognized that the definition and characterization of the criteria that allow to distinguish, in an objective way, the different socio-economic situations of every context is very difficult (farmer communities of colons, Mesolithic communities with evidences of exchange, "mixed" system, in which the weight of the predatory and producing activities is similar, functional variability of the Neolithic expressions...). This difficulty can be explained by the fact that no archaeological element defines for itself the hunter-gatherer or farmer nature of the context. This is in particular due to the fact that the presence / absence of certain archaeological elements respond to multiple factors: functionality of the deposits, interaction / exchanges between different groups, importance of the activities of subsistence ...

The aim of this introduction is to explore the variability of situations through practical examples or case studies taken from different kind of geographical, technical and archaeological contexts.

ORAL

**2. NEOLITHIC PROCESS OF THE IBERIAN PENINSULA THROUGH OF ABSOLUTE DATING**

*Sanz González de Lema, Sofía (Universidad Técnica Particular de Loja (Ecuador) ssanz@utpl.edu.ec*

In this paper I would like to take the opportunity to present the result of my doctoral research about the Neolithic process of Iberian Peninsula through the absolute dating (*Dating to a Historical Process: Absolute dating in the Iberian Neolithic. Analysis and Cultural Assessment*, Universidad Autónoma de Madrid, 2012). Our first aim is to contribute an interpretation about the Iberian Neolithic process through absolute dating.

The method of working commences in the collecting published absolute dating (radiocarbon and thermoluminescence dating) at archaeological context with Neolithic technology (the domestication of animals and plants, ceramic and polished stones). The dates are examined in depth including the method of detecting radiocarbon, type of sample, error term, alteration effects, contamination, sedimentary analysis and taphonomy. The result of the test is one absolute dating group with a safe age. In this manner there is a safe chronology of archaeological context and materials.

On the one hand, 1091 absolute dates has been analyzed from 364 archaeology sites with Neolithic

context and the 32% of data only could be seen as safes. In most problematic cases has relation with: method and site of recollecting sample, high error term, taphonomic problems and little published information about the sites. On the other hand, the percentage of safe dates vary according to the geographic regions, the Iberian Peninsula is divided in sixth regions: Northeast, Ebro Valley, Meseta, Levant, Baetic-Guadalquivir Axis and Atlantic coast. On third place, according the archaeological record the population model could be mosaic model.

In the light of the research and his results, it is possible to propose the Neolithic process as an "Inland phenomenon", not as "Coast phenomenon"; where the mountain ranges had an important part in this process. So, the traditional models about the Neolithisation of Iberian (Maritime Pioneer Colonization, Dual Model and Acculturation Modell) look upon the Mediterranean route as only Neolithisation route, but dates show other different order. Finally, a chronologic-cultural table about the Neolithic process in Iberian Peninsula has been made by mean of results.

ORAL

### 3. BACK TO THE MESOLITHIC-NEOLITHIC TRANSITION IN NORTHERN SPAIN: THE ABSOLUTE CHRONOLOGY

*Fano, Miguel Ángel (Universidad de La Rioja) miguel-angel.fano@unirioja.es*

*Wood, Rachel (The Australian National University) rachel.wood@anu.edu.au*

*Cubas, Miriam (IIIIPC - Sociedad de Ciencias Aranzadi) mcubas@aranzadi-zientziak.org*

Thanks to investigations in northern Iberia during the last two decades, it is now possible to establish models for the Mesolithic-Neolithic transition (5th millennium cal BC). This requires a critical evaluation of the archaeological evidence, and agreement on which criteria allow discrimination between context with evidence of hunter-gatherer groups and those corresponding to Neolithic groups. In northern Spain a traditional criteria based on technology was used to identify the new *way of life* until the 1990s. Currently, well-established but scant data about farming and stockbreeding is available, and a consensus exists about the importance that should be given to the introduction of artificial techniques in food production. However, this criterion can be difficult to apply and the cultural

attribution (Mesolithic vs. Neolithic) of distinct contexts is complex. After a consideration of these difficulties, this paper presents a model for the transition to the Neolithic based on the statistical treatment of the radiocarbon dataset.

In order to analyse the Neolithisation process from the chronological point of view, published dates for the period of time covering the process have been compiled ca. 9500-2500 cal BC. Bayesian statistical models have been constructed to investigate the transitional process and assess the value of radiocarbon dates in understanding this period.

Using published dates, the chronological models show an overlap between the final Mesolithic and the Early Neolithic archaeological deposits. The final hunter-gatherer societies appear to have disappeared after the Neolithic groups were present in the region. This result is in accordance with the complexity displayed by the Early Neolithic in archaeological terms.

Results support the hypothesis of a "mosaic" Neolithisation process, with groups of hunters and farmers living together in the region during the first half of the fifth millennium, at least in the eastern part of Cantabrian Spain.

ORAL

### 4. "ARCHAEOGRAPHY AND ARCHAEOLOGY: THE INTERPRETATION OF THE ELS TROCS CAVE DATA (SAN FELIU DE VERI, HUESCA, SPAIN)"

*Rojo-Guerra, Manuel (Universidad de Valladolid) marojo@fyl.uva.es*

*Tejedor Rodriguez, Cristina (Universidad de Valladolid) tejedor.cristina@gmail.com*

*García Martínez de Lagrán, Iñigo University of the Basque Country, Euskal Herriko Unibertsitatea igmtzl@gmail.com*

*Royo Guillén, José I. marojo@fyl.uva.es*

*Arcusa Magallón, Héctor (Universidad de Zaragoza) marojo@fyl.uva.es*

*Iriarte, Eneko (Universidad de Burgos) eiriarte@ubu.es*

*Lancelotti, Carla (Universitat Pompeu Fabra) carla.lancelotti@imf.csic.es*

*Mazucco, Niccolo (CSIC) niccomazucco@imf.csic.es;*

*Leonor Peña Chocarro (CSIC) leonor.chocarro@cchs.csic.es.*

Reading and interpreting the archaeological record (archaeography) is a very attractive challenge in those sites with important "entropy", such as cave contexts

submitted to numerous taphonomic processes with postdepositional alterations of the archaeological layers. This results in different interpretations about the type of occupation or the function of the archaeological contexts in different periods.

In this communication we will describe and interpret the prehistoric record of the Els Trocs cave as a perfect example of the combination of several analyses to analyze different contexts during the Neolithic. The key elements to be analyzed are the following:

- The environment, and especially the singular location of this cave in a high mountain area (1500-2000 meters above the sea level), with the evident connections with traditional livestock tracks.
- Evidences of mobility: through the study of sources of raw materials (flint) and the comparison of pottery styles in the Neolithic contexts of this cave.
- Evidences of seasonality: clearly reflected by the study of the faunal and microfaunal remains, and the micro-morphology and palaeobotanic analyses.
- Palaeo-environment: together with the study of the archaeological evidences inside the cave, sondages were made outside, in the surroundings, where interesting deforestation events have been documented, probably related with the anthropic impact of the inhabitants of the cave and their activities.
- Habitation evidences inside the cave: presence of numerous hearths, pits, and above all a spectacular pavement made of potsherds (with more than 25.000 pieces), which are crucial to interpret the domestic use of the cave.
- Finally, the ritual use of the cave would be also analyzed through the study of human bones discovered in the domestic contexts (with marks of violence, *peri mortem* treatment, etc.).

To sum up, the global analysis of these multiple evidences would be very useful to propose hypotheses about the interpretation of the different contexts of the cave. In other words the complete study of the archaeometric and archaeological data would help us to understand the life forms of the first settlers of the Central Pyrenees and the environment in which they lived, in the general framework of the Iberian and regional Early Neolithic.

ORAL

## 5. THE NEOLITHISATION OF INNER IBERIA: ANALYSIS OF THE ARCHAEOLOGICAL CONTEXTS AND ITS HISTORICAL INTERPRETATION.

*García-Martínez de Lagrán, Íñigo (Postdoctoral Programme of the DEUI of the Basque Government, Spain - University of the Basque Country, U.P.V./E.H.U. - IT622-13 Research Group in Prehistory, Basque System of Research, Spain - Laboratoire TRACES UMR5608, Université de Toulouse Le Mirail 2) igmtzl@gmail.com*

The Neolithisation as a historical process has the great handicap to interpret and identify on the archaeological record different types of societies and historical situations that have been defined from ethnographic and anthropological models: pioneers, groups in transition, "low-level food production", "mixed communities", "hunter-gatherer with ceramic", etc. In the case of the Iberian Peninsula, especially in the Ebro Valley and the Northern Meseta, this has also been conditioned by the dominant cultural historical theory, which usually interprets as Neolithic any context with any archaeological remain defined as such.

In this communication we will try to overcome these problems classifying the contexts identified in this territory between ca. 6000-5000 cal BC. This classification is based on a hierarchy of archaeological, chronological and theoretical criteria:

- Archaeological:
  - Quantitative and qualitative importance of Neolithic elements in each context;
  - The presence / absence in the same site of previous Mesolithic occupations;
  - The type of site and its functionality: shelters and caves exploited as logistical camps and open-air settlements defined as residential camps;

- Chronological:

Based on current data two "chronological limits" can be proposed: 1) ca. 5700-5600 cal BC as the beginning of the Neolithic, and 2) ca. 5400-5300 cal. BC as the end of the above process and starting the Early Neolithic.

- Theoretical:

Neolithic concept based on agriculture and livestock as historical and archaeological genesis is assumed. Also we consider the Neolithic as allochthonous to the Iberian Peninsula and, therefore, different processes of colonization and population movements for its explanation are proposed.

The analysis of these criteria results in the definition of three groups of contexts. Each of them will respond to different historical situations: Neolithic pioneers, Mesolithic contexts with neolithic elements obtained by exchange, and, finally, farming communities that will

begin the Early Neolithic and that will result from the previous interaction, mentioned above.

Each of these definitions present particular features in the archaeological record and a specific chronological frame defined above.

From this classification we will try to define the different historical situations that might occur during the Neolithisation and to characterize the Early Neolithic communities as the final result of it. All this will serve as argument for the approach of a specific hypothesis about the Neolithisation of this Inner Area and the Iberian Peninsula as a whole, which, at its core, is characterized by the importance of interaction between Mesolithic and Neolithic populations, and the need for certain processes of colonization of the territory.

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ORAL

## 6. MESOLÍTICO, NEOLÍTICO, CONTEXTOS, COMPLEJIDADES Y PROCESOS. REFLEXIONES EN LA CUENCA DEL EBRO

*Alday, Alfonso (Universidad del País Vasco) a.alday@ehu.es*  
*Perales, Unai (Universidad del País Vasco) perales.unai@gmail.com*  
*Soto, Adriana (Universidad del País Vasco) kurajadri@yahoo.es*

La pregunta clave que nos planteamos en nuestra reflexión es conocer cuál es la aportación de un contexto arqueológico neolítico en la definición de la cultura neolítica. La respuesta arranca en el momento que sustentamos el concepto de Neolítico, priorizando unos caracteres sobre otros.

La dinámica histórica neolítica no puede analizarse sin comprender el episodio anterior, el Mesolítico, que en el Alto Ebro, se significa por unas sociedades flexibles en sus planteamientos, y consolidados en su relación con el entorno. Desde fines del tardiglaciario las poblaciones se instalan aquí, dialogando con el medio a través de una red de yacimientos. Los lugares tipos responden al modelo de abrigos bajo roca, injustamente simplificados como altos de caza a partir de una industria lítica retocada con alta participación de armaduras, la posición estratégica que ocupan y el registro de su fauna. Esta visión debe ajustarse, por derivar de unas políticas de prospección sesgadas, de problemas de conservación diferencial y porque la serie de actividades que en ellos se realizan sobrepasa las propias de un cazadero. La polivalencia

es uno de sus caracteres más notables, observada en las dinámicas de talla, la variedad, proporcionalidad y funcionalidad de los instrumentos (deslegitimando la vinculación entre industria lítica y caza). Las estrategias de caza de los grupos les permite un control de los recursos que, en las condiciones medioambientales imperantes y dada la gestión desarrollada, son predecibles. Las sociedades mesolíticas están engarzadas en la región y alcanzan una organización social compleja en un claro proceso sedentarizador.

Caracteres similares ofrecen los registros neolíticos: talla del sílex, elaboración de cerámica, multiplicación de acciones, molinos en soportes alóctonos y láminas de hoz como evidencia de agricultura, animales domésticos... Hay cambios profundos en las industrias líticas: en los módulos (suponen nuevos planteamientos tecnológicos), en los proyectiles, en la proporcionalidad de las categorías retocadas, en la gestión de las materias primas... Los inventarios de estos abrigos no se diferencian, fuera de detalles, de los catálogos de los clásicos registros neolíticos del mediterráneo peninsular. Reflexionamos también, sobre la fauna: en el Mesolítico la gestión es diferencial según la especie, argumento que confirma la complejidad de las decisiones de los grupos. No es sorprendente, en esta situación, la detección prematura de ganadería que, a partir del último tercio del sexto milenio, pone en práctica un nuevo tipo de gestión, con rediles como yacimientos especializados.

La continuidad mesoneolítica en los abrigos deviene del hecho de que las comunidades prehistóricas materializan sus estructuras económicas, sociales e ideológicas en estos y otros lugares: ahí expresan su esencia e identidad. Defendemos la existencia de un vínculo entre los grupos y los lugares, que trasciende la perspectiva económica, para transferir un mensaje social que se traslada a otros aspectos del registro, y argumentan la participación local en el proceso neolitizador.

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ORAL

## 7. INSIGHTS INTO THE PREHISTORIC TOOLKIT: TRACEOLOGICAL ANALYSIS OF LITHIC ASSEMBLAGES FROM MESO-NEOLITHIC CONTEXTS IN THE NEW MEDITERRANEAN

*Mazzucco, Niccolò (IMF-CSIC) nicco.mazzucco@gmail.com*  
*Gibaja, Juan Francisco (IMF-CSIC) jfgibaja@imf.csic.es*

The traceological analysis of archaeological artefacts has a great potential in prehistoric studies. Apart from

defining the functionality of determinate categories of objects, traceological analysis can strongly contribute to the understanding of the overall economic organization, of the productive processes which took place in each site and of the role they had in the overall site organization. During the last decade, the study of an increasing number of archaeological contexts of Neolithic and Mesolithic period, has allowed to establish comparisons between settlements of diverse functionality and cultural affiliations. As result, both Mesolithic and Neolithic 'toolkits' have been investigated by means of traceological analysis.

In this communication, we are going to present the results of the traceological analysis realized on the chipped stone assemblages from a number of case studies dated to the VII-VI millennium calBC, in the Western Mediterranean. Our aim is to highlight which are the key-elements that can help us understanding the site functionality and its cultural affiliation. All the lithic collections considered, have been studied through an integrated approach, including also data from technological and provenance analysis.

Typical 'Neolithic' tools are for example harvesting tools (among which the so-called sickle blades), tools associated with hide processing (endscrapers or blade scrapers) or related with working processes on clay/ceramic. On the contrary, 'Mesolithic' toolkit is generally characterized by a much larger production of projectile inserts (e.g. geometric tools), but also by notched blades often related with crafting activities on wood or bone/antler materials and a large set of scarcely elaborated blanks related to butchering and animal substance processing.

Even if some qualitative differences can be remarked both from a technical and functional point of view, is not always easy to establish a clear boundary between a 'Mesolithic' and 'Neolithic' assemblages. The patterns of resource exploitation can vary notably from site to site during Neolithic and Mesolithic, depending from the economic organization, the site functionality, the geographical and environmental settings.

ORAL

## **8. BETWEEN MESOLITHIC AND NEOLITHIC: WHICH STATUS FOR THE MATERIAL PRODUCTIONS OF AVEYRON (FRANCE) DURING THE VITH MILLENNIUM B.C.**

*Defranould, Elsa (EHESS-UMR5608 TRACES) [elsa.defranould@yahoo.fr](mailto:elsa.defranould@yahoo.fr)*

*Caro, Joséphine (Université Toulouse 2 - Le Mirail-UMR5608 TRACES) [josephinecaro@hotmail.fr](mailto:josephinecaro@hotmail.fr)*

During the VI<sup>th</sup> millennium B.C., the French department of Aveyron shows few settlements attributed to a specific Early Neolithic currently named «Roucadourien». Defined at the end of the 60's, the Roucadourien is a large cultural group which spreads out from Aquitaine to the Pyrenean and the Massif Central piedmonts. Its particularity is to associate various Mesolithic and Neolithic's components from an economic as well as material point of view. These associations have, until now, been interpreted as a "cultural group" of transition from the last indigenous hunter-gatherers to the Neolithic (with the first farmers and practice of animal husbandry). Among those specific data, ceramic and lithic productions were the main arguments for a theory where this cultural group was largely influenced by Mesolithic traditions. The ceramic productions, often defined as clumsy and coarse, could result of a local invention by Mesolithic hunter-gatherers. On the other end, the association of 2<sup>nd</sup> Mesolithic and Early Neolithic lithic assemblages, could also show signs of an acculturation process of the indigenous populations.

Consequently, because of their geographic situation on the margin of the Cardial culture emergence and because of early <sup>14</sup>C datations (up to VII<sup>th</sup> millennium B.C.), the settlements taken into account in this study, play a crucial role in the current debate on the neolithisation process. Different hypothesis may be stated:

A pole of indigenous neolithisation, independent from the Cardial group.

Acculturated Mesolithic groups, but still preserving some of their cultural backgrounds.

A phenomenon related to the expansion of the Epicardial complex.

The results of stratigraphic mix and/or the lack of chronological resolution.

Thus, today, the reliability of the archaeological contexts as well as the definition of a vast and homogenous cultural entity, are called into question. From this statement, it seems very important to study again all data material from selected main settlements. Recent typotechnological studies on lithic and ceramic assemblages from Aveyron (Combe-Grèze, Clos de

Poujol, Roquemissou, Les Usclades, La Poujade) allowed us to renew our perception of these continental contexts. It is now possible to consider these sites in a more functional perspective and not only according to culturalist approach. Thus, this study may be considered as a further step to the understanding of cultural relations and technical know-how between the 2<sup>nd</sup> Mesolithic and the Early Neolithic.

ORAL

### 9. BURIED STRUCTURES IN BARCELONA PLAIN NEOLITHIC SETTLEMENTS: A GENERAL REVISION, MORPHOLOGICAL ANALYSIS AND FUNCTIONAL APPROXIMATION

Molist, Miquel (UAB) [miquel.molist@uab.cat](mailto:miquel.molist@uab.cat)  
Gómez Bach, Anna (UAB) [anna.gomez@uab.cat](mailto:anna.gomez@uab.cat)  
González, Javier (UAB) [jmusteriense@gmail.com](mailto:jmusteriense@gmail.com)  
Rios, Patricia (UAB) [priosmendoza@gmail.com](mailto:priosmendoza@gmail.com)  
Bordas, Anna (Atics) [annabordastissier@gmail.com](mailto:annabordastissier@gmail.com)  
Breu, Adrià (UAB) [germanic51@gmail.com](mailto:germanic51@gmail.com)  
Harzbecher, Karin (UAB) [karin\\_harzbecher@hotmail.com](mailto:karin_harzbecher@hotmail.com)  
Fernandez, Joaquin (UAB) [joaquin-fr@hotmail.com](mailto:joaquin-fr@hotmail.com)  
Vicente, Oriol (UAB) [oriol.vicente@uab.cat](mailto:oriol.vicente@uab.cat)

The discovery of occupations in the underground of the actual city of Barcelona is one of the most significant news in North-east recent Iberian prehistory. During the last two decades, thanks to a right preventive archaeology policy, the number of archaeological findings has been multiplied, this defining a set of settlements in the proximity of the sea shore.

In the present communication the structural evidences from the Neolithic settlements (located in the lower part of the Montjuïc mountain, in the actual Raval quarter (Caserna de Sant Pau del Camp, Conservatori del Liceu, Reina Amàlia...) will be analyzed both jointly and generally. In particular, buried structures will be revised (pits, slumps,..) whose morphological characteristic and its filling has allowed a functional analysis (hearts, combustion structures, used silos...). The spatial analysis at macro level, all along with archaeological type variables, chronology in particular, will allow an approximation to the characterization of the settlement.

In a methodological level, the search for digging and register systems is, together with the interesting collaboration between public and private professionals, one of the important variables taken into account.

ORAL

### 10. COCINA CAVE REVISITED: UNDERSTANDING THE NEOLITHISATION CONTEXT IN MEDITERRANEAN IBERIA

García Puchol, Oretó (Investigador Programa Ramon y Cajal. Departament de Prehistòria i Arqueologia. Universitat de València (Spain) [oreto.garcia@uv.es](mailto:oreto.garcia@uv.es)

Juan Cabanilles, Joaquim (SIP Museu de Prehistòria de València) [joaquim.juan@dival.es](mailto:joaquim.juan@dival.es)

McClure, Sarah (Pennsylvania State University (USA) [sbm19@psu.edu](mailto:sbm19@psu.edu)

Pérez Ripoll, Manuel (Departament de Prehistòria i Arqueologia. Universitat de València (Spain) [manuel.perez@uv.es](mailto:manuel.perez@uv.es)

Bernabeu Aubán, Joan (Departament de Prehistòria i Arqueologia, Universitat de València (Spain) [juan.bernabeu@uv.es](mailto:juan.bernabeu@uv.es)

Pardo Gordo, Salvador (Departament de Prehistòria i Arqueologia. Universitat de València (Spain) [salvador.pardo@uv.es](mailto:salvador.pardo@uv.es)

Molina Balaguer, Lluís (Departament de Prehistòria i Arqueologia. Universitat de València (Spain) [lluis.molina@uv.es](mailto:lluis.molina@uv.es)

Pascual Benito, Josep Lluís (SIP, Museu de Prehistòria de València) [josep.ll.pascual@uv.es](mailto:josep.ll.pascual@uv.es)

Díez Castillo, Agustín (Departament de Prehistòria i Arqueologia. Universitat de València (Spain) [adiez@uv.es](mailto:adiez@uv.es)

Ferrer García, Carles (SIP, Museu de Prehistòria de València) [carlos.ferrer@dival.es](mailto:carlos.ferrer@dival.es)

In this paper we present the preliminary results of new studies carried out in Cueva de la Cocina, a major site to study the Neolithic transition in Western Mediterranean. Early fieldwork was conducted in the 1940s (directed by L. Pericot) and in the 1970s (directed by Fortea), but only a partial analysis, referred to the sector E1 (1945), has been published in detail since. In there, Fortea concludes that the better hypothesis to understand the pass between pre-ceramics and ceramics levels is an acculturation process. Recently, has been pointed out the possibility of a gap between late Mesolithic and Early Neolithic occupations from the techno-tipological analysis of lithic industries (García Puchol 2005).

Currently we are processing all information of previous excavations according with archaeometric analysis (including zooarchaeological and pottery studies in a new radiometric framework) in order to obtain new data with the idea of contrasting this explanation framework. In this paper we put attention in zooarchaeological and radiometric analysis referred to immediate preceramic levels and ceramic contexts at the site (Fortea's excavation) with the goal to generate relevant infor-



mation for understanding this complex archaeological context and to achieve relevant information about the Neolithic transition process in Mediterranean Iberia.

ORAL

## 11. BEYOND THE SYMBOLISM: CONTRIBUTION OF THE GRAPHIC RECORD TO THE STUDY OF THE NEOLITHIC EXPANSION IN THE IBERIAN MEDITERRANEAN BASIN.

*López-Montalvo, Esther (CNRS UMR5608-TRACES) esther-montalv@gmail.com*

The Iberian Mediterranean basin shows an exceptional graphic record as a result of the expansion of the Neolithic communities. Up to three different graphic horizons can be documented in this territory.

So far, the study of these graphic horizons, especially in the case of the Spanish Levantine paintings, has paid little attention to those aspects that could contribute both to reach a better comprehension of this cultural process and to assess the role of these graphic expressions in the Neolithic communities.

In this sense, the naturalism of depictions and the narrative content of Levantine paintings must be considered as a significant tool in our goal of characterizing the cultural dynamics of their authors.

However, the multiple and opposed readings and interpretations of the social and economic activities portrayed in the Levantine panels have fuelled the discussion concerning chronology and authorship.

We propose a new approach to the thematic content taking into account temporal variables as well as the territorial distribution of the activities portrayed. These two variables will allow us to define the continuities and ruptures concerning these activities in order to characterize the cultural dynamics of these groups. Besides, the exhaustive analyse of these scenes will allow us to make an anthropological approach focused in some aspects concerning the social organisation that have few or none archaeological evidences.

This new approach to Levantine scenes allows us to get new data about their authors, their social and economic dynamics. These new data questions the use of the thematic content as an argument to justify a Mesolithic authorship of Levantine paintings.

Our goal is to show that rock art can contribute to reach a better understanding of prehistoric societies, digging for some social and economic aspects that have no material remains.

ORAL

## 12. INTERPRETATION OF DOMESTIC SITES AND TRANSITION INTO THE PRODUCTION PROCESS IN VALE DO TEJO (PORTUGAL)

*Cruz, Ana (Instituto Politécnico de Tomar) anacruz@ipt.pt*  
*Graça, Ana (Instituto Politécnico de Tomar) anagrace@ipt.pt*

The debate on the neolithisation process in Alto Ribatejo continues on the table due mainly to the discovery and excavation of new archaeological contexts in which the presence of material culture typically considered to be Neolithic appears truncated and where we can find material culture with very peculiar characteristics such as the Holocene macrolithic industries.

The taphonomic issues affecting these archaeological contexts contribute to some extent to hinder archaeographical reading, particularly the migration of artefacts. However, the stratigraphies and the positive and negative structures are obvious and can clearly be seen *in situ*. Both Amoreira and Fontes boast material culture, stratigraphy, structures and datings.

The outdoor sites of Amoreira and Fontes bring new data to the discussion implying a review of the existing models in order to understand a phase of change that may have taken different paths in Alto Ribatejo and may, or may not, match other contexts in Portugal.

Both Amoreira and Fontes data strongly suggest a "change" from a form of predation to a form of production, which is not exhaustive and deterministic.

Any of these sites, contemporary of the estuarine shell-middens, undermines the maritime pioneer colonisation model created in the 90s of the 20th century, which claimed the existence of a *cardinal enclave* in Estremadura Limestone Massif, on the one hand, and inland desertification during the Epipalaeolithic, on the other.

Rather than deconstructing paradigms or interpretative models new archaeographical readings should be implemented as records are revealed through facts and

these are in line with a reality where the producer is also collector and where the collector can also take up new technologies.

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ORAL

### 13. UNDERSTANDING THE LANDSCAPE OF NEOLITHIC GROUPS IN THE TAGUS INNER BASIN (EXTREMADURA REGION, SPAIN)

*Cerrillo Cuenca, Enrique (CSIC, Instituto de Arqueología - Mérida) enrique.cerrillo@csic.es*

*Almeida, Nelson J. (ITM, Instituto Terra e Memória.) nelson-jalmeida@gmail.com*

The Early Neolithic of the inner Tagus has only been systematized during the last decade (Cerrillo 2005) after a revision of material culture, stratigraphies and the development of new excavations. The proposal of a complex neolithisation process has gradually replaced the traditional view of a marginal and late process linked to a migration of peasant groups from the Atlantic or the Andalusian shores, as some scholars claimed during the previous decades.

The sequence has been established after the excavation of a few sites and a limited number of C<sup>14</sup> absolute datings that confirm that the region was inhabited around the middle of the 5<sup>th</sup> millennium cal BC (ca. 7500 cal BP). Although the signals of Early Mesolithic (Epipalaeolithic) habitats are being recognised in the region, particularly from the 8<sup>th</sup> millennium cal BC (ca. 9500 cal BP), at this moments it does not seem possible to provide a clear understanding on how both communities interacted.

More than thirty locations with presence of Neolithic artefacts have been recorded alongside the different units of landscape that compose the region, sharing common patterns, but also many differences in terms of geology and possible models of resource exploitation. In this sense, the currently on-going survey projects are providing data about how complex it is to detect the archaeological evidence in the region and what are the barriers that bias the recognition of both Mesolithic and Neolithic sites. The preliminary results are also offering information about surface scatters that can be relevant when performing comparisons with other territories.

From our point of view, a holistic approach on how landscape is organised can aid in offering a regional vision of the Neolithic in the area by jointly analysing patterns of settlement, palaeoenvironmental data and

faunal remains. In this sense, these data are providing a renewed framework with new arguments that point to a diversified strategy of territorial exploitation.

In this paper the question that we want to address is if the current picture of Neolithic landscape(s) can collaborate in understanding the transition to farming, by considering that the aforementioned approaches can describe the first materialization of such a process in the landscape. Wide-spectrum exploitation strategies and a low anthropization of landscape suggest the possibility that cropping practices and livestock were introduced and managed as complementary strategies since the first archaeologically evidenced indicators of productive economies.

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ORAL

### 14. DEFINING THE NEOLITHIC OF SEMIARID NE-MOROCCO

*Linstädter, Jörg (University of Cologne) joerg.linstaedter@uni-koeln.de*

The traditional European understanding of the Neolithisation process, in which agriculture and animal husbandry play a dominant role, is difficult to apply to the semiarid Mediterranean zone of NW-Africa. Here, the introduction of food production indeed represents an important economic innovation. However, recent studies show that in NW-Africa this specific mode of subsistence is integrated within a wider spectrum of complex subsistence strategies which are better described by concepts such as "broad spectrum economy" or "low level food production".

Recent excavations in shelter deposits from the middle of the 8<sup>th</sup> millennium calBP in the Eastern Rif area in Morocco have given us the opportunity to study such concepts in more detail. The application of innovative analytical methods such as black carbon analysis, micromorphology, and pollen analysis of the abri deposits have permitted us to detect the appearance of new economic features. In addition, sediment flotation has produced comprehensive data that allow palaeomalacologists and palaeobotanists to define the particular adaptation of Early Neolithic groups to a climatically sensitive and therefore challenging environment.

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POSTER

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**15. DEFINING NEOLITHIC ARCHAEOLOGICAL CONTEXTS USING POTTERY VESSELS IN A VOLUMETRIC APPROACH.**

*Alberch Calm, Pau (UAB) pau.alberch@gmail.com*

*Gómez Bach, Anna (UAB) anna.gomez@uab.cat*

*Molist Montañá, Miquel (UAB) miquel.molist@uab.cat*

This poster aims to address the relationship among the first groups of farmers with their territory in the central coast of north-eastern Iberian Peninsula analysing ceramic production. The geographical context chosen includes the maritime coastal between Besós and Llobregat rivers, including stretch Catalan coastal, Garraf-Ordal littoral mountains and Barcelona's plain.

To approach this problem we decided to apply a double methodology: volumetric pottery shapes and settlement patterns analysis. With the aim to check if there is a causal relationship between intentionality in the ceramic use and stratigraphical depositions we would focus our work to define an initial economic and functional proposal by sites; analysing the volume of ceramic vessels and identify if there is any relationship between pottery shape, intentionality and its context where it has been repaid.

The methodology of the present work is bibliographic and it provides us a first approach to this subject thanks to the field works of different archaeological teams (giving us an whole of 76 archaeological contexts). It made essential the elaboration of a united database focused on the analysis of specialization and production of the ancient Neolithic. Specifically, the chronology goes from 5.480 to 3.500 cal BC and it is attributable to the cultural groups known by the name of "cardial", "epicardial" and "postcardial".

This way allows us a practical approach of each site thanks the partial landscape study, as well as lay down the divergences and similarity among the ceramic material of each archaeological context with the intention of proposing some specialization or opportunism criteria for this containers. Besides this general and theoretical introduction, the present paper tries to test the analysis of the landscape of a limited territory. The combination of different landscapes and sceneries is going to provide a view of a possible pattern of coastal and alluvial exploitation during the firsts steps of farmers communities and comparing this view with other exploitation patterns made for the researchers in the 90's.

# B22 Premonetary currency systems in past societies

Organiser: Dirk Brandherm and Stefan Wirth

Monday 1st (14:00-19h30)  
S4 Meeting Room



2014 burgos  
1-7 sept.

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XVII Congreso Mundial de UISPP

ORAL CONTRIBUTION

ORAL

## 1. SOME THOUGHTS ON THE ROLE AND FORMAT OF PREMONETARY CURRENCY SYSTEMS IN PREHISTORIC SOCIETIES.

*Brandherm, Dirk (Queen's University Belfast) d.brandherm@qub.ac.uk*

Premonetary currencies come in a wide range of different forms, from livestock and perishable materials to inorganic matter. Their value, however, is invariably measured according to one of only two different underlying models. On the one hand we are dealing with systems based on fixed nominals, on the other we find systems in which value is determined more flexibly, e.g. on a weight-based scale. Most of today's familiar fixed-nominal systems to some extent try to integrate elements of a weight-based approach, usually by employing weight as one of the defining criteria for metal currency units. It is far from clear, however, if the same universally applies also to pre-monetary currency systems of the past.

Based on a number of case studies, this paper will attempt to explore to what extent an integration of these two basic approaches was already attempted at different stages in the European Bronze Age. The focus will be on ingot torques for the Early Bronze Age, on sickles for the Middle Bronze Age, on socketed axes for the Late Bronze Age, and on the question to what degree any of these employ weight to define the value of individual currency units.

Work on this project is still ongoing at this stage, but preliminary results seem to indicate that exact unit weight in premonetary currency systems which employed fixed nominals during the European Bronze Age was not a primary criterion for defining the 'value' of individual currency units.

As an important overall conclusion from our study it emerges that previous attempts to identify premonetary currency systems based mainly on weight standardization may have been crucially flawed, in that they presuppose a degree of integration between fixed-nominal and weight-based systems that is not generally reached prior to the 1st millennium BC.

ORAL

## 2. EQUALIZATION OF TRADABLE QUANTITIES AND WEIGHT STANDARDS IN PREHISTORIC EUROPE

*Lalongo, Nicola ("Sapienza" University of Rome) nialongo@hotmail.com*

*Vacca, Agnese ("Sapienza" University of Rome) agnese.vacca@gmail.com*

*Vanzetti, Alessandro ("Sapienza" University of Rome) alessandro.vanzetti@uniroma1.it*

Traditional research on proto-money transactions generally assumes that the widespread use of metal as "commodity currency" should have resulted in the normalization of shared, widespread scales of measurement. Hence, many studies aimed at the identification of recurrent weight values as multiples/submultiples of certain (often theorized) standard units. Setting apart several important results gained, such an approach faces a critical proper methodological limitation, and a historical-comparative pitfall: 1) the absence of written references and the rarity of statistically sound samples makes it impossible to either validate or reject any reconstruction of normalized prehistoric scales of measurement; 2) in the Ancient World, unit standards unification across distinct polities is never actually fully achieved, while it is known that several, more or less different local systems co-existed.

The question will be empirically addressed through the analysis of Italian Bronze Age case studies. An *ad-hoc* mathematical methodology, based upon frequency distribution and multi-peak curve fitting, is used to analyze weighed metal records, in order to identify recurrent values across time and space.

The results of the quantitative analysis show that several significant concentrations of weight values find correspondences across many, very distant regional contexts. Furthermore, the variance of such significant quantities tends to narrow as mass values grow.

An alternative approach to the study of recurrent weight values in Bronze Age Europe can be envisaged. The identification of recurrent weight quantities (both as single objects and as total assemblage/i.e. hoard weights) can define "standard average quantities". Instead of looking for a "fractional" logic of given standards, one can observe that constant exchange activities produced a normalization towards widespread "tradable quantities": this can happen without necessarily implying a unification of the local scales of measure. This model is

loosely akin (with necessary adaptations) to the “factor price equalization” theory (Samuelson 1948), stating that commodity prices of two free-trading countries tend to equalize. A theoretical framework is also outlined.

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ORAL

### 3. THE SET OF TEN WEIGHTS FROM THE TOMB 200 AT EL CIGARRALEJO (SPAIN, MURCIA)

*Poigt, Thibaud (Laboratoire TRACES, universit  Toulouse 2-Jean Jaur s) thibaud.poigt@gmail.com*

On the Iberian peninsula, the majority of data belonging to the practice of weighing appears in the *Alicante-Murcia-Valencia* area, between the 6<sup>th</sup> and the 1<sup>st</sup> centuries BC, therefore before coins were used for trade. Weighing and monetization involve the same process: to provide an exchange-value expressed in counting units. For this reason, many authors tried to determine relations between the masses used on Iberian metrology and the Mediterranean standards generally closely linked with current money (shekel, drachma...).

By studying the set of ten weights for weighing-scales, from the tomb 200 in the El Cigarralejo necropolis (late 5<sup>th</sup> or early 4<sup>th</sup> century BC, *Mula, Murcia*), we can propose a metrological system different from the foreign models. The existence of a local weighing system from the 4<sup>th</sup> century BC raises questions about the Iberian standards and the use of weighing.

The interest of the set from El Cigarralejo, by its homogeneity and its find in a closed context, is that it can be used as a basis for the analysis of the metrological system from which it stems. It is made of ten tronconical perforated weights, in copper-alloy, whose masses were between 1,98 g and 208,45 g, numbered in this work from I to X, from lightest to heaviest. The chosen method does not involve the application of known weighing standards to the El Cigarralejo’s weights, but proving the most probable system used for that set, and subsequently comparing it with the foreign metrological systems.

Observing the arithmetical relationship between each weight and the entire set, we noticed that the weight VI (20,48 g) offers a particular internal logic, with a ratio 1/10 : 1/6 : 1/4 : 1/3 : 3/4 : 1 : 2 : 4 : 6 : 10 and a low percentage of average error (1,13%). Assuming the establishment of the system on this unit (20,765 g for a minimal average error), the set permits, by combining the weights

among them, to produce an uninterrupted sequence of multiples up to 24 times the standard (498,36 g for the theoretical value). This system is not known in the Classical World within the same period, nevertheless few fractions and multiples could permit easy exchange transactions.

This set shows the existence of indigenous weighing systems, which, after comparison, seem to be used with high precision in restrictive circles. We have noted that the precision differs according to the observation scale: it is generally higher inside the set (like tomb 200) than inside the series or between settlements. Regarding the morphology and size of the weighing instruments, they were probably used to give a numeral value for a small quantity of material, whether a form of collection and redistribution of resources or whether for the normalization of a raw material, to give it an intermediary value. In such case, the weighing seems to be linked to forms of pre-monetary payment.

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ORAL

### 4. HEADS OR TAILS: METAL HOARDS FROM THE EASTERN MEDITERRANEAN IRON AGE

*Heymans, Elon (Tel Aviv University) elonheyman@gmail.com*

This paper deals with the use of precious metal in monetary exchanges, based on the hoards from Israel and Greece. The introduction of coinage in the Greek world from the late 7<sup>th</sup> century BCE onwards, has often been equated with the introduction of money altogether. Needless to say, coinage is only a specific form of money, and certainly not all money is coinage. The misconception that money in the ancient Mediterranean starts with coinage, results in part from the notion that only when minted as coin precious metal becomes a symbol of value, a token issued by the state, and not only a commodity, a metal desired for its intrinsic value.

However, Hart (1986) pointed out that money is always a token and a commodity at the same time, referring to the ‘heads or tails’ combined on our coin. Following his approach, this paper proposes the study of the metal hoards as a way of understanding the monetary character of the precoinage economy.

A case study will be presented of the 8<sup>th</sup> century BCE silver hoard from Tel Arad, Israel. With reference to a corpus of 33 metal hoards from the southern Levant,

dating between ca. 1200 and 600 BCE, the material characteristics of the hoard will be discussed and placed in the context of a wider material practice. This will concern the differentiation in weight and a categorisation in shape of the pieces of silver that comprise the hoard. The hoard will be shown to contain a variety of objects, ranging from indiscriminate pieces of scrap to jewellery. The consistent cutting up of finished objects, attested in the hoards, will be discussed in the context of literary sources referring to this practice, and compared to a similar material phenomenon known from Viking Age silver hoards. This discussion will serve to interpret the hoard content as reflecting a dynamic practice, indicating the use and appreciation of metal as intrinsically transitive, with objects moving back and forth between categories.

Echoing Hart's conception of money, the hoards should be understood as neither bullion, appreciated for the metal's intrinsic value, nor collections of objects without monetary use or meaning. Rather the dynamic use of the metal as transitive between finished object and money, indicate that its qualities as token and commodity were closely interwoven.

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ORAL

## 5. BEYOND THE USUAL FUNCTIONS ? THE CONSUMPTION OF A PREMONETARY CURRENCY.

*Hensler, Martin (Goethe Universität-Frankfurt) hensler@em.uni-frankfurt.de*

The Early Bronze Age ring ingots with looped ends (Ösenringe) have been generally seen as a typical premonetary currency in prehistoric Middle Europe. In particular M. Lenerz-de Wilde (1995, 2002, 2011) corroborated this interpretation in her publications. In line with basic economic theory, she ascribed different functions to currencies in general: standard of value, medium of exchange, storage of value and means of payment in social contexts. According to her works, ring ingots with looped ends functioned mainly as value storage, thus resulting in their deposition. As hoards are the typical archaeological sources in which these rings are discovered it has been argued that they were deposited in secret, hidden from the eyes of others.

However, the starting point for this study of the Ösenringe is the assumption that they had not been hidden secretly, but instead could have been buried publicly and under enormous efforts for everyone to

see. It is possible to interpret the deposition and the use of the Ösenringe as consumption in an anthropological meaning. Consumption is not only a combination of the acquisition and the technical use of goods. In addition, activities connected with the decision making before the acquisition itself, the definition of the necessary criteria and the function of the goods as well as their usage in the social space have to be considered. The physical properties of the Ösenringe were analyzed to determine criteria helping to discern their potential use and determination of their value. Different attributes such as weight, diameter and chemical composition among others were considered.

In this context it can also be shown, that the standardization of their weight is not an isolated phenomenon. Other formal properties were regulated in a similar way.

The results have further been used trying to reconstruct the needs underlying their consumption. The collective data show that the Ösenringe and their respective consumption had a strong communicative component extending their capacity as premonetary currencies previously described in the literature.

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ORAL

## 6. WEIGHT UNITS AND THE TRANSFORMATION OF VALUE IN THE NORDIC BRONZE AGE: APPROACHING PREMONETARY CURRENCY SYSTEMS?

*Melheim, Lene (University of Gothenburg) a.l.melheim@iakh.uio.no*

Different yet interacting economies existed in Eurasia in the 2<sup>nd</sup> millennium BC, some practicing true commerce based on the mass-production of goods while others were ranked systems of exchange. The anthropological distinction between gifts and commodities and the strong emphasis on gift-exchange in the archaeologies of the 1990s nearly abolished trade from the Scandinavian Bronze Age discourse. That there is seldom an absolute division between gifts and commodities is, however, well-known. Often, a change from gift to commodity is seen when objects move across a cultural boundary. At the same time, following Frederik Barth, the up-keeping of cultural boundaries may be said to rely on a constant flow of goods across them.

In an article from 1993 Mats Malmer identified a local Nordic weight unit of 107,7 g. Arguably, this weight

unit ties in with a wider monetary system convertible with weight units used in the Mediterranean region. This paper discusses material from the Nordic metal workshops in light of Malmer's theory of a weight unit. In focus of the analysis are the clay refractories; crucibles and moulds. A strong indication of the existence of a common weight standard is found in, among other things, the standardized size of the crucibles. Another significant trait that will be discussed is the occurrence of unalloyed copper and tin.

Different strands of evidence discussed in this paper suggest that there was an ongoing process of commodification in the Nordic realm in the second millennium BC. Objects and raw materials gained through long-distance exchange were increasingly treated as socially neutral commercial products. Despite this, no urban centers or ports of trade have yet been identified and little is therefore known about how the transformation of value happened in practice. It is here argued that the centralized metal workshop sites in Scandinavia were early ports of trade, where metal was recast to meet local demands, and from there distributed further as preforms. The sites discussed in the paper are situated at locations easily accessible by boat, with abundant evidence of specialized craft production as well as long-distance imports.

It seems that in the Nordic Bronze Age, metal played central stage in the maintenance of cultural boundaries as a convertible store of value that could be endlessly transformed.



# B23 Beyond the reduction sequence: new insights in lithic technology

Organiser: Sara Cura, Eric Böeda, Stefano Grimaldi and Fabio Santaniello

Tuesday 2nd (9:00-13h30)  
B28 Meeting Room



2014 burgos  
1-7 sept.

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ORAL CONTRIBUTION

ORAL

## 1. EXAMPLES OF TECHNO-FUNCTIONAL ANALYSIS OF LITHIC TOOLS : THE LEVALLOIS TOOL VS THE MICOQUIAN TOOL

*Bonilauri, Stéphanie (UMR 7041 ArScan, AnTET) stephanie.bonilauri@gmail.com*

The techno-functional approach proposed here is based on a perception of the tool "in action", structured by several functional parts including at least a part in contact with the material being processed and a part directly held by hand or indirectly using a haft. Each of these parts is structured by a number of technical traits which have a functional role in the material processed and for prehension of the tool. These technical traits that structure the tool can be completely obtained from the phase of production (débitage or shaping) or be partially obtained involving, in that case, a phase of retouch more or less important (phase of restructuring of the blank, total or partial). The techno-functional analysis thus allows to evaluate the difference between the techno-functional intentions established by the phase of production and the techno-functional traits required for the action and established during the phase of retouch.

Based on this techno-functional approach, we suggest to compare two different types of tools based on two production systems radically different: the Levallois tools (predetermined blank) and the micoquian tools (shaped blank). This comparison will be established from the study of Levallois tools from the Near east selected in the sequence of Umm el Tlel (central Syria) and from the study of micoquian tools from the site of Antonovka (Ukraine).

We will see that if these tools have differences (where the causes can be numerous: environment, functional etc.) they also present numerous similarities like their volumetric structure and some techno-functional traits.

ORAL

## 2. FROM THE FLAKE TO THE BLADE IN MIDDLE PALEOLITHIC. CO-EXISTENCE, INTERACTION AND ALTERNATION OF TWO CONCEPTS OF TOOLS. THE CASE STUDY OF RIPARO TAGLIENTE (VERONA, ITALY).

*Carmignani, Leonardo (Universitat Rovira I Virgili) leonardocarmignani76@gmail.com*

Simplifying what is produced through the lithic production, we can identify three categories of possible products: flakes and blades, produced by knapping operations (débitage), and hand axes - choppers (*lato sensu*) by shaping operations (façonnage). If the shaping operations contain a conceptual structure of modelling a morphology from a block of raw material, the dichotomy flake-blade, is, at a macroscopic scale, a double variant of the same theme, which is a separation of a piece from a volume. Evidence of blade technology is confirmed in Northern Europe (France, Belgium and South England), at least from the last part of the Middle Pleistocene (OIS 7-6). Later on, in stage OIS 5 these productions cover a larger area, which includes the North-Western Germany, central France, and occasionally the South of France. A third moment (OIS 4-3) shows us the reappearance of laminar productions in Southern Europe and more particularly in the South of France and the Italian peninsula. At the present state of research these three phases appear as on-and-off events without a clear evolutionary continuity. These productions can show an exclusive blade's production or can be associated with flakes productions mostly represented by the Levallois reduction system.

The Riparo Tagliente's lithic assemblages have been analysed across two different approaches: a productional one and a techno-functional one. The production analysis was focused on the identification of the producing intentions through the identification of techniques, methods and concepts that underlie the entire *chaîne opératoire*. The techno-functional approach was applied to identify the potentials transformative and maintenance parts of tools linked to the grade of predetermination of the systems production.

The Riparo Tagliente site shows two macrophases. The first one with an exclusive flake production and the second one with a volumetric blade production associated with others kind of flake productions. Preliminary results of this study are focused on evaluating the impact of the introduction of a new concept of tool (blade) on the production systems previously dominated by a "classical" flake production.

In the Italian peninsula laminar production doesn't have clearly evidence dating back to earlier period of isotopic stage 4. In Italy the sites holding a laminar component seem to be concentrated in the latter phases of the Middle Palaeolithic and especially in the first part of

isotopic stage 3. The geographical distribution of these products does not seem confined to a territory or a specific environment. In parallel to the emergence of the laminar volumetric systems, the Levallois concept seems to be redirected towards the production of elongated blanks at the expense of the flake modules. More generally we can observe that at the end of the Mousterian cycle the operational patterns shows a strong differentiation and the laminar production is one of the most evident expressions. The origin of this fragmentation is questionable.

ORAL

### 3. SIMPLE TECHNOLOGY, COMPLEX BEHAVIOR IN THE FINAL LOWER PALEOLITHIC OF THE RIBEIRA DA PONTE DA PEDRA SITE.

*Cura, Sara (Museu de Arte Pré-Histórica) saracura@gmail.com*  
*Grimaldi, Stefano (Università di Trento) stefano.grimaldi@lett.unitn.it.*

*Cura, Pedro (Museu de Arte Pré-Histórica de Mação)pedro-cura@gmail.com*

*Rosina, Pierluigi (IPT) prosina@ipt.pt*

The lithic assemblage of the Ribeira da Ponte da Pedra site ( OIS8-9) was produced, almost exclusively over the exploitation of quartzite fluvial pebbles of good quality and is characterized by the application of two main reduction sequences that result in abundant worked pebbles, retouched pebbles, cortical and half cortical flakes, few cores and rare bifacial artifacts. Some artifacts present irregular and variable edge modifications described as «informal» retouch that can be the result of the utilization of these blanks. From a strict technical point of view the assemblage can be described as quite simple, however we can envisage an inherent complexity starting in an accurate selection of the quartzite pebbles, with regular morphology allows a «predetermined» production of blanks with simple gestures.

ORAL

### 4. APPLICATION OF THE TECHNO-FUNCTIONAL ANALYSIS ON EARLIEST STONE AGE / MODE 1 ASSEMBLAGES: FROM MIGRATION WAVES TO LOCAL INVENTION.

*De Weyer, Louis (UMR 7041 ArScAn - AnTET) louis.deweyer@gmail.com*

The European earliest assemblages are often compared with those from the Oldowan period in East Africa, older of 500 ka, because of their archaic aspect. They are classified in the Mode 1 technology, distinguished from Mode 2 by the absence of handaxes. The African origin of the first European assemblages is an issue often used to illustrate the paradigm of migration waves. One considers that each hominid species went out of Africa with specific technical skills similar to those recognized in Africa.

However, this pattern is not so clear when archaeological data are taken into account. Indeed, very few skeletons were discovered to prove that theory, thus anthropological data are weak. Moreover, the classification of the first lithic assemblages was made in a very global way, and numerous differences could be hidden by that superficial homogeneity.

In East Africa, Oldowan is also a term that hides the variability of the first human productions. That variability has always been explained by contextual issues. Indeed, according to a site occupation context (butchery, knapping workplace, habitat), we will obviously find different remains; if the quality of the raw material is bad, the production will appear less complex. Thus, it limits the interpretations about the goals, abilities and knapping skills of the first knappers.

Contextual data cannot be the unique criterion used to define the first hominids' knapping skills. It is necessary to look at the artifacts with issues about their meaning for the ancient knappers. What did they want to do? How did they manage to realize their objectives with such a raw material? Are there similarities between tools on poor raw material and well-made tools on good raw material that we found in some other sites?

In this presentation, we use the examples of Koobi Fora FxJj-1, 3, 10 (Kenya), Fejej FJ-1 (Ethiopia), Pirro Nord (Italy) and Orce (Spain) to balance the Out of Africa I model with a local invention hypothesis, implying a convergence of ideas, based on the techno-functional analysis of the assemblages.

Developed with the combination of different disciplines, this approach aims to find the structure of the artifacts, divided in techno-functional units. That leads us to understand how the combination of the different structural areas constitutes the tool.

Regarding such issues as the variability of the first human productions, this methodology allows us to go further in the research of the first human activities and their

diversity. Each site reveals specific skills, and universals as flakes with a natural back. We propose new tool types and a combination of skills for each assemblage, leading to new comparison criterion.

According to the techno-functional analysis of the earliest technical phenomenon, the migration waves model is no longer satisfying to explain the development of stone knapping, and new hypothesis have to be stated.

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ORAL

## 5. THE EARLIEST PROTOAURIGNACIAN IN ITALY: THE RIPARO MOCHI.

*Grimaldi, Stefano (Università di Trento) stefano.grimaldi@unitn.it*

*Santaniello, Fabio (Università di Trento) fabio.santaniello@unitn.it*

Based on the current evidence, the base of the Unit G of Riparo Mochi (Balzi Rossi, Italy), dating to around 37-36.5 ka BP (41.5 cal BP), is the oldest directly-dated Aurignacian assemblage in Italy.

In this paper, the lithic assemblage coming from this layer have been techno-functionally analyzed.

From a technological perspective, the assemblage is mainly represented by a bladelet production made from non-local raw materials and by an elongated-flake production made from local flint. Regardless this technological difference, the lithics have been used for tasks linked to the treatment of animal materials. In particular, besides retouched tools showing traces of hard materials (bone or antler), unretouched tools show traces related to butchering or cutting soft/medium material such as meat and hide.

According to the type and distribution of the macro and micro wears, a possible reconstruction of the hafting technique is also suggested.

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ORAL

## 6. THE FINAL MOUSTERIAN IN WESTERN ITALY.

*Santaniello, Fabio (Università degli studi di Trento) fabio.santaniello@unitn.it*

*Grimaldi, Stefano (Università degli studi di Trento) stefano.grimaldi@unitn.it*

Late Mousterian lithic technology remains poorly known in Italy. The traditional typological approach still permeates the literature, and most technological analyses focus on the "transition" to the Upper Palaeolithic. In this paper, we provide new data about the behavior of the last Neandertals who inhabited Tyrrhenian western Italy. Lithic assemblages from two well-known sites e Riparo Mochi (Grimaldi caves, Balzi Rossi area, Liguria) and Grotta Breuil (Monte Circeo, Lazio) have been technologically and functionally analyzed.

The results are discussed and compared to other data such as fauna, chronology, and palaeoenvironmental reconstructions.

The data reveals a highly dynamic world where behavioral changes were rapid in time and characterized by strong differences in territorial exploitation.

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ORAL

## 7. THE TECHNOLOGICAL AND BEHAVIORAL TRANSFORMATION IN THE MIDDLE UPPER PALEOLITHIC OF HOKKAIDO, NORTHERN JAPAN: INTERPRETING THE EMERGENCE OF PRESSURE MICROBLADE PRODUCTION AND ITS SIGNIFICANCE

*Takakura, Jun (Hokkaido University) jun-ta@let.hokudai.ac.jp*

In the past decades, much attention has been focused on the search for the earliest archaeological records relating to the pressure microblade production of the Late Pleistocene in Northeastern Asia. The archaeological evidence of the middle Upper Paleolithic assemblages in Hokkaido, Northern Japan, has seen a transformation in our understanding of the emergence and dispersion of the pressure microblade production in a vast range of geographical area. These assemblages, consisting of microblade and non-microblade technologies, mostly date to during and immediately before the Last Glacial Maximum (LGM) cold period, 30,000-24,000 calendar years ago.

The aim of this paper is to examine how the emergence and adoption of the pressure microblade production in Northern Japan were related to the behavioral transformation, such as composition and maintenance of tool kits, mobility, domestic activities, technological transmission, and regional interaction. To accomplish it, this paper presents the current knowledge on technological and behavioral variability and dating of

the lithic assemblages, and discusses interpretations of technological and behavioral variability in the middle Upper Paleolithic in Hokkaido, in particular based on the chaîne opératoire approach for the lithic reduction sequences as well as the use-wear analysis of stone tools. In Hokkaido, Northern Japan, the pressure microblade production suddenly appeared around 25,000 calendar years ago. Several evidences show that these were associated with the emergence of the use of organic hammers for detaching blades and the use of stone graters for fabricating bones and antlers systematically.

The adoption of the pressure microblade production in Hokkaido was apparently related to not only the emergence of newly lithic reduction sequences but also the technological and behavioral transformation of the prehistoric hunter-gatherers.

POSTER

POSTER

**8. TECHNO-TYOLOGICAL ANALYSIS OF THE LITHIC ASSEMBLAGE AT CUEVA BLANCA SITE (HELLÍN, ALBACETE, SPAIN): A CONTRIBUTION TO DETERMINE THE LITHIC REDUCTION SEQUENCES IN THE LATE MESOLITHIC OF THE SOUTHEASTERN IBERIA.**

Mingo Álvarez, Alberto (UNED) [amingo@geo.uned.es](mailto:amingo@geo.uned.es)  
Barba Rey, Jesús (UNED) [jbarba@pausanasias.com](mailto:jbarba@pausanasias.com)

Cueva Blanca is situated in the northernmost sector of the Betic mountains. The geographic corridor Jumilla-Yecla-Hellín, where the site of Cueva Blanca is placed, has not shown stratigraphic references belonging to Late Mesolithic period. Its discovery provides a reference of settlement and information concerning the Late Mesolithic at the Campos de Hellín.

The archaeological layer of the mesolithic occupation is called 1B and is composed by fine detritus material that occasionally might contain some sharp clasts reaching 15cm of size. The thicknesses vary from 7 to 20cm.

The analysis is based on the Fortea's work (1973) on lithic industry of the last hunters-gatherers in Iberia. The description of the retouching has been done following the study of Laplace (1974), while the cores analysis is based on Pelegrin (1995). Finally, the alterations has been described following Bernaldo de Quirós *et al.* (1981).

The laminar lithic industry was carried out largely using local sources of siliceous rocks. However, the cores of these laminar products registered in the site are scarce (N = 4), formless and made of small size quartzite nodules. The characteristics of various *debitage* elements (all in flint), the finding of abrasion traces in several bladelets and the presence of a good number of pieces showing platform angles above 90° are aspects that help to recognize an exploitation system based in unipolar reduction, preparation of flaking and striking platforms, and abandonment by exhaustion. Two different types of laminar supports are obtained: 1) displaying parallel negatives in their dorsal face 2) with convergent and / or little regular negatives.

The flake production is done either in flint and quartzite, seeking small and medium size supports.

We have identified 3 *debitage* schemes linked to diverse strategies of raw materials procurement and exploitation. The obtainment of blades/bladelets and some short flakes of quartzite could respond to an expeditive strategy carried out on flattened small nodules present near the site. In contrast, the production of blade/bladelets in flint seems to respond to a curated strategy. We think the decortication phase of nodules didn't occur at the site, although the extraction of supports, revivals and preparations of cores is openly observed. A third and last lithic reduction system seems to be documented when generating medium size flakes of fine-grained quartzite.

For the tools, we can remark their almost exclusively abrupt, marginal and direct retouching and the use of flint to make most of them. In general, the types fit well into the classification proposed by J. Fortea (1973). The tools assemblage as a whole, especially those made on blade and bladelets, has a geometrical nature which is clearly testified through the presence of trapezoids.

The Late Mesolithic deposits in the closest regions to Cueva Blanca hold up lithic assemblages attributed to facies Cocina. Unfortunately, the limited lithic analysis carried out for these sites, except Casa de Lara, don't allow further comparison with our results.

The techno-typological analysis of Cueva Blanca lithic industry has contributed to a better knowledge of lithic reduction systems of the last hunters-gatherers in the hinterland of southeastern Iberia.

# Innovation in the production and use of equipment in hard animal materials: origins and consequences in prehistoric Palaeolithic to Mesolithic societies

## B24

Organiser: Aline Averbouh, José-Miguel Tejero, Nejma Goutas and Marianne Christensen

Friday 5th (9:00-13:30 to 15:00-19:30)  
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ACCUEIL DES PARTICIPANTS

INTRODUCTION

Président de séance : José-Miguel Tejero

ORAL

**1. ROD PRODUCTION BY EXTRACTION («DÉBITAGE» BY EXTRACTION): AN OVERVIEW OF DIFFERENT CASES IDENTIFIED FOR THE UPPER PALAEO-LITHIC AND THE MESOLITHIC IN EUROPE**

*Averbouh, Aline (Archéozoologie, Archéobotanique : sociétés, pratiques et environnements, Museum National d'Histoire Naturelle, Paris, France) aline.averbouh@mnhn.fr*  
*Goutas, Nejma (Equipe d'Ethnologie préhistorique, Maison René Ginouvès, Nanterre cedex, France) nejma.goutas@mae.cnrs.fr*

*Marquebielle, Benjamin (Maison de la recherche, Campus de l'Université du Mirail-Jean Jaurès, 5 allées A. Machado, Toulouse, France), Et membres du Groupement de Recherche International PREHISTOS.) benjamin.marquebielle@yahoo.fr*

One of the objectives of the GDRE PREHISTOS, created in 2007, is to look for cases of "debitage by extraction" on the European continent from the Paleolithic to the First Iron Age. We will thus be able to fill the gaps in our knowledge by first describing each case in technical and economic terms and by identifying new variants of this method. This debitage consists of selectively extracting a defined portion from a piece of raw material in order to obtain blanks with standardized forms and dimensions. It is a major invention in the working of osseous materials and it is conceptually similar to the laminar debitage procedure (Averbouh 2000 p. 154; Goutas 2009) in stone working in that it allows blanks of a similar shape, artificial and standardized, to be produced. The "baguette", whose shape is close to that of blades, is the best known of these blanks. This capacity to produce series of blanks with sometimes exactly similar morphology and then finished objects lead to the standardized mass productions that characterize the evolution of some categories of objects, such as projectile points. This debitage by extraction appears globally during the first half of the Upper Paleolithic (being present in the Early Gravettian of western Europe, Goutas 2004). The aim of our presentation is to give an overview of different cases identified those last years for the Upper Paleolithic to the Mesolithic, especially in Europe.

ORAL

**2. POSSIBLE EVIDENCES OF DÉBITAGE PAR EXTRACTION IN THE WORKED OSSEOUS ASSEMBLAGE OF THE HUNGARIAN PALEOLITHIC**

*Tóth, Zsuzsanna (Eötvös Loránd Science University, Budapest) zsuzsanna.toth11@gmail.com*

The worked osseous material originating from the Palaeolithic period of Hungary is not very numerous, and often rather poorly preserved. That is why research based on the reconstruction of the *chaîne opératoire* of these tools has not carried out yet.

Aim of this study was to investigate the most numerous and best preserved Late Palaeolithic tool assemblage, discovered in the Lovas ochre mine in the fifties, in order to identify different manufacturing techniques, with a main interest to the *débitage par extraction*. This is widespread in Western Europe and around the Carpathian Basin, but counted as an unknown technique in our country.

Optical investigation with low magnification was used during the study, which proved as first, that the worked osseous assemblage was relatively well preserved for the identification of the different manufacturing techniques. Some worked elk ribs and antler pieces suggested the evidence of the extraction technique, based on the grooving still visible on the pieces. Some other tools were based on a baguette preform, which suggests the use of the same technique, though the edges were completely modified during shaping, only the contours of the finished objects suggesting the existence of former grooving.

Statement of clear evidence of the knowledge and use of the extraction technique in the Hungarian Late Palaeolithic would go too far, but we may say, that our studies, based on the observation of the manufacturing stigmas on the tools and waste material suggest, that the knowledge and use of the extraction technique is plausible.

ORAL

**3. HARD ANIMAL TISSUE EXPLOITATION IN THE UPPER PALAEO-LITHIC SEQUENCE OF PAGLICCI CAVE (SOUTHERN ITALY)**

*Borgia, Valentina (University of Cambridge - UK) vb330@cam.ac.uk*

*Boschin, Francesco (Università di Siena- Italy) fboschin@*

hotmail.com

Ronchitelli, Annamaria (Università di Siena - Italy)  
annamaria.ronchitelli@unisi.it

In this paper we present evidence of the hard animal tissue exploitation at Paglicci Cave (Rignano Garganico, Foggia, Southern Italy).

Recent studies on faunal remains and on the 100 bone and antler tools found in the Upper Paleolithic sequence of the cave have allowed us to reconstruct the choices made by Paleolithic hunters both in terms of prey and the exploitation of hard animal materials for tool fabrication. Regarding the archaeozoological data, most of the sequence is characterized by the abundance of remains of species related to open or steppe environments, such as goats (especially ibex), horses and aurochs.

Only starting from layer 6 (6c, Final Epigravettian, about 17,000 cal. BP) the presence of these taxa decrease in favour of deer, wild boar and ass, reflecting an important climatic change leading to more humid and temperate conditions.

Only the bones of some hunted animals were chosen for the preparation of the tools: deer, horse, aurochs and wild boar.

In total, we identified three manufacturing techniques:  
1) the exploitation of naturally pointed bones for the construction of awls;  
2) the intensive shaping of long bones, particularly the metatarsals of deer: with the reconstruction of some waisted products it has been possible to recreate this process;  
3) the *rainurage* of antlers for the construction of spear points.

The exclusive presence of these last tools in one level of the cave (layer 17, Ancient Epigravettian, about 20,000 cal. BP) together with the total absence of waisting products and the general scarcity of remains attributable to deer, suggests interesting points for reflection on the different phases of attendance of the cave and a possible allochthonous origin of these tools.

PAUSE

Présidente de séance : Aline Averbouh

ORAL

#### 4. DEBITAGE BY FRACTURATION IN THE OSSEOUS INDUSTRY OF COVA DEL PARPALLÓ (GANDÍA-VALENCIA, SPAIN)

Borao, María (Universidad de Valencia) m.isabel.borao@uv.es

Villaverde, Valentín (Universidad de Valencia) valentin.villaverde@uv.es

Aura, Emili (Universidad de Valencia) emili.aura@uv.es

The excavations carried out by L. Pericot from 1928 to 1931 in the Cova del Parpalló allowed to document the Gravetian in the base, a potent Solutrean layers and a Magdalenian. All this sequence comprise an excepcional assemblage of portable art because their number of plaquets/objects and the great cronological amplitude. With all this information, Parpalló was included in the reduced list of reference sites to organize the european Upper Paleolithic sequence in the first half of the XX century.

The Magdalenian layers were organized in four phases, following H. Breuil's (1937) proposal. Changes in bases morfology and decorative topics on osseous points permitted this correlation, identifying by the first time the oldest Magdalenian in the south of Europe (Pericot, 1942).

With this precedent, we show in this presentation a preliminar technological and tipological study of the Ancient Magdalenian or Badegulian Parpalló's type osseous industry. The main objective is to identify the operational schemes that define the osseous material working. We analyze the different artifact categories which belongs to the production operational sequence. On the other hand we study the tipological composition of finished objects of an assemblage composed by spear points, *baguettes demi-rondes*, awls, neddles, hammers and harpoons.

The first aproach reveals us that in Parpalló, one of the operational schemes employed was fracturation. Extraction is documented as well. Both of them were used to obtain flat blanks to make objects like simple bevel points, double points or simple based points.

We make a valuation between techno- tipological transformations in lithic industries and the radiocarbon dating obtained for the beginning of this technocomplex.



All this is put in relation to the transformations produced in the SW of Europe in the LGM.

ORAL

## 5. OF HORSE METAPODIALS DEBITAGE DURING THE UPPER MAGDALENIAN IN EUROPE: AN OVERVIEW OF TECHNIQUES, METHODS AND OPERATIVE SEQUENCES.

*Bignon-Lau, Olivier (CNRS-UMR7041-ArScAn) olivier.bignon-lau@mae.u-paris10.fr*

Horse hunting strategies have been observed in a great number of Upper Magdalenian regional groups across Europe. Besides the obvious subsistence interest of these hunts, the technological exploitation of numerous raw materials leads us to a more complex understanding of Magdalenians' economical choices. In this direction, this contribution aims more particularly to point out some common techniques and methods used in the debitage of metapodials diaphysis, from Occidental to Central Europe. Surprisingly, a regular breakage pattern of these skeleton elements emerges from observations and our study tends to understand why so distant regional groups show a common operative sequence. More than this, bone fragments from this operative sequence have been used in many ways, but also, alternative operative sequence of metapodial diaphysis has been recognized in some sites. Finally, several lessons is brought to us by the study of these skeletal elements a priori of low importance, of the great similarity of the operative sequences to the diversity of the "chaînes opératoires", of its technological versatility to its economic output.

ORAL

## 6. CONTEXTUAL TAPHONOMY OF WORKED BONES IN THE NATUFIAN OF EL-WAD TERRACE (ISRAEL)

*Yeshurun, Reuven (University of Haifa) ryeshuru@research.haifa.ac.il*

*Weinstein-Evron, Mina (University of Haifa) evron@research.haifa.ac.il*

The integration of the contextual, zooarchaeological and taphonomic data with the worked osseous assemblage may enrich our knowledge of provisioning, use and especially discard of hard animal materials. Here we present a contextual taphonomy case-study from the major Early Natufian hamlet of el-Wad Terrace (EWT), in Mount Carmel, Israel, focusing on intra-site variability in

relation to architectural features and the general faunal assemblage.

The archaeofaunal sample from Early Natufian EWT (ca. 15.0-13.7/13.0 ka) is large and well-preserved. The good architectural preservation of the lower layers allows the intra-site comparison among four kinds of Early Natufian deposits: Inside and Outside Structure II, interpreted as a domestic area with consumption refuse in primary deposition; Locus 67, a stone pile showing evidence for thermal and other activities and probably resulting from a combination of primary and secondary depositions; and Locus 25, interpreted as an occasional toss-zone outside the living compound. Evidence for bone-working was recorded systematically, as part of a comprehensive taphonomic analysis of the vertebrate remains. The working procedure ensures quantitative comparisons among the worked and unworked samples.

The inclusion of worked items in the taphonomic study of EWT sheds light on an aspect that contributed to the formation and modification of the faunal assemblage, and is informative for studying the production, use and discard of the osseous artifacts. The tools and ornaments were fabricated on-site, using the available game animals that were transported to the site, mainly gazelle and occasionally partridge and tortoise elements. For gazelle at least, it can be suggested that bone-working followed butchery and consumption, and was an extension of these activities. Subsequently, the worked items were discarded with the other faunal refuse, often perhaps as a result of breakage and wear, although many beads were discarded when still usable – apparently not in any special contexts. Fragmentation and burning patterns indicate that these items underwent a similar taphonomic history to the total faunal assemblage in each context. The frequency of worked items and the diversity of types display several significant differences among the sampled contexts. Given the deposition of primary refuse in most contexts at the site, these patterns may be interpreted functionally to show where bone items were manufactured, used and discarded.

PAUSE REPAS-LUNCH

Présidente de séance : Nejma Goutas

ORAL

## 7. OSSEOUS INDUSTRY FROM MANOT CAVE (WESTERN GALILEE, ISRAEL). SEEKING TO RECONSTITUTE THE OPERATIONAL SEQUENCES OF

## BONE AND ANTLER EXPLOITATION AT THE EARLY UPPER PALAEOLITHIC IN LEVANT

*Tejero, José-Miguel (CNRS UMR 7041 ArScAn Equipe Ethnologie préhistorique. Nanterre (France) & SERP Barcelona University (Spain) jose-miguel.tejero@mae.cnrs.fr*  
*Marder, Ofer (Ben Gurion University of the Negev. Beer-Sheva (Israel) mardero@bgu.ac.il*

*Omry, Barzilai (Israel Antiquities Authority. Jerusalem (Israel) omry.barzilai@weizmann.ac.il*

*Hershkovitz, Israel (Tel-Aviv University (Israel) anatom2@post.tau.ac.il*

*Yeshurun, Reuven (Zinman Institute of Archaeology, University of Haifa, Mount Carmel. Haifa (Israel) ryeshuru@research.haifa.ac.il*

*Schenell-Pels, Nehora (Zinman Institute of Archaeology, University of Haifa, Mount Carmel. Haifa (Israel) nehora512@gmail.com*

*Bar-Oz, Guy (Zinman Institute of Archaeology, University of Haifa, Mount Carmel. Haifa (Israel) guybar@research.haifa.ac.il*

Nowadays Levantine Upper Palaeolithic archaeology is of great importance in understanding the emergence, dispersal, and adaptations of the first Anatomically Modern Humans (AMH) populations. Nevertheless, research on this period in the studied region has been limited to specific data, for instance osseous industry suffers from a dearth of data. Thus, exploitation of osseous raw material (mainly bone and deer antler) is one of the major innovations that appears at the beginning of the Early Upper Palaeolithic (EUP) both in Levant and Europe (innovation documented since the Middle Stone Age in the African context). With this in mind, the characterisation of technical concepts chosen by the first Levantine AMH is of great interest. Until now the Levantine rich collections of bone and antler objects are mostly known from a typological point of view.

The discovery of the important site of Manot Cave (Galilee. Israel) in 2010, preserving Mousterian, Ahmarian and Aurignacian levels, has initiated a multidisciplinary and international project. The main objective of this project is to reassess the variability of the chronological sequence of the Levantine EUP confronted with data from others archaeological sites of the Region.

Within the framework of this project, we present the first results of the technological and traceological analysis of the bone and antler industry of Aurignacian levels of Manot Cave (C Area). This assemblage is until now composed by more than half a hundred pieces including objects as well as blanks and wastes. The

excavation is on-going so the data is provisional, but we already have some interesting results. The Manot Cave bone and antler industry shows both similarities with the European osseous industry: such as the choice of bone for "domestic" tools (recurrent morpho-types like awls and retouchers) and that of antler for the cinegetic equipment (spear points). Differences are present within the hunting equipment with only simple-based points and not split-based points as known in Europe and some Levantine sites. Added to these characteristics the absence of polishers and the, probably, common exploitation of fallow deer antler, among others. These features support some particularities already stated from the Levantine Aurignacian by for some authors.

The presented preliminary data from technological analysis of Manot Cave osseous industry is a part of a larger final goal. Our aim is to reconstitute and understand the operational sequences of bone and antler exploitation at the Early Upper Palaeolithic in Levant (through the enlarged study of other important Levantine collections like Ksar Akil or Hayonim D). The obtained techno-economical data, compared to European ones, will not only contribute to refine the chrono-cultural EUP sequence of the Levant but also to give a better understanding of the adaptation mechanisms of the first Anatomically Modern Humans in Eurasia.

### ORAL

## 8. BOIS DE RENNE ET DE CERF DANS L'AURIGNACIEN ANCIEN DE GARGAS (HAUTES-PYRÉNÉES, FRANCE): APPROCHE PRÉLIMINAIRE DES SCHÉMAS TECHNIQUES D'EXPLOITATION

*San Juan-Foucher Cristina (S.R.A. D.R.A.C. Midi-Pyrénées et UMR 5608 TRACES, Université de Toulouse-Le Mirail) cristina.san-juan@culture.gouv.fr*

*Vercoutere, Carole (Département de Préhistoire du Muséum national d'Histoire naturelle / CNRS UMR 7194 « Histoire Naturelle de l'Homme Préhistorique ») cvercout@mnhn.fr*

*Foucher, Pascal (S.R.A. D.R.A.C. Midi-Pyrénées et UMR 5608 TRACES, Université de Toulouse-Le Mirail) pascal.foucher@culture.gouv.fr*

Surtout connue par son habitat et son art pariétal gravettiens, la grotte de Gargas a livré aussi des vestiges d'une occupation aurignacienne. Mise en évidence par les travaux d'Emile Cartailhac et d'Henri Breuil (1911-1913), elle avait été attribuée à l'Aurignacien « inférieur » en raison de la présence de pointes de sagaie à base fendue dans l'assemblage.

Le projet de recherche en cours et les nouvelles fouilles sur le site (2004-2013) ont permis de mieux situer ce niveau dans la séquence stratigraphique, de le dater et d'obtenir des données complémentaires concernant les industries lithiques et celles en matières dures d'origine animale. Nous présenterons ici les premiers résultats de l'analyse des schémas techniques d'exploitation des bois de cervidés, en particulier ceux relatifs à la fabrication d'armatures de projectiles, à partir de l'étude croisée des séries ancienne et récente, dans un cadre radio-chronologique et un contexte faunique actualisés.

ORAL

### 9. L'INCIDENCE DE L'UTILISATION ET DU RÉAFFÛTAGE SUR LA TYPOLOGIE DES POINTES DE PROJECTILE AURIGNACIENNES EN BOIS DE CERVIDÉ

*Doyon, Luc (Université de Montréal, Département d'anthropologie, C.P. 6128 succursale Centre-ville, Montréal, Québec, Canada, H3C 3J7) luc.doyon@umontreal.ca*

Malgré des similitudes morphométriques qualitativement appréciables, les pointes de projectile aurignaciennes en bois de cervidé présentent un large éventail de formes et de dimensions qui mérite d'être expliqué. Dans la présente communication, la contribution de l'utilisation et du réaffûtage à cette variabilité est examinée en détail. Les résultats démontrent que ces deux processus convergents et producteurs de variabilité affectent principalement la morphométrie distale des armatures. L'analyse et la discussion offrent une perspective de recherches jusqu'à maintenant inexplorée, soit la révision des critères de classification typologique de ces pointes de projectile. Pour ce faire, un cadre d'analyse artefactuelle est avancé; celui-ci tient compte (1) des contraintes fonctionnelles auxquelles sont soumises les pointes de même que (2) leurs propriétés structurales et mécaniques dans une perspective globale de la transmission sociale du savoir technique. Finalement, une nouvelle mesure est introduite, le ratio proximo-distal, qui permet d'apprécier l'étendue des dimensions relatives des armatures considérées idoines par les chasseurs aurignaciens pour l'exécution des activités cynégétiques.

ORAL

### 10. THE INCISED BONE POINTS FROM THE EARLY AURIGNACIAN OF POTO-KA ZIJALKA, HAFTING SYSTEM OR ORNAMENT?

*Jéquier, Camille (Università degli Studi di Ferrara) jqrcll@unife.it*

From a technological point of view, the hard osseous spear points have been ever more studied during the last 20 years. The peculiarity of this kind of artefact is linked to the different raw materials, techniques and hafting systems used throughout the Upper Palaeolithic. The case study of Poto-ka zijalka, located in the Carnic Alps at 1700 m a.s.l. in northern Slovenia has yielded a conspicuous amount of fauna from its 8 main layers. The faunal spectrum is mainly composed by *Ursus speleus*, although some rare ungulates such as *Cervus elaphus* and *Bos/Bison* have been identified. The lithic industry is very poor and only one Dufour point was discovered. In layer 7 at the front of the cave, seven combustion structures were identified.

The cave also contained 125 hard osseous artefacts, mainly made of bone (only three elements were identified as antler and the raw material of two of them is unidentified). Typologically, the corpus is composed of 12 points, two roughout of spear points and 111 elements of spear points. It is probable that most of them are made out of *Ursus sp.* shafts, as is also partially confirmed by the DNA analysis previously conducted.

The finishing of the spear points is not systematic. Three types of incisions were identified, whose morphology and localisation vary. The first one, which is the most frequent (n : 15), is systematically located on the sides of the spear points. They are parallel and are often regularly disposed, mainly on the mesio-distal part of the point or on the whole length of the element. The second type of incision is much rarer, since it was only identified on three artefacts. Its morphology consists in narrow and superficial stria that turn around the point circumference. They are rarely entirely continuous and never extend to the distal extremity of the point. Finally, the third type of traces consists more in a very deep grooving than in a proper incision. They are always located proximally, over the groovings that shaped the diaphysis and, when they are present, over the first type of incisions.

If an esthetic aim can be proposed for the first two kinds of stigmata, it is difficult to say the same for the third. In particular, the morphology and the position of the stigmata seem to indicate clearly some implement in order to facilitate the hafting of the spear point to the wooden support.

PAUSE

Présidente de séance : Aline Averbouh

ORAL

ORAL

## 11. BONE, DECORATIVE AND ORNAMENTAL ASSEMBLAGES OF THE GOROTSOVIAN? PARTICULAR CULTURAL UNITY OF THE EAST EUROPEAN UPPER PALAEO-LITHIC /GI-6 - GS-5/.

*Sinitsyn, Andrei (Inst. for the History of Material Culture. RAS)  
andrei.sinitsyn@gmail.com*

Bone, decorative and ornamental assemblages of the Gorotsovian – particular cultural unity of the East European Upper Palaeolithic /GI-6 – GS-5/.

As a separate cultural unity Gorodtsovian was identified by P.P. Efimenko in 50-th of the last century. In 70th G.P. Grigoriev united under this title Kostenki 14 (cultural layer II), Kostenki 15, Kostenki 16, Kostenki 12 (cultural layer I). Chronological framework of the Gorodtsovian was distinguished by the chronological group II of Kostenki model: 32-28 ka (34-32 cal ka BP), which corresponds to the GI-6 - GS-5 inside MIS3.

Principal background for Gorodtsovian definition was specific features of lithic assemblage:

- high meaning of flake knapping technology and flake-based typological set;
- high content of Mousterian tool-kit, primarily side-scrapers;
- low index of burins up to total absence in the II cultural layer of Kostenki 14;
- particular bone assemblage including Gorodtsovian 'fossil director' - large spatulas with nail-like extremity of the haft.

Gorodtsovian coexists in Kostenki with Early Gravettian (Kostenki 8, cultural layer), but provides different both lithic and bone assemblages.

Gorodtsovian sites provide numerous and expressive series of bone tools, including decorated, pendants and beads at least of four types, zoomorphic volumetric objects, etc., which is a matter for discussion in the paper. Gorodtsovian bone and decorative assemblages remains to be unique without analogies in the Paleolithic of Eastern and Central Europe.

**Acknowledgement:** Presidium RAS; RFBR: 14-06-00295; RFH: 14-01-18097.

## 12. CARACTÉRISATION NON DESTRUCTIVE DES MATIÈRES PREMIÈRES OSSEUSES PRÉHISTORIQUES: APPORT DE LA MICROTOMOGRAPHIE X À L'ANALYSE DES BOIS DE CERVIDÉS

*Lefebvre, Alexandre (UMR 5199 PACEA, Université de Bordeaux, Talence, 33405, France) a.lefebvre@pacea.u-bordeaux1.fr*

*Rocheffort, Gaël (EA 2496 Pathologie, Imagerie et Biothérapies orofaciales, UFR Odontologie, Université Paris Descartes, PRES Sorbonne Paris Cité, Montrouge, F-92120 France; Plateforme d'Imagerie du Petit Animal Paris Descartes, Paris, F-75015 France) gael.rocheffort@parisdescartes.fr*

*Salmon, Benjamin (EA 2496 Pathologie, Imagerie et Biothérapies orofaciales, UFR Odontologie, Université Paris Descartes, PRES Sorbonne Paris Cité, Montrouge, F-92120 France; Plateforme d'Imagerie du Petit Animal Paris Descartes, Paris, F-75015 France) Département d'Odontologie (Bretonneau et Charles Foix), AP-HP, Paris, France benjamin.salmon@parisdescartes.fr*

L'imagerie 3D biomédicale est aujourd'hui détournée de son domaine d'application initial pour alimenter la recherche sur la caractérisation des matières premières osseuses préhistoriques. Si les principaux biomatériaux minéralisés que compte l'industrie osseuse préhistorique (os, bois de cervidés, dentine/ivoire), ont fait l'objet des premiers essais de caractérisation concluants, la détermination taxinomique des vestiges reste, en revanche, un domaine d'étude en cours d'exploration. Dans le cas particulier des pièces archéologiques réalisées en bois de cervidés, la distinction entre le bois de cerf et le bois de renne peut s'avérer, dans certains cas, délicate (modification anthropique des vestiges et/ou action d'agents taphonomiques). En complément des techniques d'identification physico-chimiques destructives classiques (spectrométrie de masse, étude des ratios isotopiques, analyses ADN), la microtomographie par rayons X s'avère être un outil d'analyse non destructif pertinent. En collaboration avec la plateforme d'imagerie bio-médicale de l'Université Paris Descartes, cet article présente la méthodologie expérimentale (scan des échantillons, analyse d'images et statistiques descriptives) ayant conduit au développement d'une méthode de caractérisation visant à distinguer les bois de cervidés à partir de l'étude de la microarchitecture osseuse d'une collection de référence de bois actuels et archéologiques. Les limites de spécificité et de sensibilité statistiques de cette méthode de discrimination relative sont notamment discutées en fonction des différentes portions anatomiques étudiées

ORAL

**(3. MICRO-PIXE/PIGE ANALYSIS OF AURIGNACIAN IVORIES: ADVANCES AND LIMITATIONS IN THE STUDY OF PALEOLITHIC OSSEOUS MATERIALS**

*Heckel, Claire (Center for the Study of Human Origins, New York University, USA) claire.heckel@nyu.edu*

*Müller, Katharina (Laboratoire d'Archéologie Structurale et Moléculaire, CNRS UMR 8220, Paris, France)*

*White, Randall (Center for the Study of Human Origins, New York University, USA)*

*Floss, Harald (Institut für Ur- und Frühgeschichte und Quartärökologie, Universität Tübingen, Germany)*

*Conard, Nicholas (Institut für Ur- und Frühgeschichte und Quartärökologie, Universität Tübingen, Germany)*

*Reiche, Ina (Rathgen Forschungslabor Staatliche Museen zu Berlin Stiftung Preußischer Kulturbesitz, Berlin, Germany)*

Non-destructive methods for the chemical analysis of osseous materials have expanded the range of archaeological artifacts that can be analyzed for their chemical composition. The results of micro-PIXE/PIGE analysis performed at the AGLAE facility at the C2RMF in Paris of ivory artifacts from Early Aurignacian deposits at Abri Castanet, Grotte de la Verpillière I, and HohleFels Cave are presented, with specimens of Middle Paleolithic origin from the Grotte de la Verpillière II for comparison. Some bone and tooth samples were likewise analyzed for comparison. This study had three primary goals: precise determination of the diagenetic alterations to mammoth ivory of Aurignacian age; the assessment of F-content as a method for establishing relative chronology within individual sites; the determination of the potential of trace element analysis as an indication of mammoth ivory provenience at the regional level.

While diagenetic alterations do impose certain limitations on the conclusions that can be drawn from chemical analyses of ancient materials, we have been able to obtain results that are significant to understanding patterns of raw material procurement and use in the Early Upper Paleolithic. The results of these studies are presented, and their implications for the study of ivory and other osseous materials from Paleolithic contexts are discussed. The indications of the potentials and limitations of these analyses will be of interest to specialists engaged in the study

DISCUSSION ET CONCLUSION

SÉANCE POSTERS

POSTER

POSTER

**LITHIC-OSSEOUS INTERFACE: HOW PROTOAURIGNACIAN (EUP) LITHIC TOOLS WORKED OSSEOUS MATERIALS IN PROTOAURIGNACIAN SITES**

*Pasquini, Amaranta (LAMPEA (Laboratoire Méditerranéen de Préhistoire Europe Afrique) - UMR 7269, France) amerasi@gmail.com*

The beginning of the Upper Palaeolithic in Western Europe (ca. 40-30 ka BP) is characterized by the presence of different cultural techno-complexes in southern Mediterranean areas (Uluzzian, Protoaurignacian) and continental Europe (Chatelperronian, Early Aurignacian). Traditionally, Chatelperronian and Uluzzian lithic traditions are associated with Neanderthal fossils, while the Protoaurignacian and Early Aurignacian are considered as a Sapiens (AMH) production.

Chronologically the Protoaurignacian is considered the first techno-complex attributed to AMH in Western Europe.

Compared with the profusion and the variety of Early Aurignacian osseous production, Protoaurignacian sites show a very scarce presence of this industry (except for few rich deposits).

The usewear analysis carried out on the lithic assemblages from four French Protoaurignacian sites (Observatoire, Esquicho Grapaou, Laouza, Cottés) shows that the archaeological reality is more complicated than appears. Even in the absence of organic remains on site, a great number of analyzed lithic tools worked osseous materials (almost exclusively antler) at the different production stages of the osseous reduction sequence.

The implications and importance of these results (observed gap between "osseous" and "lithic" traces) are discussed.

POSTER

**BONE TOOLS USED IN PREHISTORIC ENGRAVINGS OF PATAGONIA (ARGENTINA)**

*Pérez, Alberto J. (Fundación Azara. Universidad Maimónides) arqueo.meliquina@gmail.com*

*Díez, J. Carlos (Universidad de Burgos) clomana@ubu.es*

We analysed skeletal remains from the Cueva-Paredon Loncomán site (Río Negro, Patagonia), dated around 2000 BP. The walls of this metamorphic rock shelter contain "Pisadas" (Menguin, 1957) zoomorphs, a style found in much of the southern tip of the American continent. Archaeological analysis identified a set of bone tools (Lama guanicoe and Pterocnemia pennata /long bones) on the Upper level with taphonomic features used in scrapings and incisions on walls. Given the novelty of this proposal, we conducted an experiment involving the manufacture and use of bones (guanaco and choique) in engraving work. The bones proved well suited for the production of similar archaeological motifs. The microscopic features seem to show that guanaco and choique long bone tools could have been manufactured and used by Patagonian hunter gatherer societies in prehistoric engravings.

# Looking at the sky, walking on the earth. Climatic changes and historical evolution in the Mesolithic and Neolithic of Western Europe

# B25

Organiser: M<sup>a</sup> Jose Iriarte-Chiapusso and Iñigo García-Martínez de Lagrán

Thursday 4th (14:30-19:30)  
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2014 burgos  
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ORAL CONTRIBUTION

ORAL

**1. WHAT INFLUENCE DID CLIMATE CHANGES HAVE ON STYLES? METAMORPHOSIS IN EUROPEAN MESOLITHIC AESTHETICS.**

*Bouvry, Florence ((ARSCAN UMR 7041), Maison de l'Archéologie et de l'Ethnologie, Nanterre (92) florence.bouvry@gmail.com*

Nine to ten thousand years ago, Mesolithic era was marked by a great number of economical and social changes partially due to forest development in Europe. It's ending takes place (is to be seen) between the eight and fourth millennium B.C., with the rising of the Neolithic era.

With each new period, culture re-evaluates it's past (puts it's past back into perspective) and defines what seems contemporary, thus being the time being's preoccupations. With the transitional phase to Mesolithic, transformations are to be observed in representation styles. Those change (evolve) from Paleolithic's realistic figuration to Neolithic's symbolic figuration. As reflections of the ecological environment, these style metamorphoses match with Lithic's technological three "mutation-revolutions". (Marchand G. 1997).

As such (Being so), those different styles refer to society's mutations-or as P.Francastel (1970) would name them-"figurative systems".

P. Francastel writing : "Though we have tried to explain art by society, it is art that -partly- explains society's challenges (radical changes). We have always considered art as an ornament or an accessory, a social superstructure instead of analyzing it and questioning it as being a fundamental function. (...)"

Throughout this communication, I intend to analyze how climate changes are to be considered as the beginning of styles' metamorphosis in European Mesolithic aesthetics.

ORAL

**2. PALAEOENVIRONMENTAL AND ANTHROPIC ACTIVITY INDICATORS DURING THE NEOLITHIC IN THE SEDIMENTARY RECORD OF LAKE BANYOLES (GIRONA, NE SPAIN)**

*Cho, Sonia (Laboratorio de Evolución Humana, Departamento de Ciencias Históricas y Geografía, Universidad de Burgos, Burgos, Spain) scm0049@alu.ubu.es*  
*Iriarte, Eneko (Laboratorio de Evolución Humana, Departamento de Ciencias Históricas y Geografía, Universidad de Burgos, Burgos, Spain) eiriarte@ubu.es*  
*Revelles, Jordi (Universitat Autònoma de Barcelona, Departament de Prehistòria, Bellaterra (Barcelona), Spain) jordy\_reve@hotmail.com*

*Burjachs, Francesc (Institució Catalana de Recerca i Estudis Avançats & Institut Català de Paleoecologia Humana i Evolució Social, Tarragona, Spain) f.burjachs@icrea.es*

*Piqué, Raquel (Universitat Autònoma de Barcelona, Departament de Prehistòria, Belaterra (Barcelona, Spain) raquel.pique@uab.cat.*

*Palomo, Antoni (Universitat Autònoma de Barcelona, Departament de Prehistòria, Belaterra (Barcelona, Spain) antoni.palomo@uab.cat.*

*Terradas, Xavier (CSIC-Institució Milà y Fontanals, Barcelona, Spain) terradas@imf.csic.es*

*Peña-Chocarro, Leonor (CSIC-Escuela Española de Historia y Arqueología en Roma (Italia) leonor.chocarro@cchs.csic.es.*

This research was performed within the AGRIVESTMED project that studies the agriculture expansion in the western Mediterranean area. Various areas surrounding main Neolithic sites in Iberia and northern Morocco were sampled (cored), including the Lake Banyoles (Girona, Spain) in which eastern margin is located a Neolithic settlement called La Draga. In this site, an archaeological project is being developed for the last 24 years in the frame of consortium composed by the UAB, CSIC and the Archaeological Museums from Catalonia and Banyoles. This work analyzes and interprets one of the cores (named SB2) retrieved from the margins of the lake, showing interesting information concerning the palaeoenvironmental evolution and human impact during the Neolithic period.

The study is carried out over 4 m long sedimentary record. The research includes: sedimentological interpretation (sedimentary facies and stratigraphic description of the core), high-resolution geochemical analysis (XRF) measured at 1cm intervals, statistical multivariate analysis of the data (PCA), mineralogical analysis by X-ray diffraction (XRD), particle size analysis and the radiocarbon dating by AMS of eight sediment samples.

To construct the chronological model of the SB2 core, 7 out of the 9 radiocarbon dates were used. The obtained ages covers nearly the whole Holocene.



Four sedimentary facies have been defined and correlated within the core according to the macroscopical and microscopical observations and compositional analyses: i) carbonate sands, ii) carbonate muds, iii) mineral-rich peat and iiiii) edaphized carbonate mud. Based on these facies we can infer four different depositional environments. Accordingly, the SB2 sequence has been divided into four stratigraphic units and furthermore in ten sub-units.

The granulometry measures the grain size and provides also four intervals according to the different sedimentation rates.

The mineralogy has been characterized by X-ray diffractation and the main minerals found have been calcite, gypsum, quartz and clay minerals.

Geochemical core logging was undertaken by XRF analysis. The core scanner measured 24 chemical elements: Al, Si, P, S, Cl, Ar, K, Ca, Ti, Rh, Ni, Cu, Zn, Ga, Ge, As, Br, Rb, Sr, Y, Zr, Nb and Pb.

A multivariate statistical analysis (PCA) was applied to the XRF results. Two main components were extracted indicated by PCA analysis: PC1 shows an opposite connection between siliciclastic elements and carbonates; while PC2, is controlled by organic content in opposite to carbonates.

The study of the SB2 core from Lake Banyoles have allowed us to define four stratigraphic units composed of four lacustrine sedimentary facies controlled by the water depth variation. The pattern is indicative of the trend and evolution of carbonate lake margin depositional environments from humid to relatively more arid environments. The decline of the water level could be due to a lower rate of precipitation in the recharge zone.

Coinciding with La Draga Neolithic settlement, some anomalies are detected in the sedimentary record probably related to deforestation.

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ORAL

### **3. MESOLITHIC TO BRONZE AGE LANDSCAPE SIGNATURES DURING PERIODS OF ABRUPT CLIMATE CHANGE: CURRENT WORK FROM THE UPPER VINALOPÓ VALLEY (SE SPAIN) LAKE DEPOSITS**

*Elsie Jones, Samantha (IPHES) sjones@iphes.cat*  
*Burjachs Casas, Francesc (IPHES) fburjachs@iphes.cat*  
*Fernandez Lopez de Pablo, Javier (IPHES) jfernandez@iphes.cat*

Within the last few years, different studies undertaken in southern France and the Iberian Peninsula suggest that the Middle Holocene climatic crisis had drastic impacts on Late Mesolithic foragers, causing the abandonment of previously settled areas, changes on human mobility strategies and possible population decreases illustrated by migrations and cultural gaps. There are many cultural gaps recorded at archaeological cave in-fillings between 8500-8000 cal BP. These cultural and stratigraphic gaps make it quite difficult to analyse the potential relationship between environmental factors and population dynamics during the Mesolithic-Neolithic transition.

In March 2014 a two year IEF Marie Curie project was established, entitled 'Prehistoric Transitions in the Mediterranean: Cultural and economic responses to climate change during the Mesolithic-Bronze age' (PRETM). The project was established to gain a more precise understanding of the effects of climatic-events on prehistoric economies and culture in the Mediterranean. The key objectives are to examine the effects of environmental stress on prehistoric communities, the palaeo-environmental context of the Mesolithic-Neolithic transition and the anthropogenic impact on the first agricultural and husbandry systems on landscape between 7500-4000 cal BP. Two cores were extracted, from Casa Corona and the Villena lagoon in the upper Vinalopo valley of Eastern Spain, for multi-proxy, high resolution analysis. This included analysis for pollen, phytoliths, Loss on Ignition, Magnetic susceptibility, DXR-XRF and C14 dating. The study area was selected because it provides a unique opportunity to analyse, at a local scale, a rich and very sensitive record of Holocene vegetation dynamics from natural deposits and to compare this record with completely new archaeological data from Mesolithic and Neolithic sites.

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ORAL

### **4. CLIMATE CHANGES, ADAPTIVE TRANSFORMATIONS AND SOCIO-ECONOMIC EVOLUTION DURING THE MESOLITHIC IN THE EBRO VALLEY**

*García-Martínez de Lagrán, Íñigo (Postdoctoral Programme of the DEUI of the Basque Government, Spain - University of the Basque Country, U.P.V./E.H.U. - IT622-13 Research Group in Prehistory, Basque System of Research, Spain -*

*Laboratoire TRACES UMR5608, Université de Toulouse Le Mirail 2) igmtzl@gmail.com*

The studies on the Mesolithic in the Ebro Valley have focused primarily on defining the evolution of lithic tools, on the characterization of the settlement and livelihoods, and on obtaining a detailed chronological framework. In the lithic industries a marked distinction between the so-called Mesolithic of Notches and Denticulates (MND) and Geometric Mesolithic (GM) is detected. Also, recently some studies have focused on certain aspects of the socio-economic development of these groups and possible paleoclimatic events (especially the 8.2 ka event) that may affect them. In this paper a compilation of the latest data on these topics will be showed and a hypothesis of the historical evolution of hunter-gatherer communities of the Ebro valley will be proposed.

In this paper the following aspects will be discussed in detail:

- 1) The chronological framework: we will analyze the available dates of MND and GM and its temporal relation to the 8.2 ka climate event.
- 2) The internal evolution of each site will be analyzed with respect to the number of faunal remains and their management, the number of lithic remains, and the number and type of lithic tools.
- 3) An approximation to the latest interpretations of the traceological studies was performed.
- 4) Data on climate and landscape and the potential visibility and impact of these events on the paleoclimatic record of the archaeological sites were listed.

The study of all these variables allow us to define the evolution of these communities of hunter-gatherers between, grosso modo, 8000 and 5500 cal BC. Subsequently, we will analyze all data in relation with the climate event 8.2 and will try to establish possible relationships between them. Also, if this relationship is finally confirmed, we will try to define the evidence of the archaeological record to show us the influence of these climatic changes in the historical evolution of these groups.

In principle, the chronological evidence could relate the development of the Mesolithic in the Ebro Valley with the 8.2 ka climate event, as already highlighted other studies, for example in Lower Aragon. Certain paleobotanic data and technological change detected between the MND and the GM would be the main evidences of this fact. However, in this paper we intend that our conclusions

have greater both chronological and socioeconomic perspective. We will analyze the evolution of these societies since the beginning of MND until the beginning of the Neolithisation and study different aspects of these societies. A priori, one could argue that this climatic event did have an influence on the evolution of these groups although the data available are insufficient and inconclusive.

ORAL

## **5. HUMAN-ENVIRONMENT RELATIONSHIPS AROUND THE TELL OF DIKILI TASH (NORTHERN GREECE): ANTHROPOGENIC IMPACTS AND CLIMATIC CHANGES FOR THE EARLY HOLOCENE.**

*Glais, Arthur (Université Caen Basse-Normandie) arthur.glais@unicaen.fr*

*Lopez-Saez, José-Antonio (CSIC) joseantonio.lopez@cchs.csic.es*

*Lespez, Laurent (UPEC) laurent.lespez@u-pec.fr*

The investigations carried out around the tell of Dikili Tash, one of the oldest Neolithic settlement site in balkanic region, improve our understanding of the evolution of the palaeoenvironment from the beginning of the Early Neolithic (6 500 cal BC) to the Bronze Age, the periods during which the site was occupied. While global climate reconstructions researches based on the study of the Tenaghi-Philippon marsh, located 7 km from the tell, have focused on forces that drive the environment at the regional or continental scales, we attempt to use the local sediment archives to identify periods of changes around the closer inhabited areas. In order to investigate the human and the climatic impacts, mainly Rapid Climatic Change events, the small-scale alluvial sedimentary archives are valuable sources of palaeoenvironmental and geomorphological information.

The reconstruction of environmental changes is based on field work and more than 20 cores located in the wetland and alluvial areas near the archaeological site. Two sources of palaeoecological investigations have been conducted: geomorphological and sedimentological investigations and pollen and non-pollen palynomorphs analyses. Palaeobotanical proxy data give an overview of an "initial environment" before the neolithisation process and thereafter a comprehensive view of anthropogenic impact on the vegetation cover which can be compared to the sedimentological changes undertaken in lowland areas. Combined with archaeological data, this

information allows reconstruction of interactions and/or adaptation of the past local societies to global changes. The chronology is based on the radiocarbon dating of 25 samples (organic sediment or charcoal) obtained by "AMS" method.

This paper presents geoarchaeological investigation conducted in order to understand the magnitude of the climatic and human perturbations. The first results covering the Neolithic period give evidence on the role of the climatic oscillations in local environmental changes. Furthermore, the implications of these events seem to have probably favored or coincided at least with a process defined such as a Neolithic settlement pattern. The Human-Environment relationships complexity is illustrated at Dikili Tash by a settlement discontinuity which no follows only climatic events. So, the cultural changes caused by environmental changes are more often inferred from the co-occurrence of the different changes than proved by the observation of the environmental change and their real consequences for the society at the local scale.

The significant contradictions between climatic regional data set and archaeological data available locally (site of Dikili Tash), that attest a setting out of an early anthropogenic system persuade to develop multiscale approach about Early Holocene dynamics. In fact, human populations can react at local to regional scales in order to assess environmental changes from inhabited areas to then broader cultural group scale.

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ORAL

## 6. PALAEOENVIRONMENTS AND SITE FORMATION PROCESSES AT THE NEOLITHIC LAKESIDE SETTLEMENT OF LA DRAGA, BANYOLES, NORTHEASTERN SPAIN

*Iriarte, Eneko (Laboratorio de Evolución Humana, Departamento de Ciencias Históricas y Geografía, Universidad de Burgos, Burgos, Spain) eiriarte@ubu.es*

*Cho, Sonia (Laboratorio de Evolución Humana, Departamento de Ciencias Históricas y Geografía, Universidad de Burgos, Burgos, Spain) scm0049@alu.ubu.es*

*Revelles, Jordi (Universitat Autònoma de Barcelona, Departament de Prehistòria, Bellaterra (Barcelona), Spain) jordy\_reve@hotmail.com*

*Burjachs, Francesc (Institució Catalana de Recerca i Estudis Avançats-Institut Català de Paleoecologia Humana i Evolució Social-Universitat Rovira Virgili, Tarragona, Spain) f.burjachs@icrea.es*

*Piqué, Raquel (Universitat Autònoma de Barcelona, Departament de Prehistòria, Bellaterra (Barcelona, Spain) raquel.pique@uab.cat.*

*Palomo, Antoni (Universitat Autònoma de Barcelona, Departament de Prehistòria, Bellaterra (Barcelona, Spain) antoni.palomo@uab.cat.*

*Terradas, Xavier (CSIC-Institució Milá y Fontanals, Barcelona, Spain) terradas@imf.csic.es*

*Peña-Chocarro, Leonor (CSIC-Escuela Española de Historia y Arqueología en Roma (Italia) leonor.chocarro@cchs.csic.es.*

Prehistoric lakeside settlements have been studied extensively in many regions of Europe. The study of lacustrine sediments, lake level changes and related palaeoenvironmental/climatic evolution has been the main concerns of such studies. However, few studies have attempted to understand the detailed interactions between the cultural and natural processes involved in site formation in such contexts.

*La Draga* is a lakeside Neolithic settlement by the Banyoles karstic lake (Girona). The study of 12 sedimentary cores obtained along the site and the facies analysis of the sediments, supported by a suite of environmental and geochemical indices, has provided detailed palaeoenvironmental data and elucidated the main processes involved in the formation of the site and its history of occupation.

We study 200 to 300 cm long 12 sedimentary cores from *La Draga* site study area (cf. 1 ha).

The research includes: sedimentological study (stratigraphy and sedimentary facies description), high-resolution geochemical analysis (XRF core scanner), organic matter determination (L.O.I.), statistical multivariate analysis (PCA), mineralogical analysis by X-ray diffraction (XRD), particle size analysis and the radiocarbon dating by AMS.

The recovered sedimentary records were lithostratigraphically correlated and 3 main pre-site, syn-site and post-site stratigraphic units were defined. Different stratigraphic subunits and sedimentary facies were described in detail in each main unit.

The geochemical analysis of the sediments was undertaken using an Avaatech XRF core scanner. 28 chemical elements were measured: Al, Si, P, S, Cl, Ar, K, Ca, Ti, V, Cr, Mn, Fe, Rh, Ag, Ni, Cu, Zn, Ga, Ge, As, Br, Rb, Sr, Y, Zr, Nb and U. A multivariate statistical analysis, Principal Component Analysis, was applied to the XRF results.

The principal components were extracted and explain the main variations in organic matter content, charcoal content or autochthonous vs. allochthonous sediment input in the studied records.

The obtained preliminary data suggest that the onset of *La Draga* site in the shoreline of the Lake Banyoles coincided with a lowstand of the lake level. The littoral sedimentary processes conditioned the formation and the characteristics of the geoarchaeological record that is being excavated in the site. The main sedimentary control in the formation, evolution and preservation of the archaeological site is the formation of local accumulation-space during Neolithic due to the subsidence of a doline present below the archaeological area.

The joint interpretation of the results obtained from the archaeological and the preliminary stratigraphic, sedimentological, geochronological and geochemical study of 12 lacustrine sedimentary sequences cored in the Neolithic archaeological site of *La Draga* allowed the recognition of the main geological controls involved in the onset, evolution and conservation of this archaeological site.

The onset of *La Draga* site coincided with a lowstand of the Lake Banyoles level possibly reflecting less humid palaeoenvironmental conditions. The main sedimentary control in the formation and preservation of the archaeological site was the differential accumulation-space formation during the Neolithic due to the subsidence of a doline. The different subsidence pulses conditioned the environmental characteristics and the anthropic use of the archaeological area during the Neolithic.

## ORAL

### 7. LATEGLACIAL-HOLOCENE TRANSITION IN NW IBERIA: A PALAEOECOLOGICAL APPROACH

*Iriarte-Chiapusso, María-José (IKERASQUE - Universidad del País Vasco) mariajose.iriarte@ehu.es*

*Muñoz-Sobrino, Castor (Universidade de Vigo) bvcastor@uvigo.es*

*Gómez-Orellana, Luis (Universidade de Santiago de Compostela) luis.gomez-orellana@usc.es*

*Hernandez-Beloqui, Begoña (Universidad del País Vasco) begona.hernandez@ehu.es*

*García-Moreiras, Iria (Universidade de Vigo) bvcastor@uvigo.es*

*Fernández-Rodríguez, Carlos (Universidad de León) cferr@unileon.es*

*Ramil-Rego, Pablo (Universidade de Santiago de Compostela) ramil.rego@usc.es*

Palaeoenvironmental reconstructions in NW Iberia may be taken into account that this is a transition area between typically Atlantic or Mediterranean territories, with continental tendencies appearing in the inner slopes and depressions. The abrupt orography also introduces local variants. The systematic recognition of a series of climate events may be a functional way to correlate pollen sequences in a large and dissimilar area such as this. Furthermore, this method allows that intra-regional migrations or un-coupled vegetation changes were detected. The existence of this spatial component might assist in better explaining the palaeoenvironmental characteristics of each territory and the unequal human influence on the landscape.

NW Iberia may be divided in four main biogeographical units, largely based on geographical characteristics, climatic parameters and present day biogeography. High quality pollen sequences from each unit were selected to obtain reconstructions of local dynamics at each site, and also approximations of the regional tendencies in each unit. The correlation between the different regional tendencies and their coherence in relation to the climatic models performed for NW Iberia and the North Atlantic are discussed.

Low summer temperatures have been reconstructed in NW Iberia for the Oldest Dryas (8 °C) and the Younger Dryas (10° C), but increasing during the Lateglacial interstadial (ca. <13 °C) and Early Holocene (>13 °C). These changes notably affected the tree-line. Several other short-lived climatic shifts occurred, with summer temperatures dropping about 0.5-1°C, that may be linked to a series of isotopic sub-stages occurring during the GI-1 (GI-1d, GI-1c2 and GI-1b) and the early Holocene (11.2 k, 9.3 k and 8.2 k events). Steppes expanded in the inland drier basins during the coldest periods, but *Pinus* woodlands persisted in mid-slope situations at highlands, especially in areas affected by rain-shadows. Postglacial tree colonization generally follows the sequence: *Betula-Pinus-Quercus*. The representation of pine is much reduced in many oceanic areas, so no *Pinus* expansion has been recorded at the sub-coastal area, and a final *Corylus* expansion is also commonly recorded in the Cantabrian coastal mountains. The tree succession in northwest Iberia may have been postponed in some landward localities compared with other seaward sites. Pollen data denote a new ascension of the tree-line at the beginning of the Holocene Climatic Optimum, when also deciduous forest colonized the lowlands.

The sequence of temperature changes might be similar to that found in Greenland and in the Alps. Nevertheless, the regional impact of most of the less intense Lateglacial/early Holocene cold events was limited in NW Iberia, where only minor vegetation changes were recorded in very sensitive sites that were very close to ecotonal situations. The vegetation successions in the studied area were strongly influenced by the steep orography and other associated factors: e.g. the rain-shadow effect; the availability (or the lack) of appropriate migration routes for the arrival of certain species; or the overrepresentation of the regional pollen sources when the local vegetation is scarce.

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POSTER

**8. A PALAEOENVIRONMENTAL PERSPECTIVE OF THE MESOLITHIC-NEOLITHIC TRANSITION: THE CASE OF MARTES SPP. IN EASTERN IBERIAN PENINSULA**

*Llorente-Rodríguez, Laura (Laboratorio de Arqueozoología-Universidad Autónoma de Madrid) laura.llorente@uam.es*

*López-Sáez, José Antonio (Instituto de Historia-CCHS-CSIC) joseantonio.lopez@cchs.csic.es*

*Nores-Quesada, Carlos (Universidad de Oviedo) c.nores@uniovi.es*

*Morales-Muñiz, Arturo (Laboratorio de Arqueozoología-Universidad Autónoma de Madrid) arturo.morales@uam.es*

Current data in sympatry areas suggest little competition between pine marten (*Martes martes* Linnaeus, 1758) and the beech marten (*Martes foina* Erxleben, 1777) despite the similarities in their biology. This is probably due to niche segregation on the basis of different ecomorphologies and behavior, the pine marten being the only of the two species being strongly associated with dense forests. The beech marten is an invasive species that colonized Europe during the Holocene from its Middle Eastern quarters, apparently benefiting from the opening of the landscape that the Neolithic expansion brought about. In this presentation, the paleo - biogeography of both mustelids in the Iberian Peninsula is addressed through pollen data. The aim is to determine whether the displacement of the pine marten towards the northern Euro-Siberian regions, documented since the Mesolithic period, was somehow coupled to the retreat of the forest during the Boreal-Atlantic transition, coincident with the transition from the Mesolithic to Neolithic, or if this could instead be due to a competitive displacement caused by the beech marten being better able to cope with the newly open landscapes that the development

of farmland fostered. Within such context, the site of Cova Fosca (Castellon, Spain), with a chrono-stratigraphic sequence that includes the Mesolithic-Neolithic transition and ample data about the coexistence of both species in the area, has proved of particular relevance.

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ORAL

**9. CLIMATIC OSCILLATIONS DURING THE LATE MESOLITHIC AND NEOLITHIC IN THE CANTABRIAN MARGIN: THE ISOTOPIC RECORD FROM A STALAGMITE IN GOIKOETXE CAVE (BIZKAIA, SPAIN)**

*Martínez-Pillado, Virginia (Departamento de mineralogía y petrología, facultad de ciencia y tecnología, universidad del País Vasco y ARANZADI Geo-Q) vmpillado@gmail.com*

*Aranburu, Arantza (Departamento de mineralogía y petrología, facultad de ciencia y tecnología, universidad del País Vasco y ARANZADI Geo-Q) arantza.aranburu@ehu.es*

*Iriarte, Eneko (Laboratorio de evolución humana, departamento de ciencias históricas y geografía, universidad de Burgos) eiriarte@ubu.es*

*Moreno, Ana (Instituto pirenaico de ecología-CSIC) amoreno@ipe.csic.es*

*Cacho, Isabel (Departament d'estratigrafia, paleontologia i geociències marines, universitat de Barcelona) icacho@ub.edu*

*Arsuaga, Juan Luis (Departamento de paleontología, facultad de ciencias geológicas, universidad complutense de Madrid y Centro mixto UCM-ISCI) jlarsuaga@isciii.es*

The start of the Holocene is characterized by an important warming whose pronounced optimum, called the Hypsithermal Climatic Optimum, ranged from 8300 to 5000 yr BP, at the height of the Mesolithic development. Although the Holocene is considered as an epoch of relatively stable climate, some fluctuations, likely with a cyclicity of 1500 years, have been found in marine and terrestrial records. However, the timing of these events and the response on land is not yet well established.

The speleothems are one of the main archives to reconstruct paleoenvironmental and paleoclimatic sequences during the Quaternary period. Their chronological analyses, together with the study of stable isotopes and trace elements, allow knowing the paleoenvironmental evolution delimiting climatic events of short or long duration.

A 43 cm long stalagmite named *Moreno* was used for that purpose. It was collected in the Goikoetxe cave (Busturia, Bizkaia) in the Urdaibai Biosphere Reserve.

First studies were conducted in hand-sample under binocular microscope and photography with ultraviolet light, followed by a petrographic study for determining the carbonate crystals growth and the different crystal fabrics.

C and O isotope analyses have been also conformed in 160 samples taken along the growth axis, with a spacing of 2 mm.

For the speleothem chronology, U/Th dating was performed in 6 samples. Afterwards, an age model based on the StalAge algorithm for R program was carried out extrapolating a timeline for each isotope value obtained.

The obtained dates range from ~6800 yr BP to ~4900 yr BP.

The petrographic study reveals a homogeneous crystal fabric along de whole growth, without diagenetic features.

The UV image shows an alternance of *light* and *dark* bands which may be related to changes in the content of organic matter. Cyclicities of distinct range can be distinguished, including decadal and centennial oscillations.

A very good match is observed between the UV-bands and the stable isotope data presenting relatively low  $\delta^{13}\text{C}$  and  $\delta^{18}\text{O}$  values within the dark bands in contrast to the light ones.

From the homogeneity of the crystal fabric, a relatively constant growth rate under constant carbonate saturation conditions can be deduced.

The high resolution obtained for the dating and the isotopic analyses as well as the UV photography allow us to establish climatic cyclicities that might be pointing variations in the rain precipitation rate and the amount of organic matter in the soils. As a preliminary hypothesis, we can associate humid conditions during the *dark* bands, rich in organic matter, and relatively drier events with the *light* bands, with less presence of organic matter.

The studied period shows a very strong cyclicity at multidecadal time scale, particularly clear for the central part of the speleothem (Unit II) which cover about 1200 yr (from 6.4 to 5.2 ka BP), suggesting the occurrence of wetter periods with more developed soils (enriched organic matter) followed by dryer periods with less developed soils. This strong cyclicity could be associated

to the operation of some mode of climate variability at multidecadal time-scale such as the NAO.

ORAL

## 10. ENVIRONMENTAL CHANGES AND PERSISTENCE OF THE POPULATION AT THE ARBA DE BIEL (ZARAGOZA, SPAIN)

*Montes Ramírez, Lourdes (Universidad Zaragoza) lmontes@unizar.es*

*Domingo Martínez, Rafael (Universidad Zaragoza) rdomingo@unizar.es*

*González-Sampérez, Penélope (Inst. Pirenaico de Ecología-CSIC) pgonzal@ipe.csic.es*

*Laborda Lorente, Rafael (Universidad Zaragoza) laborda@unizar.es*

*Alcolea Gracia, Marta (Universidad Zaragoza) malcolea@unizar.es*

The Arba de Biel is a short affluent of the Ebro that forms a small basin located in the central Pre-Pyrenees. Its geographical features (high humidity in the heart of a semi-arid region, smooth relief, abundance of sandstone rockshelters, local outcrops of good-quality flint) were profited by groups of prehistoric people that frequented the area for more than 10 millennia. This paper aims to relate the archaeological sequences and the climate fluctuations, in order to explain some singularities in the human occupations.

In this area our team has discovered five sites: Legunova, Peña-14, Valcervera, Rambla de Legunova and Paco-Pons. All the sites except Paco-Pons are found in the lower areas of the valley, next to the river and oriented to rising sun. The other one is at a high-altitude location (more than 1000 m) and we relate it to the exploitation of the copper veins that can be found in its neighbourhood. The prehistoric settlements spread from the Upper Magdalenian at Legunova to the Chalcolithic funerary employment of the site of Paco-Pons

The main part of the occupation levels belong to the Mesolithic and the Neolithic periods, in a process that seems unrelated to the climate fluctuations registered in this stage by palynological and anthracological analysis: a remarkable lack of human presence for around 1000 years between the Sauveterrian and the Notches and Denticulates Mesolithic phases can't be explained from the climate register; In the other hand, it seems that the well known 8.2 event was not apparently important in this basin.

ORAL

## 11. MID-HOLOCENE VEGETATION HISTORY AND NEOLITHIC LAND-USE IN LAKE BANYOLES

*Revelles, Jordi (UAB - Universidad Autònoma de Barcelona) jordi.revelles@uab.cat*

*Burjachs, Francesc (ICREA, IPHES, URV) fburjachs@iphes.cat*  
*Cho, Sònia (UBU - Universidad de Burgos) scm0049@alu.ubu.es*

*Iriarte, Eneko (UBU - Universidad de Burgos) eiriarte@ubu.es*  
*Palomo, Antoni (UAB - Universitat Autònoma de Barcelona) antonipalomo@gmail.com*

*Piqué, Raquel (UAB - Universitat Autònoma de Barcelona) raquel.pique@uab.cat*

*Terradas, Xavier (IMF-CSIC) terradas@imf.csic.es*

*Peña-Chocarro, Leonor (CCHS-CSIC) leonor.chocarro@csic.it*

In the second half of the 8th millennium cal BP, the establishment of first farming societies in northeastern Iberian Peninsula significantly changed the relationship established between society and nature, supposing the onset of an increasing process of landscape disturbance. In that context, the study of the several geosystem changes that occurred at the onset of the Holocene takes a decisive role.

In this work we focus on a Mid-Holocene pollen record extracted in the margin of Lake Banyoles (Banyoles, Spain), located in northeastern Iberian Peninsula, 35 km from the Mediterranean Sea, 50 km south of the Pyrenees and 173 m asl.

The study area is remarkable for containing evidences of early farming communities of Iberian Peninsula, and for providing the possibility to relate archaeological sites with palaeoecological records obtained in lacustrine and peat deposits. In that sense, the main objectives of the work are 1) to assess the impact on the landscape by first farming societies; 2) to comprehend vegetation change patterns and their causes.

A 370 cm core (SB2 core) was extracted in the western shore of the lake, but only 102 cm of dark silty clay provided a good preservation of pollen remains, in terms of variability and concentration. Contiguous samples were retrieved at every 1 cm of this part of the core, and pollen, non-pollen palynomorphs (NPP) and sedimentary charcoal were analysed in a period comprised between c.9000-3000 cal BP.

Pollen analysis describes a mid-Holocene vegetation succession, reacting to both climatic and anthropic

causes. The main change in vegetation evolution is recorded in c.7250 cal BP, when is documented the impact of the settlement of early Neolithic communities in the lakeshore of Lake Banyoles. In that sense, the prevailing broadleaf deciduous trees forests are affected by human management of vegetal resources, causing a decrease in deciduous *Quercus* values and the colonization by herbs, shrubs and secondary trees.

From c.5500 cal BP an increasing aridity is recorded, with the appearance of fire episodes, water level regression, and the increase of sclerophilous evergreen trees, all of them consistent with other works in western Mediterranean at the same dates.

The analysis of pollen, NPP and sedimentary charcoal of one core from the surroundings of Lake Banyoles provides relevant data to understand the causes and consequences of different changes recorded in Mid-Holocene vegetation history. Several hypotheses were considered in order to explain the results, considering both climatic and anthropic factors and, thus, achieving the objective of understanding the relevant role that played first farming societies in landscape evolution.

POSTER

POSTER

## 12. RADIOCARBON DATES, CLIMATIC EVENTS AND SOCIAL DYNAMICS AT THE TIME OF NEOLITHIC TRANSITION IN IBERIA

*Bernabeu Aubán, Joan (Departament de Prehistòria i Arqueologia. Universitat de València) juan.bernabeu@uv.es*

*García Puchol, Oreto (Departament de Prehistòria i Arqueologia. Universitat de València) oreto.garcia@uv.es*

*Pardo Gordó, Salvador (Departament de Prehistòria i Arqueologia. Universitat de València) salvador.pardo@uv.es*

*Barton, C. Michael (Center for Social Dynamics & Complexity, Arizona State University) michael.barton@asu.edu*

*McClure, Sarah B. (Department of Anthropology, Pennsylvania State University) sbm19@psu.edu*

The transformation of subsistence systems from hunting and gathering to farming involved a crucial change to the relationship between humans and the environment, and affected all levels of human society. Perhaps for this reason, the issue of the origin and expansion of Neolithic economies remains a major topic in the archaeological and anthropological literature. Some consensus exists regarding the origin of Cardium-Imprinted pottery

wares in southern Italy, but the debate surrounding its process of expansion to the west remains open, most particularly in Iberia.

Lefocus in this poster on temporal and spatial distributions of human occupation in the Iberian peninsula spanning the Neolithic transition, from last hunters-gatherers groups (c. 8500 cal. BP) to the end of Early Neolithic (c. 7100-6900 cal. BP). Special attention is paid to the role of climatic events in social and economic change, using for this our database which contains information about: a) sites and their locations; and b) radiocarbon dates with indication of dated samples and the contexts with which they are associated. The method is the summed radiocarbon probability distributions (*sumprob*).

Our goals are to evaluate the rich archaeological and paleoenvironmental database produced by recent decades of research in this area in order to address issues related to the Neolithic Transition.

#### POSTER

### 13. EVOLUTION OF THE VEGETATION, DURING THE HOLOCENE IN THE SIERRA DE URBIÓN AND NEILA (SISTEMA IBÉRICO, SPAIN)

Gil García, María José (UAH) [mjose.gil@uah.es](mailto:mjose.gil@uah.es)  
Ruiz Zapata, M<sup>a</sup> Blanca (UAH) [blanca.ruiz@uah.es](mailto:blanca.ruiz@uah.es)  
Vegas, Juana (IGME) [j.vegas@igme.es](mailto:j.vegas@igme.es)  
Pérez-González, Alfredo (CENIEH) [alfredo.perez@cenieh.es](mailto:alfredo.perez@cenieh.es)

Pollen data from two lacustrine sequences are presented: LHN-H (Soria) and QS2-H (Burgos), located in the Iberian system in order to establish the behavior of the vegetation during the Holocene, as well as to detect some of the most significant events of this period from the climatic point of view (8,200, 2,800 and 4,100 cal BP). The formation of both sequences is related to the withdrawal of the ice of the last glacial period, due to overpasses or proglacial character, respectively. In both cases, it's one of the most sensitive files in the registry of climatic events.

Radiometric dating, have identified the power of sediment accumulated during the Holocene. For the extraction of pollen grains, the samples were attacked chemically with acids and alkalis; then the residue, was concentrated through the use of dense liquor of Thoulet. The graphical representation of the data was conducted with the software package TILIA<sup>®</sup>, expressing the relative percentages of all taxa identified in each of the samples,

as well as the relationship between all of the no tree, and arboreal pollens as an expression of the structure of the vegetation. In order to facilitate the reading of data has been built a synthetic diagram, based on the selection of taxa and grouping of taxa according to ecological demands, most significant, from the climatic point of view.

The vegetation composition defines the installation conditions of warm-humid are characterized by the development of the deciduous forests, consisting basically of *Betula* and *Corylus* and to a lesser extent by *Quercus* type deciduous and *Fagus*, among others. The development of perennial forest (*Quercus* type evergreen), takes place is more late, and uncompetitive rates. Climatic events, as mentioned above, are defined through development of the taxa and xeric and sub-continental steppic grasslands, fundamentally Poaceae and *Artemisia* (8,200), by the increase of Cupressaceae (4,100) or both (2,800), as well as the general loss of the rate of moisture, which leads to the reverse of the deciduous forest and the increase of the mediterranean forest and Ericaceae. In this context of high mountain is very dampened anthropic activity, centered primarily in the increase of nitrophile plants.

It is important to point out how the development the forest mass, which characterizes the entire Holocene, presents some peculiarities, for each profile, marked by the altitude and orientation of each of the deposits.

The most relevant data is summarized in:

1- Identification both of the Younger Dryas, through the development of the taxa and sub-continental steppic grasslands and xeric.

2- Characterization of the events of the 8,200, 4,100 and 2,800, through the expansion of Cupressaceae and to a lesser extent of the taxa xeric-and sub-continental steppic grasslands.

3- Pinus, next to *Betula* and *Corylus*, defined the majority composition of the forest, as a response to the installation of temperate conditions-wet.

4-The behavior of the vegetation, to roof of both sequences is very similar. After a major pine forest, expands Ericaceae, and later again pine forest.



# B26 The lithic issues of the Gravettian

Organiser: György Lengyel and Jarosław Wilczyński

Monday 1st (14:30-19:30)  
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ORAL CONTRIBUTION

ORAL

## 1. THE CONCEPT OF CULTURAL VARIABILITY DURING THE GRAVETTIAN IN THE CANTABRIAN REGION

*Calvo, Aitor (University of the Basque Country) aitor\_calvo@ehu.es*

*Foulloubey, Christophe (INRAP Grand Sud-Ouest) christophe.foulloubey@inrap.fr*

*Martínez, Lucía (University of Oviedo) lucia\_satis@hotmail.com*

*Arrizabalaga, Alvaro (University of the Basque Country) alvaro.arrizabalaga@ehu.es*

*Bradtmoeller, Marcel (University of the Basque Country) marcel.bradtmoeller@ehu.es*

To investigate the Gravettian occupation of the Cantabrian region means to deal with different datasets of high internal variability; the mosaic topography and a regional and diachronic changing environment, as well as the heterogeneous archaeological legacy of the Pleistocene hunter-gatherers. To connect these variables is the mayor aim of this paper.

Being one small part of this legacy, we focus thereby on the reconstruction of the local lithic chaîne opératoire and the study of possible external (e.g. raw material availability) or internal spheres of influence (e.g. site function).

What impact does these factors have had on flint knapping and procurement, like reduction techniques, intensity of reduction, pattern of blank selection for tool modification or different compositions of tool types? To address this questions, scientific results from several sites between Asturias and the French Basque Country were used for this study to draw a more enhanced picture of cultural variability during the Gravettian period.

ORAL

## 2. THE GRAVETTIAN LEVEL AT THE FOZ DO MEDAL SITE (SABOR VALLEY, NORTHEAST PORTUGAL)

*Gaspar, Rita (Baixo Sabor ACE) ritantunesgaspar@gmail.com*

*Ferreira, João (Baixo Sabor ACE) ritantunesgaspar@gmail.com*

*García-Vadillo, Francisco (Baixo Sabor ACE, EPPEX) ritantunesgaspar@gmail.com*

*Carrondo, Joana (Baixo Sabor ACE) ritantunesgaspar@gmail.com*

*Silva, Maria João (Baixo Sabor ACE) ritantunesgaspar@gmail.com*

The Sabor valley is located in the Douro River basin, in northeastern Portugal. This interior region was viewed as a marginal territory in the context of the upper Paleolithic settlement of Iberia, until the discovery of the nearby Côa valley engravings and sites in the 1990's. The recent archaeological works developed in an adjacent area, north of Douro river, revealed an important Upper Pleistocene occupation sequence. One of the occupations presents characteristics that can be included in the Gravettian complex. However the lithic assemblage is still under study.

The goal of this communication is to discuss the significance of lithic variability between sites with "typical" Gravettian characteristics, like those in the Portuguese Estremadura, and others with "atypical" characteristics, like Foz do Medal, and the role played by the available local raw materials and culture in technological choices. The Terraço da Foz do Medal presents a very complex stratigraphic sequence with an intensive Upper Pleistocene to Early Holocene occupation. In the 1085 layer, interpreted as the remains of a Gravettian occupation, we found a lithic assemblage that counts over 50 000 pieces, distributed by an area of approximately 120 square meters.

The vast majority of cores are directed to the production of flakes, thus the most represented blanks in this assemblage are flakes, followed by bladelets, being the amount of blades residual. The greater part of tools is also made on flakes. There is a bigger ratio of bladelets and blades among retouched tools when compared to non-retouched blanks, some used in the production of backed projectile points.

Due to the regional geological formation, chert in this territory has a high procurement cost. On the contrary a great diversity of other lithologies can be found, including at the fluvial deposits alongside the Sabor River.

The low availability of flint resulting from the regional geology led Paleolithic populations to search for alternative raw materials thus developing of lithic reduction strategies "uncharacteristic" of the Gravettian. These local adaptations resulted in an important macrolithic component of the lithic assemblage. Despite this there is a shared ground with other "more

typical" Gravettian collections, mainly concerning stone projectile elements typology but also at a technological level.

ORAL

### 3. DYNAMISM IN THE ORGANIZATION OF TECHNOLOGY IN EASTERN CENTRAL EUROPE IN THE LAST STAGE OF THE PLEISTOCENE (MIS2)

*Lengyel, György (University of Miskolc) bolengyu@uni-miskolc.hu*

Lithic assemblages related with the Gravettian lineage cover a long period in Hungary, between 28 and 12 k years BP. This period can be divided into three stages, pre Last Glacial Maximum (LGM) with Gravettian, LGM with Ságvárian, and post LGM with Epigravettian. According to lithic raw material provenience studies pre LGM assemblages have a moderate presence of distant materials, those dated to LGM have almost none, and post LGM assemblages are highly dominated by flints from Prut valley and Upper Silesia. This raw material variability may have caused variability in the lithic technologies. Present paper provides information on the dynamism of technological organization of 16 thousand years in the Pannonian basin in relation to the Eastern Central European archaeological record.

ORAL

### 4. ENVIRONMENT AND CHRONOLOGY OF THE GRAVETTIAN TECHNO-COMPLEXES IN THE EASTERN EUROPEAN LOESS BELT

*Haesaerts, Paul (Royal Belgian Institute of Natural Sciences, Vautier street 29, 1000 Brussels, Belgium) paul.haesaerts@naturalsciences.be*

*Koulakovska, Larissa (Museum of Archaeology, Institute of Archaeology, Ukrainian Academy of Sciences, Kiev, Ukraine)  
Gerasimenko, Natasha (Department of Earth Sciences and Geomorphology, University of Kyiv, Ukraine)*

*Damblon, Freddy (Royal Belgian Institute of Natural Sciences, Vautier street 29, 1000 Brussels, Belgium)*

*Usik, Vitaly (Museum of Archaeology, Institute of Archaeology, Ukrainian Academy of Sciences, Kiev, Ukraine)*

*Pirson, Stephane (Royal Belgian Institute of Natural Sciences, Vautier street 29, 1000 Brussels, Belgium, & Service Public de Wallonie DG04, Namur, Belgium)*

*Nigst, Philip R (Division of Archaeology, Department of Archaeology and Anthropology, University of Cambridge,*

*Cambridge, UK, & Department of Human Evolution, Max-Planck Institute for Evolutionary Anthropology, Leipzig, Germany) prn25@cam.ac.uk*

In Central and Eastern Europe the chronostratigraphic record for the period between ca. 33,000 and 10,000 uncal BP was based during the last decades on the pedo-sedimentary signatures of long loess-palaeosol records related to pluristratified Upper Palaeolithic sites: mainly Willendorf II and Dolni Vestonice in the Middle Danube Region, Mitoc-Malu Galben, Molodova V and Cosautsi in the East Carpathian Area. In this time-span more than 15 positive climatic events marked by humic horizons grading from para-rendzina type to incipient humic soils, were recorded and chronologically positioned on the ground of long series of consistent radiocarbon dates from Groningen and Oxford laboratories. Within this system, on both sides of the Carpathians, the full development of the Gravettian techno-complexes has been recorded between 27,500 and 23,000 uncal BP, with some evidence of Early Gravettian around 30,000 BP. Here we will discuss complementary datasets gained recently in the Middle Dniester valley (Ukraine), which provide new insights on these topics. The first one deals with the Dorochivtsi III loess-palaeosol sequence recorded along the Dniester, north of Chernivtsi. Excavated since 2007, the site has given access to a 10 m thick loess body preserved on top of the first terrace. The lower part of this record contains six Gravettian cultural layers dated between 22,300 and 20,500 uncal BP; it is overlaid by a set of five loess layers alternating with humic horizons related to short interstadial episodes, capped by a 3 m thick homogeneous loess cover. The Dorochivtsi III sequence fits in with the renewed loess-palaeosol successions recorded recently at Molodova V, Korman 9 and Mitoc-Malu Galben, making the link between the Late Gravettian and the Epigravettian occurrences of the East Carpathian Area. The Dorochivtsi III sequence further provides a high-resolution palynological record complementing the pollen sequence established at Molodova V. Both pollen sequences provide a unique vegetation record, which demonstrates the persistence of a forest-steppe along the Dniester valley during the short interstadial episodes between 32,000 to 17,000 uncal BP. This record allows a direct comparison between the East Carpathian loess-palaeosol sequence and the well-dated lacustrine pollen sequence of Tenaghi Philippon (Greece) and further reinforces the proxy-correlation with the Greenland ice record.

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ORAL

## 5. KOSTENKIAN STONE INDUSTRY.

*Lev, Sergey (Institute of Archaeology RAS) zaraysk@yandex.ru*

Kostenkian lithic technocomplex was discovered more than 100 years ago. The main majority types of tools were detected and well described from typological point of view. Some definitions were corrected in the middle and 2-nd part of XX century when Avdeev site was discovered and wide area excavations in Kostenki took place. A new rich material appeared in 1990-th and later after start of Zaraysk site regular excavations. Blade production analysis was made also in late 1990-th and actual till nowadays. What can be added to the type-list that exists for such a long time?

After the analysis of about 100 000 stone artefacts from Zaraysk with a detailed description and statistical analysis of the assemblage some new ideas and types of tools appeared. Zaraysk now represented as a complex of closely related inter-stratified sites. One of them Zaraysk B contains single homogenous habitation level with clear zones of knapping, technological sequences. Using the refitting method it was possible to find the spatial links between various features of cultural layer. Some of them reflected the tools production and further rejuvenation. Some showed blade production stages. It gave a possibility to add one more technological aspect to material seemed to be well-known for a long time. As far as Zaraysk site inhabitants had no need in economy of flint, they didn't use all possibilities of volume of flint tool to make numerous rejuvenations as it was in Kostenki I and Avdeev. So we have many examples of tools on different stages of utilization which is helpful for proses of reconstructions. Only few very typical for other sites reduced tools of shortened proportions were found. As well Zaraysk contains cores that represent all stages of reduction (while the other sites contain much higher percentages of heavily reduced cores).

The lithic artefact assemblage from Zaraysk (excluding small debris) contains a relatively high percentage of tools: 10.46% of the total. Such a high percentage (10-12%) is typical for major settlements of the culture. The complex of Kostenki knife, shouldered point, leaf-shaped point and backed bladelets is typical for Kostenki-Avdeev culture and wider for the sites of the "Eastern Gravettian" tradition of the Central and Eastern Europe. But in fact other categories and their percentage in collection can also be informative for cultural definition. Kostenki knife technology has been studied in detail that gave an opportunity for valid comparison with other European materials.

All of the diagnostic stone tool types of the Kostenki-Avdeev culture are present at Zaraysk. Some differences may be accounted for by the close proximity of Zaraysk to the sources of lithic raw material, reflected by the primary production that took place at the site. Among cultural layers of Zaraysk site there is no difference in technology of flint knapping, blades and tools production except one category – backed bladelets. It shows a high stability of cultural traditions in stone industry over a long period from 23 000 up to 16 000 years B.P.

ORAL

## 6. LITHIC TECHNOLOGY VARIABILITY AND HUMAN ECOLOGICAL ECODYNAMICS DURING THE GRAVETTIAN IN SW IBERIAN PENINSULA.

*Marreiros, Joao (FCHS. Universidade do Algarve) jmmarreiros@ualg.pt*

*Bicho, Nuno (FCHS. Universidade do Algarve) nbicho@ualg.pt*

*Gibaja, Juan (IMF. CSIC) jfgibaja@gmail.com*

The origin of Gravettian industries in Eurasia is associated with climatic oscillations that had a major impact on hunter-gatherer ecodynamics, reflected on technological variability. Such variability is undoubtedly portrayed by the development of a techno-cultural polymorphism, from which, different morph-types have been associated with distinct chronological phases and ecological/regional territories where such Gravettian regionalisms are recognized.

In SW Iberia, the Gravettian industries are associated with one of the oldest evidences for Anatomically modern humans c. 33 ky calBP, and is seen as an important step for the regional Upper Paleolithic cultural tradition setting. Traditionally the expansion of Gravettian industries

in Southwestern Iberian Peninsula has been seen as a uniform process, characterized by minor regional differences and no diachronic technological changes. However during the last decade, new data show that this idea is probably unlikely due to new lithic technological data.

This paper reviews lithic technology, tool design variability, settlement patterns and chronology during the Gravettian in SW Iberia. A new model show that the H3 climatic crisis was responsible for the human expansion that led to new environmental adaptations, reflected on new subsistence strategies, cultural and stylistic regional boundaries from a diachronic and regional scale, likely related to local and regional ecological human ecodynamics.

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ORAL

## 7. LE NIVEAU GRAVETTIAN DU SITE STRATIFIÉ DE CANOLLE FERME (CREYSSE, DORDOGNE)

*Ortega, Iluminada (Inrap) iluminada.ortega@inrap.fr*  
*Bourguignon, Laurence (Inrap) laurence.bourguignon@inrap.fr*

Le secteur de Barbas/Canaule sur la commune de Creysse est connu depuis de nombreuses années pour sa concentration en sites archéologiques. Sur un rayon de 300m une mosaïque d'occupations stratifiées tel les Barbas (I, II, III et V), les Rigoux et Canaule II, auxquels s'en ajoutent d'autres de localisations plus incertaines ayant seulement fait l'objet d'investigations ponctuelles (Canaule locus 3, 4 et 5, Canaule I, Canolle 2 et Barbas IV). Le gisement de Canolle la Ferme se situe dans ce secteur, en bordure du plateau de Pécharmant surplombant la vallée de la Dordogne situé à plus de 30 m contre bas. Le site comporte six niveaux archéologiques de période, densité et extension différentes : deux niveaux moustériens, un niveau châtelperronien, un niveau gravettien et deux niveaux Paléolithique supérieur final.

Le niveau Gravettien a livré trois concentrations de vestiges. Une des concentrations est composée principalement de nucléus de grand gabarit (dépassant parfois les 45 cm). Un des nucléus présente toutes les caractéristiques décrites pour les nucléus Canauliens (Guichard et al. 1989) issus des sites de Canaule I et de Troche sur la commune de Creysse. Il s'agit de nucléus qui présentent une construction volumétrique proche de celle définie pour le Levallois : la surface la plus large du nucléus est préparée par des enlèvements « partant des bords, convergeant vers l'axe longitudinal

du nucléus et développant une crête axiale basse... » à l'aide d'un percuteur de pierre. Cette surface de débitage est opposée à une surface de plan de frappe, aménagée au percuteur dur, beaucoup plus oblique donnant un profil global « naviforme » au nucléus (pour reprendre le terme des auteurs précités). Des lames unipolaires régulières sont ainsi obtenues de part et d'autres d'une première lame dite à « crête basse » très proche tant d'un point de vue morphologique que technologique d'une lame Levallois I. L'association de ce type de nucléus Canaulien avec des nucléus classiques du Paléolithique Supérieur et de nombreuses lames avait incité les auteurs à proposer son attribution à la transition entre la fin du Paléolithique moyen et un « Aurignacien débutant » ou un « Périgordien naissant ». Les fouilles récentes (2012) permettent de recadrer plus précisément cette chronologie. Ainsi, le remontage d'un éclat de préparation de plan de frappe compris dans une des deux autres concentrations avec le nucléus Canaulien permet de rattacher ce schéma au Gravettien.

Les deux autres concentrations se composent essentiellement des déchets de production des grands nucléus laminaires, et des outils contiennent également des 2 nucléus lamellaires de type burin de Raysse.

En conséquence, le site de Canolle Ferme constitue un nouvel exemple régional de succession chronostratigraphique s'échelonnant de la fin du Paléolithique Moyen au Paléolithique supérieur. De plus, le rattachement du Canaulien de Canaule I et de Troche au Gravettien, sur la base des données acquises sur Canolle Ferme, permet d'augmenter les occurrences de ce faciès gravettien pour l'heure particulier au Bergeracois.

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ORAL

## 8. LITHIC VARIATION IN THE GRAVETTIAN OF RUSSIA: RESULTS FROM A STUDY OF FIVE BACKED PIECE ASSEMBLAGES

*Reynolds, Natasha (University of Oxford) natasha.reynolds@arch.ox.ac.uk*

The Gravettian lithic assemblages of European Russia form an important and interesting part of the overall European Mid Upper Palaeolithic record. Due to various reasons of history and specific features of the Russian record, it has been difficult to integrate our knowledge of these collections into our understanding of the European Gravettian as a whole. This research seeks to redress some of these problems.

This presentation is based on a typological and basic technological study of backed lithics (including backed bladelets, Gravette points, shouldered points, etc.) from five sites: Kostenki 8 Layer 2, Kostenki 4, Kostenki 21 Layer 3, Kostenki 9 and Khotylevo-2. These backed collections have then been compared with each other and with published collections from Russia and elsewhere. Chronological information forms an important part of the comparisons made here.

Although certain similarities and differences between Russian and other European assemblages have long been recognised, this research brings a new perspective to the collections and connections between them. In particular, this research is re-evaluating certain key lithic type-fossils. Furthermore, a new perspective is given on historically stressed similarities and differences between assemblages.

ORAL

### 9. THE NOAILLES GRAVETTIAN OF THE RIPARO MOCHI (BALZI ROSSI, ITALY): A TECHNOFUNCTIONAL APPROACH.

*Santaniello, Fabio (Università degli studi di Trento) fabio.santaniello@unitn.it*  
*Grimaldi, Stefano (Università degli studi di Trento) stefano.grimaldi@unitn.it*

The well-known Italian site of Riparo Mochi (Balzi Rossi, Grimaldi caves) provides a complete stratigraphic sequence of the Upper Palaeolithic. In this paper, we present the lithic assemblage coming from the Noailles Gravettian (Unit D). The location of the site is fundamental to analyze the diffusion of the Gravettian in the Italian peninsula.

The Balzi Rossi area is in a narrow corridor, named as the Liguro-Provençal Arc, that should have been a natural axis channelling the circulations of both humans and animals between central Italy and Southern France. Lithics (layer f3, dated to 24600 ±100 14C) have been analyzed in order to reconstruct raw material procurement strategy, reduction sequence, and the function of the artifacts. Results show that the local raw material is the most exploited one but French and central Italy flints were also imported in the site; technologically, the assemblage is characterized by a blade production and it is typologically represented by the presence of Noailles burins; finally, from a functional perspective, a mixture of opportunistic and curated behavior may be seen.

ORAL

### 10. TECHNICAL VARIABILITY INTO THE GRAVETTIAN WITH TANGED TOOLS: NEW RESULTS FROM BELGIUM

*Touzé, Olivier (University of Paris 1 / UMR 7041 ArScAn ; University of Liege) otouze@hotmail.com*  
*Flas, Damien (FNRS / University of Liege) damienflas@yahoo.com*  
*Pesesse, Damien (University of Rennes 2 / UMR 6566 CReAAH) damien.pesesse@univ-rennes2.fr*

Located at the interface between the Paris and the Rhine basins and the more northern territories of Europe, Belgium yield several gravettian occupations, all of which are located in the southern half of the country. The work of M. Otte in the second part of the seventies permitted to inventory eight deposits attributable to the Gravettian, and more than twice sites delivering clues that also evoke this period (Otte, 1979). But the quality of the documentation doesn't always respond to its quantity. Indeed, the analysis of the data is frequently complicated by the antiquity of the excavations conducted in most gravettian sites. The stratified records in karst context are particularly affected by this situation, thus restraining studies on the gravettian chronology in Belgium. This overview is however partly counterbalanced by two open air deposits excavated during the second half of the XXth century, and which benefited of good condition of preservation as well as more modern excavation methods: Maisieres-Canal (de Heinzelin, 1973; Haesaerts & de Heinzelin, 1979) and Station de l'Hermitage (Straus et al., 2000).

These two deposits have often been the object of comparisons highlighting their similarities, both in term of spatial establishment and in term of lithic industry. In fact, their lithic industries stand out by the presence of tanged tools, a typological marker usually associated with the early Gravettian of Western Europe, and also encountered in other Belgian sites, particularly in the Betche-aux-Roches cave in Spy recently studied by two of us (Pesesse & Flas, 2013). If Maisieres-Canal and Station de l'Hermitage might have been described as "sisters-sites" (Straus & Otte, 2000), the recent reappraisal of their lithic industries, henceforth lead us to nuance this proposal.

Our communication will therefore be the opportunity to shed a crossed look on two of the main gravettian sites of Belgium in the light of renewed data on their lithic assemblages, data that we will furthermore compare to the last results obtained on the Gravettian of Spy. New

elements of reflection will in particular be proposed on the variability of technical behaviours within the Belgian Gravettian with tanged tools, as well as on the causes that may be responsible for this variability.

camp, raw materials used, tool-making technologies, and the lithic typology and morphology. It's difficult to say if these differences reflect seasonal, cultural or even genetic differences, but we hope that future research will help us understand these observable dissimilarities.

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ORAL

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### 11. VARIABILITY OF THE LATE GRAVETTIAN LITHIC INDUSTRIES AT SOUTHERN POLAND

*Wilczynski, Jaroslaw (Institute of Systematics and Evolution of Animals, Polish Academy of Sciences, Slawkowska 17, 31-016 Kraków, Poland) wilczynski@isez.pan.krakow.pl*

Kraków Spadzista is one of the most recognisable Upper Palaeolithic site from Poland. Lithic inventory is visibly dominated by local Jurassic flint and includes a large number of double-platform blade cores. There is a significant number of backed blades, shouldered points and Kostienki knives (Kozłowski et al., 1974; Kozłowski and Sobczyk 1987; Sobczyk 1996). The proportions of shouldered points varies in different zones of Kraków Spadzista—the highest number of that tool class is observed in the trench with a mammoth bone accumulation (Wilczyński et al., 2012). The long history of research which has resulted in numerous studies concentrated on technology and typology of lithic artefacts, taphonomy of Pleistocene fauna, and chronology of the Gravettian settlement, allowed until recently considered this locality as “benchmarks” for Polish Gravettian.

This situation was changed after discoveries of Jaksice II site (Wilczyński et al., 2014). On this site raw material, brought to the site in the form of small nodules of erratic flint, were worked in the camp. Blanks were obtained mainly from single-platform blade cores, characterised by a careful preparation of the striking platforms and regularization of the flaking edge. Retouched tools produced mostly on blades account for more than a fifth of the whole inventory. Another characteristic feature of this tool assemblage is the absence of shouldered points (except for a single atypical specimen) and Kostienki knives, and the high percentage of endscrapers. The presence in the backed tool group of distinctive rectangles which have both their ends modified by semi-abrupt or flat retouch, always on the ventral side (Late Gravettian rectangles), is also worth noting.

Now, on the basis of the both inventories we can assume that in the period between 24,000-20,000 yrs BP at the southern Poland various human groups operated. The comparison of Jaksice II site with Kraków Spadzista reveals evident differences, especially in the siting of the

# B27 Megalithic biographies?: cycles of use and closure

Organiser: Manuel A. Rojo-Guerra, Chris Scarre and Cristina Tejedor-Rodríguez

Thursday 4th (9:00-13:30 to 15:00-19h30)  
B27 Meeting Room



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ORAL CONTRIBUTIONS

ORAL

**1. PUNCTUATED STAGES OF MEGALITHIC CONSTRUCTION: FROM BARROWS CHRONOLOGIES TO SEDIMENTS**

*Mañana-Borrazás, Patricia (Institute of Heritage Sciences (Incipit), Spanish National Research Council (CSIC), Spain) patricia.manana-borrazas@incipit.csic.es*

*Criado-Boado, Felipe (Institute of Heritage Sciences (Incipit), Spanish National Research Council (CSIC), Spain) felipe.criado-boado@incipit.csic.es*

*Ferro-Vázquez, Cruz (Institute of Heritage Sciences (Incipit), Spanish National Research Council (CSIC), Spain) cruz.ferro@incipit.csic.es*

*Martínez Cortizas, Antonio (Departamento de Edafología y Química Agrícola, Facultad de Biología, Universidad de Santiago de Compostela) antonio.martinez.cortizas@usc.es*

Archaeological excavations carried out in Galicia (NW of Iberia) during the last 15 years, have shown that megalithic barrows had a complex and long-standing life. Not only in terms of later uses and reuses (something that has been already acknowledged in bibliography since many years) but also in terms of construction and 'megalithic' use. Today, we can assume that barrows life was not so simple as: construction, use and abandonment. Rather, barrows could be easily compared, for instance, to Christian churches, that once build up were permanently used and rebuild, their 'form' becoming either the expression or the result of a permanent negotiation between social and materialization processes.

In this contribution, we review the empirical data from different well characterized barrows, such as Romea (with recognizable phases of rebuilding or use dating to 5920 – 5660calBP, 5320 – 5030calBP and 4970 – 4790calBP) and Forno dos Mouros (with a long time-span punctuated in 6510-6300calBP and 5070-4850calBP). From these data, we propose a hypothetical sequence of specific periods of building, use and rebuilding which we relate to social processes occurring on increasingly complex and progressively more unequal communities, even with changing individual identities.

This hypothesis is contrasted with a large collection of C14 dates of Galician megaliths. Based on this, we propose that the traditional assumption of a continuous monumental activity from ca. 6,500 to 4,500 cal. BP should be revised since a discontinuous series of building activity

and use is a more likely explanation for the chronologies. Activity seems to have been circumscribed to particular periods of monumental building, interspersed with long periods of inactivity, perhaps not shorter than a few centuries (200-300 years).

We suggest that this interpretation may also apply to other megalithic European regions. Therefore, the research agenda on Megalithism should incorporate this topic in future investigations as it may demand a change in excavation strategies. In order to reconstruct the formation processes, we propose a methodological approach aiming to implement the techniques of stratigraphic excavation and the chemical and pedological characterization of the sediments in megalithic archaeological contexts. Ultimately, our proposal is to treat barrows as paleoenvironmental archives.

ORAL

**2. MEGALITHIC MOUNDS AND BUILDING SOCIAL PRACTICES OF IDENTITARIAN NATURE IN NORTHERN PORTUGAL**

*Sanches, Maria de Jesus (Research Center in Archaeology, Arts and Cultural Heritage (CEAACP) and Faculty of Arts- Porto University-Portugal (FL-UP Portugal) mjsanches77@gmail.com*

In this communication we will discuss the process of building-use-condemnation of "the building" mound in the context of social practices of Neolithic societies.

Such procedures promote community cohesion but at the same time legitimize social differences. And, thereby, every monument has a specific biography because it responds, in space and time, to the social and political purposes or functions with which it was created (and not infrequently reworked during later times).

The paradigm that guides us is that the construction-use-their condemnation of the tumuli and its megalithic component (if any) should be interpreted as a practice of "use" tout court.

Since this analysis finds support in case studies, some examples of monuments excavated during recent decades in the North of Portugal are focused.

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ORAL

### 3. APPLICATION OF THE BUILDING ARCHAEOLOGY ON THE MONUMENT OF CARN (PLOUDALMEZEAU, FINISTÈRE, FRANCE): UPDATING OF ITS BIOGRAPHY

*Cousseau, Florian (Phd student, Université de Rennes 1 - UMR 6566) florian.cousseau@gmail.com*

Without methodology to study them, the conserved elevations of the megalithic monuments are usually underused to define the biography of these architectures. By the time of its discovery, a tumulus is only visible in its final state, yet the study of the elevations could allow to apprehend its construction's chronology and reconstitute its different states. The biography of a megalithic monument is punctuated by two cycles of construction that must be defined: the phases and sequences.

Studying the elevations can be done only with an appropriate methodology which is the building archaeology, currently most often used for the historical periods. The first attempts of application on the megalithic architectures have been made on the tumulus C of Péré at Prissé-la-Charrière (France) under the direction of Luc Laporte and with the collaboration of Isabelle Parron. The results being conclusive, these attempts are now expanded at other monuments in Brittany within the framework of a PhD called: *The neolithic tumulus with chamber covered by corbelling in West of France*. The works carried out as part of this PhD and applied to the monument of Carn are presented here.

The tumulus of Carn, known since the beginning of the XX<sup>th</sup> century, has been half excavated and restored by Pierre-Roland Giot during the 60's-70's. An architectural chronology with several monuments has been revealed to the excavators thanks to the significant conservation of the elevations. The monograph published in 1987 states a three phases chronology which has essentially been based on the material found in the chambers. For the past 30 years, the knowledge of the different kinds of architectural modifications on the megaliths in western France have progressed a lot, allowing Roger Joussaume and Luc Laporte to update this chronology for the colloquium of Bougon. Three phases are kept with a circular cairn of 6 m diameter for the first, a quadrangular intermediate monument and another circular cairn of 30 m diameter for the final state. Consequently, a study of the elevations with the use of the building archeology has been engaged to precise the modalities of this phasing, to add its sequences of construction and to

reconstitute virtually the states of the monument at each phase. Those new data give us an updated view on the tumulus concerning its construction, its implantation in the landscape and its aim for each neolithic phase. They also enlighten us about the quality of the builders, their organization and about the choices of restoration applied to the monument.

Studying the elevations applies as well on monuments during excavations as already excavated and restored. Thanks to an appropriate methodology, both cases allow us to acquire new knowledge on the biography of the megalithic architectures and especially on its different cycles and their modalities.

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ORAL

### 4. "MEGALITHIC BIOGRAPHIES": A PROPOSAL FOR THE STUDY OF THE CYCLES OF USE ON THE MEGALITHIC RECORD

*Tejedor, Cristina (Arcadia-Fundación General de la Universidad de Valladolid (FGUVA) tejedor.cristina@gmail.com*

Traditionally, studies of the megalithic phenomenon have focused on its foundational phase and the primary use of the monuments by the original builders of these big monuments, interpreting them as the result of a single event, without considering the successive phases of construction that may have occurred. Modifications made after the construction of a monument were read in terms of deterioration or later intrusions. However, the archaeological record shows that such acts are not occasional but recurrent, and also that the events of abandonment and destruction of the megaliths are unusual.

The "biography" of the megaliths is a complex superimposition of various reconstructions, removals and reuses accompanied by changes in both function and meaning. These 'post-foundational uses' can be documented by a wide range of archaeological events, such as destruction by fire, increase of the size of the mound, dumping of stone or soil to close down access, adding new architectural elements or reordering of the burial area, among others. However, archaeological documentation of these processes is often difficult or even impossible to attain because, in many cases, the modification or reconstruction of the monument entailed the destruction of older structures. With an appropriate archaeological methodology for studying

and classifying these practices from a diachronic approach, it is possible to define the "life-histories" of megalithic monuments and to obtain a global view of its constructional and/or destructive development.

Therefore, the traditional concept of the megaliths as constructions constrained to the Neolithic period is outdated, and now we see them as places which have played an important role in each of the societies that have coexisted with them in their environment. The changes in its internal and external space are "physical" evidences of all reinterpretations and reinventions of the megalithic monuments along time, whose study is fundamental to unravel the "history" of these places and of the people who used them. Then, these constructions are the final result of a long sequence of "cycles of use" and interventions by different users.

This presentation aims to approach this phenomenon from a specific theoretical and methodological framework, and present some characteristic examples of megalithic monuments in the Douro valley, in which different structural changes with a chronology between the 4th and 2nd millennia BC have been documented. The main goal is to discuss the interpretative implications of this type of archaeological events, whose presence and/or absence could establish different uses and meanings in the life of a monument, reflecting various social, economic and ideological transformations within the wider society that used them.

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ORAL

## 5. PATTERNS OF MONUMENTALIZATION IN THE MEGALITHIC TOMBS OF NORTH-WESTERN IBERIA

*Vilaseco Vázquez, Xosé Ignacio (Grupo de Estudos para a Prehistoria do NW Ibérico. Departamento de Historia I. Universidade de Santiago de Compostela) ignacio.vilaseco@usc.es*

Not too long ago it was upheld that megaliths in the north-west of the Iberian Peninsula (Galicia and Northern Portugal) had not undergone processes of monumentalization, namely an enlargement of the monument in successive stages throughout time. Instead of this, as certain places kept their funeral use for centuries, new tombs were built next to the previous ones, building up cemeteries.

That conception had several reasons, not the less important the archaeological record itself: North-

western monuments are all round-barrows with the funeral chamber in the center, so it is almost impossible to appreciate without excavation processes of transformation that can be glimpsed in other places where monuments of different forms existed together. Moreover, mounds cluster in cemeteries of apparently similar monuments that, once excavated, display chambers with an important polymorphism, even when they are coeval.

Scholars' attitude was relevant too: On the one hand, there was not a reflection on the way mounds were used in prehistory or the need of maintenance of an architecture done with earth and dry stone, the more so in tombs employed for more than 1.000 years. On the other hand, open-area excavations were scarce until the last decade of the 20th century, and the trench system used previously made it difficult to identify structural modifications.

The situation has completely changed in the last 25 years and today we have examples of North-western mounds that underwent processes of transformation in his architecture. Although there are many unpublished excavations, we can distinguish by now two main monumentalization patterns, one eccentric and another more or less concentric.

The eccentric pattern seems to be restricted to passage graves, as some of them were built next to a smaller mound with a polygonal chamber, as in Dombate. This is in fact a superimposition of different structures, in which the later megalithic chamber is placed beside a pre-existing mound, that is covered by the barrow of the new construction. Sometimes the older chamber seems to be emptied or even destroyed.

Concentric modifications seem to take place in different other kind of mounds, with no examples known yet in passage graves. Three models can be recognized:

Increasing the diameter and/or height of a mound that continues active, with the interpretative problem that it could be also a phase not distant in time of the same constructive process.

Raising the mound to seal definitely a tomb.

Building of a mound to seal an originally open-air architecture in stone or wood.

In view of these recent discoveries, we can point out that the building of many North-western mounds is far from

a feat frozen in time but rather a, sometimes, complex an protracted process. Also, we recognize the mound as much more than just part of the tomb, having in fact a polysemic meaning.

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ORAL

## 6. BIOGRAPHY SNAPSHOTS OF MEGALITHIC TOMBS IN ALENTEJO, PORTUGAL

*Boaventura, Rui (UNIARQ: Center for Archaeology of the University of Lisbon; FCT: Foundation for Science and Technology; Municipality of Odivelas) rui.boaventura@campus.ul.pt*

*Mataloto, Rui (UNIARQ: Center for Archaeology of the University of Lisbon; Municipality of Redondo) rmataloto@gmail.com*

Given the objectives of the session an overview of several megalithic tombs will be conducted. Although systematic excavations of tombs are rare in the Alentejo, based on the available information the authors will present snapshots of different cases attempting to discuss their respective biographies, highlighting how landscape has been build and rebuild around them, as marks of temporality.

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ORAL

## 7. MEGALITHIC NARRATIVES: SEQUENCES, RATIONALITIES AND REGULARITIES IN THE NW IBERIAN PENINSULA

*Vázquez-Liz, Pablo (Universidad de Santiago de Compostela) pvliz@hotmail.com*

*Prieto Martínez, M. Pilar (Universidad de Santiago de Compostela) mpilarprietom@hotmail.com*

Since the early 20<sup>th</sup> century a large number of tumuli have been excavated in Galicia, mainly with megalithic chambers, only a small number of them have been fully excavated and published in any detail, making it difficult to reconstruct the cycles of use of these types of sites from a diachronic perspective. Despite the limited amount of data it is nevertheless possible to propose a summary of the ways in which these sites were re-used over a long period of time, since the last third of the fifth millennium cal BC until modern times, when they began to be systematically plundered. Obviously it is not possible to refer to a continuous use over this lengthy period of time, but instead to a series of moments in

which we find evidence activity of the communities who frequented and interacted with these highly symbolic spaces, which increased over the millennia.

The information provided by the 9 well-documented examples, some of which are still unpublished and unfortunately quite scarce, make it possible to verify a series of events ranging from the sealing of previously existing tumuli by more monumental structures, or the enlargement of the tumulus, apparently without affecting the funerary chambers, through to the opening of pits that provided access to the megalithic chambers and passages made by Bell Beaker communities to deposit their materials, without any architectural remodelling, and which have only been archaeologically documented in a small number of cases but which could possibly be extended to the monuments where fragments of *bell beakers* have been found, in which the degree of deterioration has destroyed any signs of the presence of these negative structures, or the cuts or openings made around the edges of a large number of Megalithic tumuli, by the communities who were bearers of *wide horizontal rim vessels*, and deposited them in the second half of the second millennium cal BC.

It possible to introduce wider concepts which are complementary but still imprecisely defined, such as conversion into *necropoli*, both internally, by making use of a previously existing funerary space to create another, larger structure, and externally, by spatially associating a monument with a previously existing one, or *monumentalisation* by increasing the size of a previously existing tumulus (internally), or, building a similar structure next to an existing tumulus, with very similar proportions, resulting in them being perceived as a single unit (externally). Although there are only a few examples of this rationality, which still lack datings, they do represent an important new development in Galician megalithic tombs.

The limited number of absolute datings means that in most cases the identification of the construction episodes and uses are based on the ceramic materials they contain, as a fundamental source of information about the use and abandonment of these types of sites. As a result, our aim is to characterise how this megalithic space was used over time, based on a small number of well-documented examples, and supported by other samples from northern Portugal.

ORAL

**8. MEGALITHIC (RE) USES IN THE MEGALITHIC TIMES. ARCHAEOLOGICAL EVIDENCES OF LATE NEOLITHIC NON FUNERARY ACTIVITIES IN THE SPANISH NORTHERN MESETA**

*Villalobos García, Rodrigo (Universidad de Valladolid) rodrigo.villalobosgarcia@gmail.com*

Since one century ago the scientific interest devoted to the megalithic monuments began to materialise in archaeological excavations in the Spanish Northern Meseta. It is curious that by nowadays the number of excavations of these monuments comes about to circa one hundred. The ancient scripts wrote by César Morán and other scholars of these times together with the abundant new archaeological reports offer a good empirical information pack for analysing this prehistoric phenomenon on this area.

Logically, we find that in these megalithic monuments the remains of Late Neolithic people were present, but there are also a lot of evidences that show us the celebration of other activities. There are cases of ossuary manipulations and relic circulation, accumulations of vessels that suggest feast-type ceremonies with (possibly) drug consumption, great fire events and architectural closures. These activities make some of the megaliths an important ideological centre and, also, the focal point of social gathering and labour investment of the Late Neolithic times.

During the last decades many prehistorians have proposed different explanations concerning this phenomenon, in which the symbolic role of these monuments has been always emphasised. They range from viewing the megalithic issue as a way of claiming territories or resources under stress conditions (Renfrew, Chapman) to as the expression of ideological strategy of social control or religious struggle (Shanks-Tilley, Sherratt), and there are even who argues that these stone buildings are the symbolic expression of the collective force of harmonious egalitarian social formations (Lull et al.).

Our aim is to test these hypotheses with the observations made on the previously referred data, as a way to inquire in the social aspects of the very first monumentality process developed in Southwest Europe.

ORAL

**9. THE REUSE OF MEGALITHIC TOMBS IN FALBYGDEN, SOUTHWESTERN SWEDEN.**

*Blank, Malou (departement of historical studies, university of Gothenburg) malou.blank.backlund@gu.se*

This paper will discuss the different types of reuse of the megalithic tombs in Falbygden. Based on new radiocarbon analyses and re-examinations of previously excavated megaliths a multitude of modifications can be seen and various later activities can be traced.

Falbygden, in the inland of Southwestern Sweden, is an important area for the research on Neolithic megalithic graves in Scandinavia. The area has one of Northern Europe's largest concentrations of megalithic tombs. Based on typological studies of chamber forms and pottery, three different types of megaliths have been distinguished: dolmens, passage graves and gallery graves. The calcareous soils of Falbygden have resulted in a large amount of preserved bone material. In this area a high frequency of radiometric dates has been implemented which has improved our knowledge about funeral practices of passage graves. The increasing availability and precision of radiocarbon dates offers new possibilities to study the use and reuse of the different graves. The main focus of research has been the construction and use of the earlier types of megalithic tombs in the middle Neolithic. In Falbygden, as in other parts of Sweden and Europe, the reuse of megalithic graves is a common phenomenon which occurred during numerous periods of prehistory.

This paper aims to highlight the diversity of reuse emphasizing later burials and various types of structural modifications.

The focus in the paper will be on the biography of two different megalithic tombs. This in order to present the diversity of reused megalithic tombs in prehistoric times. The intention of the case studies is also to show the spatial focus of activity within the monuments during different periods. Documentation from already excavated graves combined with spatial and isotope analysis will be used to show that the megalithic tombs were periodically in change and part of the prehistoric present. I will show the distribution of reused graves by applying ArcGIS. The different parts of the grave will be problematized when discussing modifications and later burials. The updated compilation of artefacts combined

with new radiocarbon analyses on human remains enables new information about later burials.

The results show that various types of megaliths have been reused in the whole area and it seems like the graves are used and adapted to fit the prevalent cultural norm. The reuse of megalithic tombs occurs more often than previously thought, with an increased intensity in the Scandinavian Late Neolithic period.

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ORAL

### **10. DECONSTRUCTING CHOUSA NOVA 1: TOTAL EXCAVATION OF A MEGALITHIC MOUND IN CENTRAL GALICIA (NORTH-WESTERN SPAIN)**

*Bóveda Fernández, María José (Gabinete de Arqueoloxía e Xestión do Patrimonio, S. L.) majogabinete@mun-do-r.com*  
*Vilaseco Vázquez, Xosé Ignacio (Grupo de Estudos para a Prehistoria do NW Ibérico. Departamento de Historia I. Universidade de Santiago de Compostela) ignacio.vilaseco@usc.es*

The recent history of Chousa Nova 1 mound (Silleda council, Pontevedra province) was a succession of misfortunes that had seriously damaged the site. That is why its total excavation, in the context of a high-speed railway line construction project, could be considered like a worthy death to end nearly three decades of unstoppable deterioration. Surprisingly, an intact megalithic chamber was found in the battered barrow, together with evidences of a great structural complexity, with different phases both in the constructive activity and the use of the monument.

Nevertheless, the documentation of these phases, achieved mainly thanks to total excavation and removal of the site, also revealed methodological shortcomings with which usually we undertake excavations of burial mounds in North-western Iberia.

At the beginning of the excavation, the existence of a section of the mound, caused by a track, allowed the early detection of a raising of the barrow. This situation clearly directed our efforts in distinguishing the different phases of construction of the monument.

Moreover, total removal of the construction exposed the fitting-out work and ritual use of the site prior to the construction of the monument. Later on, with the control of the removal of the earth in the vicinity of the site, the preparation process of the area and a round ditch surrounding it were detected.

Due to the complete disassembling of the chamber it was also located its big pit foundation, unique for all the slabs. This helped us to understand the constructive technique and the dynamic forces that caused the collapse of the megalithic structure in prehistoric times. Possibly, Chousa Nova 1 offered so much information because it was going to vanish completely. But we believe that it is necessary to reflect on the creation of new strategies and methods that allow us to achieve greater structural information of a megalithic site without leading its complete destruction. Knowledge obtained in rescue archaeology, which normally involves the disappearance of the site, must be applicable to smaller or punctual little impact diggings, seeking the research or the enhancement of burial mounds.

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ORAL

### **11. IN THE SAME PLACE, BUT IS NOT THE SAME THING. "CYCLES OF USE" IN THE DOLMEN OF ARROYAL I**

*Carmona Ballestero, Eduardo (Universidad de Burgos) educarmonaball@gmail.com*

During October 2011 to April 2012 a research team at The University of Burgos conducted an excavation on the dolmen of Arroyal I (Arroyal, Spain). We were looking for information about segmentary societies of river Arlanzón basin. We choose Arroyal I as a case of study because there was a lack of data related to monumental graves in this area. The monumental grave was well preserved and we could document a significant funerary record.

The excavation procedure has followed the stratigraphic principles enunciated by Harris and developed by Carandini. In our opinion this is the right methodology to identify and to understand properly the formation process of archaeological record. This method provides a well-defined sequence of events that have formed the site. The archaeological recording was also accompanied by an absolute dating program that has provided a high resolution data of formation process.

As a result of this study, we documented a sequence of events. Between them it is remarkable an intensive and complex cycle of use during III millennium cal BC. On this regard, stratigraphy and absolute dating have offered a high resolution framework that it allows to argue about cycles of use. According to that, we have identified 3 main phases of use:

Building of the dolmen and first funerary cycle during recent Neolithic (3360-2900 cal BC). There is not too much of original funerary deposits because following modifications almost emptied Neolithic strata. But we have some certain data. Dolmen had a collective and a prolonged (over 400 years) funerary use. Besides, structural elements are well preserved (chamber, corridor and original mound).

Modification of Internal structure and second funerary cycle during Chalcolithic (2500-2400 cal BC): monumental grave probably had consecutive isolated burials in a remodeled chamber. The corridor was filled by rocks and sediment and some of the stones of the chamber were laid down on floor.

Third funerary cycle and modification of external structure during Chalcolithic (2400-2200 cal BC). It was made an isolate pit grave and also the tumulus was increased.

In consequence, the excavation has provided a diachronic relate of events well-fixed in time. This sequence tells us the biography of the grave. First, it was a dolmen, with a collective and long-term use. After that, it suffered a deep transformation not only in its internal architecture also in its funerary ceremonial. Arroyal I turned into a different kind of grave: monumental but non-open, and maybe non-collective. Therefore, data allow discussing the interpretative implications of this different uses. The explanation lies in segmentary social framework and its changes during III millennium cal BC.

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ORAL

## **12. FROM THE TOMB TO A MONUMENT: THE EXCEPTIONAL PROCESS OF TRANSFORMATION OF THE MEGALITHIC GRAVE OF LA MINA (ALCUBILLA DE LAS PEÑAS, SORIA)**

*Rojo Guerra, Manuel Ángel (Universidad de Valladolid) marojo@fyl.uva.es*

*Tejedor Rodriguez, Cristina (Arcadia-Fundación General de la Universidad de Valladolid) tejedor.cristina@gmail.com*

*Garrido Pena, Rafael (Universidad Autónoma de Madrid) r.garridopena@gmail.com*

*García Martínez-de-Lagrán, Íñigo (Universidad del País Vasco (UPV/EHU) igmtzl@gmail.com*

The La Mina megalithic tomb is an exceptional site with no parallel in the whole Iberian Peninsula. It is an authentic ceremonial centre, intentionally placed in

the middle of a plain surrounded by small hills and soft slopes, which formed not only a natural scenario but also were integrated with the monument in a "cultural landscape" for those prehistoric populations in whose mythological world natural elements were crucial.

Since 2008, and financed by the "Dirección General de Patrimonio de la Junta de Castilla y León", the site was excavated during four consecutive archaeological seasons. The systematic and detailed documentation has yielded very interesting data about its constructive sequence and complex architectonic transformations. The bioanthropological analyses (ancient DNA included), which were studied by the Institute of Anthropology of University of Mainz (Germany) under the direction of Professor K.W. Alt, the radiocarbon dates and the magnetic survey also complemented the information about this site.

It is a megalithic monument with two big constructive phases: During the first one (first half of the 4th millennium cal BC) a passage grave was erected, where the chamber (around 4 m of diameter) had a collective ossuary with several grave goods. During the 2<sup>nd</sup> phase the whole stone structure of the tomb was dismantled and the ossuary covered by a small stone mound. An atypical corridor was built inside the previous tomb stone mound, using part of the stones removed from the structure of the first grave, and the whole size (height and diameter) of the stone barrow surrounding the structure increased (an oval barrow of 31 x 22 m.) and small stone wall was built around all of it, enclosing a huge ritual area. A big stone decorated menhir (2 m high) was also erected. Finally around the mid 3<sup>rd</sup> millennium cal BC the tomb was reused by Copper Age populations (Bell Beaker pottery).

The La Mina Barrow is one of the clearest examples of the transformation of a collective grave into a huge funerary monument, through a complex closure process converting this burial structure in a big Neolithic ceremonial centre dedicated to the memory of the ancestors.

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ORAL

## **13. FERMETURES COMPLÈTES, FERMETURES PARTIELLES, CONDAMNATIONS**

*Masset, Claude (Université Paris 10) clmasset@orange.fr*  
*Jagu, Dominique (Comité Archéologique d'Eure-et-Loir) dominique.jagu@wanadoo.fr*

Nous présentons l'évolution de quatre monuments mégalithiques

La Chaussée-Tirancourt, Méréaucourt, Changé, Yermenonville.

Complet and partial closures ; and putting out of use. We submit our conclusions about four megalithic monuments (from middle and late Neolithic) : to the north of the Paris Basin, La Chaussée-Tirancourt et Méréaucourt ; to the south, Changé et Yermenonville. We have identified discreet periods, each one underscored by sterile fillings (i.e. almost without bones) which are more or less thick.

1) Complete but temporary closures, which are onerous operations connected with rearrangements of the monument; those can possibly go all the way to orthostat extractions. Their associated anthropic filling occupies the whole monument, including its annexes (entrance, peripheral couloir, « muche » should the case arise).

2) More inconspicuous but no less important closures, every one being associated with a change in the funerary practices (for instance, a transition from primary to secondary burials). With each one appears a thin anthropic filling, which does not go all the way to the limits of the layer.

3) Two kinds of final closures, or « putting out of use ».

The first one covers the dead and marks the end of the sepulchral use of the monument. It may go with spectacular works, going as far as moving orthostats, and putting heavy covering slabs into position. Notwithstanding the loss of their use as graves, they were afterwards visited through a long period of time.

After several centuries (ca. 2000 BC) a second closure stepped in; it affected no more the dead but the monument. It is final and always goes with a partial destruction. One observes violent fires with orthostat breakings, or the toppling of covering slabs ; a barrow may be put into place.

In those days the monument took the appearance with which we found it.

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ORAL

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#### **14. FILES DE MENHIRS, DOLMENS ET PAROIS CONSTRUITES EN PIERRE SÈCHE : L'EXEMPLE DE LA FAÇADE OCCIDENTALE DU MONUMENT DE BARNENEZ EN PLOUZOC'H (FINISTÈRE, FRANCE)**

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*Laporte, Luc (CNRS - UMR 6566 - Rennes) luc.laporte@univ-rennes1.fr*

*Cousseau, Florian (UMR 6566 - Université Rennes1) florian.cousseau@gmail.com*

Pour mieux appréhender ce qu'est le mégalithisme atlantique de l'Europe néolithique nous avons d'abord été amenés à redéfinir les méthodes d'étude des masses tumulaires construites en pierre sèche. Nous avons également insisté sur l'existence d'un véritable projet architectural soigneusement élaboré qui intègre de nombreux éléments d'une géométrie intuitive, avec par exemple différentes formes de correction optique. Nous avons alors insisté sur le fait qu'il s'agit d'une forme nouvelle, et sans doute un peu illusoire, de domestication du temps et de l'espace. Enfin, il nous avait paru utile de mieux définir les termes de dolmens et menhirs, redonnant alors un peu d'unité à ce qui est désormais traité le plus souvent comme deux champs d'étude distincts.

Au travers de cette contribution, nous nous proposons d'appliquer l'ensemble de ce raisonnement à la façade occidentale du long tumulus de Barnenez. Celle-ci intègre de nombreuses dalles dressées qui renforcent, sur le plan architectural, le pied d'une paroi implantée perpendiculairement à la pente. Les photos d'archives prises au moment de la fouille par l'équipe de P.R. Giot permettent de valider la disposition de chaque bloc au sein d'une façade qui fut restaurée. Alignées sur un même axe, ces mêmes pierres dressées prennent également la forme d'un alignement. Plus étonnant encore, elles se répartissent de façon symétrique de part et d'autres de ce qui, ailleurs, aurait été identifié comme une dalle de chevet.

Il s'agit en réalité du déroulé des dalles présentes les longs des parois de la chambre et du couloir d'un dolmen similaire aux dolmens A et B inclus dans la masse tumulaire de ce même monument. Huit dalles sont ici disposées de part et d'autres de la dalle de chevet, comme à l'intérieur d'une chambre mégalithique. Huit autres pierres au nord, et huit autres au sud, correspondent à celles qui, ailleurs, sont dressées le long du couloir. La disposition comme la morphologie ou la nature géologique de chacune de ces pierres dressées trouve d'étroites correspondances avec celles présentes à un emplacement similaire au sein des dolmens A et B du monument de Barnenez. Des dalles de couverture, qui pourraient correspondre à celles du couloir, ont été disposées au pied de cette façade, formant partie de l'assise de base d'une banquette latérale adjacente. Plusieurs éléments plaident en faveur du emploi des éléments mégalithiques d'un dolmen démantelé.



De tels emplois de dispositifs architecturaux construits précédemment, qu'ils aient été composés initialement des grosses pierres dressées isolément à l'aire libre d'un Menhir, ou de celles assemblées d'un Dolmen, fait partie intégrante du processus de monumentalisation.

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ORAL

### 15. QUILLUSARA, ENTRANCE TO THE PAST. MEGALITHIC PHENOMENON IN ECUADOR

*Sanz González de Lema, Sofía (Universidad Técnica Particular de Loja (Ecuador) ssanz@utpl.edu.ec*

*B. Aguirre, Eduardo. (Universidad Técnica Particular de Loja (Ecuador) ebaguirre@utpl.edu.ec*

*Arèvalo Benito, Héctor (Universidad Técnica Particular de Loja (Ecuador) hbenito@utpl.edu.ec*

*Balcazar, Cristian A. (Universidad Técnica Particular de Loja (Ecuador) cabalcazar@utpl.edu.ec*

*González Ojeda, Diego S. (Universidad Técnica Particular de Loja (Ecuador) dsgonzalez@utpl.edu.ec*

*Simaluiza, Ruth J. (Universidad Técnica Particular de Loja (Ecuador) rjsimaluiza@utpl.edu.ec*

*Sanchiz Álvarez de Toledo, Hipólito (CEU San Pablo de Madrid), hsan.ihum@ceu.es*

*Lorenzo Cueva, Covadonga (CEU San Pablo de Madrid), clorenzo@ceu.es*

*Lorenzo Cueva, Epifanio (CEU San Pablo de Madrid), elorenzo@ceu.es*

In this paper I would like to take the opportunity to present the preliminary results of the research about the megalithic site Quillusara (Celica, South Ecuador). This is a project of the Universidad Técnica Particular de Loja (UTPL) in the Northern Andean. Our first aim is to contribute an interpretation about megalithic site of Quillusara and his context in Ecuador and northern Peru. Quillusara is a megalithic site at 730-650 m. snm, on a hill and near to Quillusara river, this is located at the entrance to Northern Andean. In Quillusara there are alignments, cromlech and "married orthostates" and five stones with rock art with different figures (shaman, geometric, condor and feline mask). The chronology of monument is dark because there isn't excavation and absolute dating, but the Rock Art and his iconography show a chronology from Regional Period (500 a.C-500d.C) to Inca Period (until 1532).

For this project we work with an interdisciplinary method: archaeological, architectural, botanical and artistic. The method of working commences in the collecting published about archaeological site,

paleobotanical and religion pre-Columbus in South Ecuador and North Peru.

We don't make the excavation but our work is about territorial study, landscapes, megalithic architecture and iconography.

Our preliminary results are: we have seen more alignment, one cromlech and new architectural elements: the married-orthostates.

Until today, Quillusara hasn't been studied as architectonic built into the Environment and the Landscape, but our research show than Quillusara is a megalithic monument with architectural harmony and it was an active figure in the formation of the pre-Columbian landscape.

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ORAL

### 16. CYCLES OF USE AND CLOSURE IN THE PASSAGE GRAVE OF EL TERIÑUELO (ALDEAVIEJA DE TORMES, SALAMANCA)

*Rojo Guerra, Manuel Ángel (Universidad de Valladolid) marojo@fyl.uva.es*

*Tejedor Rodriguez, Cristina (Arcadia-Fundación General de la Universidad de Valladolid (FGUVA) tejedor.cristina@gmail.com*

*Garrido Pena, Rafael (Universidad Autónoma de Madrid) r.garridopena@gmail.com*

*García Martínez-de-Lagrán, Íñigo (Universidad del País Vasco (UPV/EHU) igmtzl@gmail.com*

The passage grave of El Teriñuelo is located on the first terrace of the left side of the Tormes River, on top of a small elevation, in one of the most important and well documented megalithic areas of the interior of Iberia (Salamanca Province). The passage grave has a circular chamber (around 4 m. of diameter), a corridor of 7 m. long, oriented to the southeast, all of them surrounded by a stone barrow of around 25 m. of diameter and 2.5 m high.

This passage grave has been extensively excavated first before 1930 by the Padre Morán, then by researchers from the Salamanca Museum in the 80's, mainly on the corridor. Our excavation extensively cleaned and documented the whole tomb, and ended the excavation in the last part of the passage, just to the limit with the end of the barrow.

With our excavation it was possible to document not just the internal and external structure of the stone mound but also to discover several aspects of the complex sequence of use of this burial monument. We could document how the corridor of this Neolithic tomb (4<sup>th</sup> millennium cal BC) was finally sealed during the pre-Beaker Copper Age (first half of the 3<sup>rd</sup> millennium cal BC) with a spectacular deposition of stone blocks, and how during this event pottery offerings were carefully introduced between the stones (accumulations of potsherds intentionally crushed and placed there). This will probably belong to an intentional closure of this collective tomb, clearly a big importance ritual and social event.

We have documented the archaeological remains of a single ritual ceremony where the access to the tomb was closed, a very important social event in the "life" of the megalith, since the current aspect of these monumental graves is always the result of several successive ritual practices along its time of use, ones superposing and hiding the others.

POSTER

POSTER

### **17. THE BIRTH, MATURATION AND DEATH OF SKULL BUILDING FROM THE PRE-POTTERY NEOLITHIC SITE ÇAYÖNÜ TEPEİ IN SE ANATOLIA**

*Bartkowiak, Marta (Institute of Prahistory, Adam Mickiewicz University in Pozna) martabartkowiak86@wp.pl*

The tradition of erecting the ceremonial constructions was a widespread phenomena in the Near East and SE Anatolia which began in PPNA period and existed continuously through all PPNB to disappear suddenly at the end of this period. These structures differed significantly from the domestic architecture and characterized a monumental architectural form, occurrence of various interior installations and decorations (such as bucrania, stone banks, relief decorations and pillars), and presence of human and animal burials. Considering the long-term use of these buildings and their numerous modifications (rebuilding, abandonment, intentionally destructions etc.), there is assumed that their function and role must have been modified through time and those processes must have also reflected a cultural transformation of the first farming communities. Therefore, this paper aims to scrutinize a life- history of one selected structure known as Skull

Building from the Pre-Pottery Neolithic site Cayonu Tepesi in SE Anatolia and offers a new interpretation of their use within the context the phenomena of Near Eastern ceremonial buildings.

The Skull Building was re-analyses from a perspective of the cultural biography of architecture inspired by papers of Igor Kopytoff and Ruth Tringham. This ceremonial structure has been seen as a dynamic and active medium that not only was in a process of transforming itself but might have also shaped social relations and meanings. Thus, the analysis was focused on two aspects: the human activities which modelled this structure (both their form, interior arrangements, and ritual practices undertaken inside it) and the impact of this cult building on its surroundings. Hence, the detailed examination of different phase of usage this structure and spatial arrangements of both the Building and its settlement context were undertaken in order to establish the life history corresponding to distinct social transformations of Çayönü community.

As a result of this analysis, there was possible to distinguish three major stages in life history of Skull Building, which includes Building birth and emergence of its ritual significance, maturation marked by its dominant ritual position and death associated with decline of its eminent role. The birth of the structure as a "funeral home" was inaugurated by the first burial indoors. During the stage of maturation the elaborated cult of ancestors and distinct ceremonial sector of village with Plaza was settled. The death was associated with deliberated burning of the structure and abandonment of this village sector as a consequences of reorganization of social life and rapid cultural and economic transformations

There was proved that the Skull Building was not a result of single event but rather a long chain of various activities and processes. Its social role and meaning was transformed through time in order to respond to the current social needs and its life- history reflected the various processes of this community consolidation, building identity, gradual increase of ancestors cult, tightening of interregional contacts and finally disintegration of the community and possible appearance of some kind of social stratification.

# B28 Technology and the first agro-pastoral societies: ceramic manufacturing and decoration

Organiser: Dragos Gheorghiu, Moustapha Sall, Luiz Miguel Oosterbeek, André Luís Ramos Soares and Jedson Francisco Cerezer

Thursday 4th (09:00-13:30)  
A22 Meeting Room



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ORAL CONTRIBUTIONS

ORAL

**1. GESTOS TÉCNICOS Y PATRONES DECORATIVOS. ESTUDIANDO LA HETEROGENEIDAD DEL FENÓMENO CARDIAL EN EL NOROESTE PENINSULAR (LOS CASOS DEL VALLES Y EL LLANO DE BARCELONA).**

*Breu Barcons, Adrià (Universidad Autónoma de Barcelona) adria.breu@e-campus.uab.cat*

*Gómez Bach, Anna (Universidad Autónoma de Barcelona) anna.gomez@uab.cat*

*García Batalla, Pere (CREM. Centre de Recerques i Estudis Mogoda) pgarcia@acmavolpak.com*

*Molist Montaña, Miquel (Universidad Autónoma de Barcelona) miquel.molist@uab.cat*

The cardial pottery decorative world represents, in the Iberian Peninsula, the first example of a Neolithic symbolic system. In this paper we aim to analyze the decorative structure of different cardial assemblages located in the northeast of the Iberian Peninsula (Caserna de Sant Pau del Camp, in Barcelona; Can Banús and Can Soldevila in Santa Perpètua de Mogoda), all along with a technical gesture exhaustive study

Whereas it has been proposed that pottery in the early Neolithic would have been produced domestically, phenomena in a macro scale like the decorative cardial style seem to indicate the existence of some shared and widely extended ideologies. Our goal is to clear up if any relationship at all would have existed between the characteristic cardial decorative patterns and the technical gestures used to produce it (which indicate different ways of doing, or technical "schools"). We will work with the hypothesis that different technical gestures used for the same decorative motives would indicate distinct potters decorating under a shared interterritorial decorative scheme, while a direct correlation between the technical gesture and the decorative patterns would indicate the contrary, distinct potters using decorative patterns created locally or much more regionally.

In this sense, we will present an analysis focused on the assemblages of two distinct territories. The first one, the Barcelona plain, close to the sea and therefore with good access to the cardial decoration tool source (shells), would be represented by Caserna de Sant Pau del Camp. The second one, the Vallès valley, an interior area separated from the Barcelona basin by the litoral chain and, therefore, with a less easy access to tool

source, would be represented by the Santa Perpetua de Mogoda sites and assemblages.

ORAL

**2. AMAZON GUARANI AND POLYCHROME POTTERY TRADITION: PRODUCTION PROCESSES AND TECHNO-FUNCTIONAL STUDIES.**

*Cerezer, Jedson (Instituto Terra e Memória) jcpithi@gmail.com*

The present work aims to address the issues related to the study and analysis of archaeological ceramic vessels from Southern Brazil related to the archaeological studies of Amazon Guarani and Polychrome Tradition.

In this line of work we will present results of analyses of archaeological collections, archaeological and experimental techno-functional studies of all stages of production, decoration, use of the ceramic vessels and about the abandonment process.

ORAL

**3. THE RITUAL DECORATION OF CERAMIC VASES IN THE CHALCOLITHIC SOUTH EASTERN EUROPE SOCIETIES.**

*Gheorghiu, Dragos (National University of Arts Bucharest) gheorghiu\_dragos@yahoo.com*

In South Eastern Europe the 5<sup>th</sup> millennium B.C. is characterized by a unique flourishing of the ceramic technology. This phenomenon can be explained by the use of new principles of production determined by the social transformations occurring during this period. The ceramic production of this geographical area is characterized by a standardized production of shapes and applied patterns ("decoration"), as well as by a serial production due to the advanced pyro-technology used, which led to the emergence of the sunken up-draught kilns at the end of the millennium. Such a phenomenon could be explained by the rise of a new view on production, which becomes serialized, and therefore creating a new axiological attitude towards ceramics, issued from the ritual character of the technologies implied. For example, the "decoration" of the ceramic vases reveals the use of certain standardized techniques of incision or painting with the help of templates that could be assimilated to ritual operations, due to their immutable character.

To understand the complexity of these technologies, as well as their ritual aspects, the method employed was experimental archaeology. One example would be the description of the ritual functioning of the sunken up-draught kilns as resulting from experiments; another one would be the reproduction of the ritual methods of tracing the patterns on the vases' surface with the help of templates. The paper will present some of the transcultural methods of patterns' tracing, as demonstrated by experiments. The paper will also discuss the mathematical implications of some of the patterns experimented.

All the physical and mathematical results support the idea of a standardized, i.e. ritual, production of the South Eastern Chalcolithic societies, to cite only the use of Bézier curves, mathematical functions with a well-determined structure.

The paper intends to focus the attention on a new dimension of the ceramic production in the Chalcolithic, i.e. the ritual one (as well as "industrial"), trying to illustrate the complexity of prehistoric technologies.

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ORAL

#### 4. "TECHNOLOGICAL STYLE" IN CONTEXT: CERAMIC TRADITION IN NEOLITHIC SARDINIA.

*Gradoli, Maria Giuseppina (PhD researcher in Pottery Technology, University of Leicester) ggradoli@yahoo.it*

In Sardinia since now, local practices of prehistoric ceramic production and consumption have largely remained understudied, or have only focused on stylistic attributes and their use in assessing a chronological typology. Drawing upon the ceramics characterization study of some Final Neolithic burials, ritual sites and a settlement context, the concept of 'technological style' - a sequence composed of a series of choices and actions essential to the definition of the artefact type, and variants arising from choices that have equally valuable outcomes (Lemonnier 1986) - and its implications are used in defining the role of technology as part of the cultural and social environment within which the manufacture process was learned and practised. Alternatives selected by potters, indeed, reflect internalized understanding of traditions generally passed on and preserved from one generation to the next (Gosselain 1992).

Adopting a broad theoretical context, based on both the physical and the social sciences, the process of

pottery manufacturing was studied as follows: 1) under the petrographic microscope considering the '*pottery fabric*' or the arrangement, size, shape, frequency and composition of clay, minerals, and other materials added intentionally to improve the workability and firing performances of ceramic pastes; 2) using the concept of '*chaîne opératoire*' and its individual steps to reconstruct part or the whole sequence of technical, physical and mental actions performed by potters, starting from the way natural resources (clays, sands, rocks, water) were acquired in the area, mixed together in different proportions, fashioned and then physically transformed by the process of firing; 3) the '*raw material provenance analysis*', using analytical and geological approaches, to establish whether the sampled vessels were produced using clays and other naturally or intentionally added materials obtained from the investigated area or far away from it; 4) the '*experimental archaeology*', that provides the opportunity to confirm potential hypothesis and conclusions with multiple trials and repeatable tests in a chemical/mineralogical laboratory and has been used for the reproduction of the ceramic pastes (according with the different proportion of mineral/rock inclusions and clays estimated under the microscope and their comparison with the archaeological ones under study).

The methodology adopted in the present study is starting to shed new light, in the Neolithic sites under study, on the role of technology as part of the cultural and social environment within which the manufacture process was learned and practised. Moreover, social groups whose presence was, up to now, largely invisible can be detected by distinctive patterns in pottery technology, and recognised within the wider landscape. The experimental archaeology too, due to the fact that ethnographic traditions are rarely present in the Island, proved of great help in reconstructing the ancient manufacturing processes.

In Sardinia since now, ceramic studies have mainly focused on stylistic attributes and their use in assessing a chronological typology. The application of the concept of technological style, supported by the 'experimental archaeology', informed on the communities of practise of Neolithic Sardinia and their role in shaping social structures and ritual behaviour.

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ORAL

## 5. NEOLITHIC POTTERY FROM THE LJUBI-EVA CAVE (ISTRIA, CROATIA).

*Percan, Tihomir (Croatian Conservation Institute)  
tpercan@h-r-z.hr*

Due to exceptional geographical position on the crossroads of ancient paths, the Istrian peninsula was an important link between east, west, north and south ever since the prehistoric times. The Ljubi-eva cave is situated in southern Istria (Croatia) near the village Marana and only 15 kilometers east of Pula, the peninsula's largest city. The cave itself is positioned on the bottom of a large sinkhole, making itself almost unnoticeable in the peaceful landscape. Sinkholes are very common in a karst region such as Istria. In the area around the Ljubi-eva cave there are many other recorded caves and pits. One of the most important Late Paleolithic sites in the northern Adriatic, the Šandalja cave, is also situated nearby. Since 2008 to 2011 archaeological excavations were carried out in cooperation between Musée d'Anthropologie préhistorique de Monaco (Principality of Monaco) and The Croatian Conservation Institute (Croatia).

Four trenches were excavated: two in the deepest part of the cave, one in the largest hall and another one in a smaller room. The trench in which we found the most significant number of finds and other archaeological data was the one in the smaller room. The entire excavated sediment was carried to a secondary location where the water sieving and flotation were carried out. The large and small fractions were later analysed in a laboratory. The reason for this rather complicated chain of actions was very moist and wet sediment and the lack of daylight, making it very difficult to notice all the findings. Using these methods, we collected and analysed a large number of valuable data related to nutrition, husbandry and lifestyle.

By collecting all the scientific research, we were able to reconstruct that the cave was continuously in use from the Epigravettian until the Bronze age. This thesis was confirmed with radiocarbon dates (C14) and the archaeological material that can typologically be placed in the mentioned periods. Recorded findings, specially ones from the Neolithic period, implied that the cave was intensively in use during this period. A large number of pottery fragments were nicely decorated with different motives and ornaments characteristic for the cultural phenomena from Early, Middle and Late Neolithic making it the period of the most intense usage of the cave.

With this oral presentation we will put the focus on the Middle Neolithic (Danilo culture) pottery and its ornaments (S shaped decoration, different spiral motifs, incrustation). We will try to compare this material with the similar ones from the Mediterranean. Furthermore, laboratory analyzed pottery and ornaments are showing the significance of this multidisciplinary kind of approach to archaeology and pottery. With this kind of experiments, interesting results were collected. It wouldn't be possible without good cooperation of archaeologists and the laboratory where the analysis was held (*Metris*, Pula, Croatia). We also emphasize the significance of the modern technology and methods to improve and advance knowledge connected to technology and production of pottery during the archaeological periods.

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ORAL

## 6. GUARANI INDIANS: WOULD IT BE ARCHAEOLOGIC DIVERSITY IN CERAMIC POTTERY AN ETHNIC PARAMETER?

*Ramos Soares, André Luis (UFMS) alrsoaressan@gmail.com*

Guarani Indians are the most well studied tribe in South America. They had occupied a territory that goes from the country currently called Paraguai down to Argentina, spreading themselves through the Brazilian States of Mato Grosso, Mato Grosso do Sul, Sao Paulo, Paraná, Santa Catarina and Rio Grande do Sul, totalizing an area of more than 2.000 km from north to south and even more 1000 from east to west. Many tribes called Guarani shared common language, culture and a mythological corpus in such a vast territory. The aim of this paper is to analyze the painting patterns on pottery so the regional variations can be observed and contrasted with historical and ethnographical, searching for elements that aid a construction of knowledge from different Guarani partialities in pre-historical periods.

To observe painting patterns, the area and the form of the vessels from the analysis of ceramic paintings of archaeological vessels assigned to Guarani. Further, to relate the archaeological sites to the Brazilian regions where there is historical information about Guarani Tribes. Comparing the paintings, the patterns and their location, to observe the over position and the exclusion of graphics of spatial features, aiming consequently the determination of specific uses to their ethnical territory.

It has been observed that there are repetitive painting patterns all over the publishing related to Guarani

ceramic paintings. The circle motifs, Greek, scrolls and parallel winding or diagonal lines are recurrent in all known vessels. From one's perspective, in many records there is no relationship between the painting and the place that it occupies in the vessel, preventing a deeper understanding of the study, given that certain subjects may be associated with the location of the vessel as "shoulders", "waist" lip or bulge or inside. The absence of this areas determination where the graphics are located might become a limiter of interpretative hypothesis regarding the search of the spatiality occupied by these ethnics, once these graphics are mostly recurring. From another's perspective, we observe some samples exclusive to area, what might indicate that there are, indeed, painting motifs more recurring than others according to each group territory.

Painting over archeological ceramic from horticulturist Guaranis groups is far from being finished. The creation of subsistence models (Noelli, 1993) and their social organization (Soares, 1997) have dealt with the reconstruction of a generic Guarani Indians, in whom various information are valid and relevant, however without realizing that distinct existing biases in the past. Tochetto (1996) and Lima (2008) recent studies suggest that this topic is not exhausted. Punctual sites analysis either helped to clarify the these territories limits, posting that ceramic painting might add elements which may contribute to the determination of spatial limits of past indigenous territory.

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ORAL

## 7. LIFE, DEATH AND RESURRECTION: RECYCLING MATERIALS IN POTTERY-MAKING

Vidal, Aixa (UCM) [aixavidal@gmail.com](mailto:aixavidal@gmail.com)

Padilla Fernández, Juan Jesús (UCM) [juanjpada@ucm.es](mailto:juanjpada@ucm.es)

When considering the manufacture of any kind of vessel, we imply not only the material elements and the techniques used, but also a complex symbolic universe intimately connected with it. The conceptual tool of the *chaîne opératoire* offers the appropriate background to discuss this close connection. However, it has traditionally been defined as a straight process, always moving forward, incorporating new elements to the sequence which are merely considered as raw materials. Regardless of their nature, we noticed that several of these materials had already been used and discarded in daily activities to be later incorporated in the pottery-making process. In this way, they are embodied with

new meanings which trespass the simple idea of raw material. Due to the recycling process they are involved in, these two seemingly opposed concepts, waste and new pottery, are redefined as a unique entity defined by their material correlates inasmuch their social value.

Three different and complementary methodologies were followed to record recycling in pottery-making: on the one hand, the analysis of archaeological pottery from different cultural periods reported the use of several materials (ashes, crashed bones, pottery sherds, animal by-products) which had certainly been active in different domestic and productive process to end up as waste.

Complementary, some experiments were carried out incorporating these elements in the modelling clay and/or using them for pottery-making so as to test their properties and visualisation. Finally, the direct observation of traditional potters' work as well as the revision of ethnoarchaeological literature revealed the actual use of these materials along the *chaîne opératoire*.

The experiments showed distinctive compositions which were similar to the ones found in archaeological specimens. Moreover, the observation of the potters' environment highlighted that a series of related activities take place together with the potter-making process, some of them with material correlates which may be traced in fabric composition.

We discuss the concept of "waste" as a final stage in the biography of any object. In the case of the pottery-making process, as probably happens in most of everyday activities, it is clear that not only what is conventionally called waste participates in the manufacture but it is also assigned new meanings. As exemplified in the case of pottery-making, it is necessary to change the traditional view which considers any production as a linear sequence to evidence the several back and forward movements present in the process which ultimately define the wider interconnected context of social life.

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POSTER

POSTER

## 8. ARCHAOMETRIC INVESTIGATIONS ON GUMELNI A CERAMIC PIGMENTS

Bugoi, Roxana (Horia Hulubei National Institute For Nuclear Physics And Engineering, Magurele, Romania) [bugoi@nipne.ro](mailto:bugoi@nipne.ro)

*Haita, Constantin (Muzeul National De Istorie A Romaniei, Bucuresti, Romania) costel\_haita@yahoo.com*  
*Popovici, Dragomir (Muzeul National De Istorie A Romaniei, Bucuresti, Romania) mirel\_d\_n\_p@yahoo.com*  
*Sciau, Philippe (Cemes, Toulouse, France) sciau@cemes.fr*  
*Bouquillon, Anne (C2rmf, Paris, France) anne.bouquillon@culture.gouv.fr*

During the Copper Age the South-Eastern region of Europe was the cradle of several remarkable cultures – Petreti, Gumelnita, Slcua, Cucuteni – that produced remarkable painted ceramic potteries. Until now, Gumelnita ceramic paste and pigments has been just occasionally the subject of archaeometric investigations, contrary to Cucuteni culture pottery, which, in the last decades was extensively studied from scientific point of view.

To fill in the gap the nowadays knowledge about Gumelni a painted wares, a set of ceramic shards excavated at Bordu ani-Popin (Ialomi a County, Romania) and attributed to phase A2 of Gumelni a culture were subjected to some scientific investigations aiming at the characterization of the ceramic paste and the identification of the mineral pigments used for the decoration.

Optical Microscopy (OM) observations were focused on the fabric and mineralogy of the ceramic paste, Particle-Induced X-ray Emission (PIXE) was used to determine the chemical composition of both paste and painted zones, while micro-Raman spectrometry and X-ray Diffraction (XRD) led to the un-ambiguous determination of the compounds present in the decorated layers present on some shards.

The pottery paste shows a remarkable variety induced not only by the matrix mineralogy, but also by the inclusion characteristics (nature, texture, frequency and dimensions). The micro-mass includes very fine silty grains of quartz, feldspars, muscovite and some opaque phase grains. The overall texture of the paste was divided into three main groups: very fine (silty clay), medium (silt) and coarse/ medium-coarse grained sand. Inclusions consist mainly in fragments of crushed pottery (grog) and rare quartz sand grains. Occasionally, carbonaceous inclusions, such as shells or limestone fragments and vegetal debris were observed, too.

The analytical results showed that the white color was produced through the application of a calcite - based compound ( $\text{CaCO}_3$ ), while the black colored regions feature high amounts of graphite (C).

This archaeometric study led to some conclusions about the manufacturing techniques and raw materials employed by the potters who crafted these painted ceramic.

POSTER

## 9. ANALYSIS OF INCRUSTATION OF LASINJA CULTURE POTTERY FROM THREE SITES IN CROATIA

*Cataj, Lea (Croatian Conservation Institute) lcataj@h-r-z.hr*  
*Posilovic, Hrvoje (Croatian Geological Survey) hrvoje.posilovic@hgi-cgs.hr*  
*Kos, Katarina kos\_katarina@yahoo.com*

White incrustation is one of the decorating techniques used on middle Eneolithic Lasinja culture pottery. The aim of this presentation is to show the composition and technology of the white incrustation paste.

From three sites in central Croatia seven samples of incrustated pottery were analyzed. Old town Barilovi and Crkviše-Bukovlje are only few kilometers away from each other, south to the town of Karlovac. The site Brekinjova kosa is placed close to the town of Glina, about 50 km to the southeast of the above mentioned sites.

Five of the analyzed pottery samples belong to the Eneolithic Lasinja culture, absolutely dated from 4300 to 3900 cal BC: three of them are from the site of Crkviše-Bukovlje, one from the Old Town Barilovi and one from the site Brekinjova kosa.

For comparison two samples from Brekinjova kosa were analyzed. One of them dates to the late Eneolithic Vu edol culture (cca 3000 - 2400 cal BC) and the other one to the Early Bronze Age Vinkovci culture (cca 2500 - 2000 cal BC).

The composition and technology of the white incrustation paste on prehistoric pottery was analyzed and described. Deep field optical microscopy was used for structural investigations. Chemical composition of incrustation paste was determined by chemical tests. Scanning Electron Microscopy (SEM) coupled with an Energy Dispersive Spectrometer (EDS) was used for additional particle analysis.

The paste was applied in incisions or flutes, up to 1,5 mm deep and up to 2 mm wide. Pottery ornaments were incised before firing, using a sharp tool in the still



fresh material. Incrustation paste was applied in incisions or flutes previously impregnated with organic resin. The incrustation material is of excellent whiteness and powdery texture. The material was mixed with organic binder and applied in the incisions or flutes. At the end of process the whole surface was resin coated which resulted in a shiny thin layer. The chemical tests and EDS analysis showed calcium-phosphate composition. The elements stoichiometric ratio closely matches the composition of hydroxyapatite. The incrustation particle shape and structure is in accordance with mammal bone material structure. It is possible that the material was obtained by deer antler burning. In resin remains plant material particles could be found; the tissue structure is similar to birch-tree.

Although from different time periods, all of the samples display similar composition of the incrustation paste. It is interesting to mention that the results of incrustation analysis from eastern Croatia belonging to the late Eneolithic Kostolac and Vu edol, as well as to the middle Bronze Age Transdanubian Encrusted Pottery showed almost the same composition of the white paste.

# B30 A diachronic perspective of human behavioural adaptations to interglacial lakeshore environments during the European Pleistocene to early Holocene

Organiser: Sabine Gaudzinski-Windheuser, Alejandro García, Jarod M. Hutson, Lutz Kindler, Geoff M. Smith, Elaine Turner, Aritza Villaluenga)

Wednesday 3rd (9:00 to 14:00)  
A03 Meeting Room



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ORAL CONTRIBUTION

ORAL

## 1. A DIACHRONIC PERSPECTIVE OF HUMAN BEHAVIOURAL ADAPTATIONS TO INTERGLACIAL LAKESHORE ENVIRONMENTS DURING THE EUROPEAN PLEISTOCENE TO EARLY HOLOCENE: AN INTRODUCTION

*Garcia-Moreno, Alejandro (MONREPOS Archaeological Research Centre and Museum for Human Behavioural Evolution, RGZM) garcia@rgzm.de*

*Hutson, Jarod M. (MONREPOS Archaeological Research Centre and Museum for Human Behavioural Evolution, RGZM) hutson@rgzm.de*

*Kindler, Lutz (MONREPOS Archaeological Research Centre and Museum for Human Behavioural Evolution, RGZM) kindler@rgzm.de*

*Smith, Geoff M. (MONREPOS Archaeological Research Centre and Museum for Human Behavioural Evolution, RGZM) smith@rgzm.de*

*Turner, Elaine (MONREPOS Archaeological Research Centre and Museum for Human Behavioural Evolution, RGZM) turner@rgzm.de*

*Villaluenga, Aritza (MONREPOS Archaeological Research Centre and Museum for Human Behavioural Evolution, RGZM) villaluenga@rgzm.de*

*Gaudzinski-Windheuser, Sabine (MONREPOS Archaeological Research Centre and Museum for Human Behavioural Evolution, RGZM) gaudzinski@rgzm.de*

During the course of human evolution, we have successfully adapted to various environments. Changing climates and landscapes often required new behavioural strategies for survival: human societies indeed came into being against the background of this challenge. Although the casual connection between the development of human behaviour and environmental change is well acknowledged, the processes involved are still not fully understood. To what extent, how rapidly and at what scale climate and environmental change led to modifications in human behaviour are issues which are only just beginning to be intensively addressed. A fundamental problem is the complexity and interdependence of human behaviour and environmental conditions, necessitating the identification of relevant levels of comparability in order to provide a solid foundation on which to base the archaeological record as a product of behavioural adaptation.

A major prerequisite of this research are sites with high resolution archives. In our session we consider human

behavioural adaptations to European interglacial environments, beginning in the Middle Pleistocene, some 500,000 year ago, through to the beginning of our own interglacial, the Holocene, just over 10,000 years ago. Interglacial sites offer favourable conditions for the preservation of archaeological remains and high-resolution ecological records. Frequently, these records have been recovered near to freshwater sources (lakes, springs, rivers, etc.), which provided attractive, well-known locations for the procurement and butchering of animals, lithic provisioning and occasionally more permanent visits.

Collating evidence from sites of different character, from ephemeral sites to extensive, multi-occupation localities to the highly detailed information preserved at early Mesolithic sites, we aim to understand the importance and attractiveness of freshwater localities as focal points for human behaviour during interglacials.

In this session, we evaluate freshwater sites during interglacials in order to understand the interplay between hominin/human behaviour against the context of availability and distribution of local resources. Our ultimate goal is to evaluate how survival strategies in similar environmental situations evolved throughout the course of our history.

ORAL

## 2. A RE-EVALUATION OF AN INTERGLACIAL SITE IN THE CENTRAL RHINELAND OF GERMANY: THE LOWER PALAEO-LITHIC SITE OF MIESENHEIM I

*Turner, Elaine (MONREPOS Archaeological Research Centre and Museum for Human Behavioural Evolution, RGZM) turner@rgzm.de*

The Lower Palaeolithic site of Miesenheim I, located at the edge of the Neuwied Basin, was investigated in a series of campaigns at the end of the 1980's and beginning of the 1990's. The site produced an interglacial fauna in association with a small assemblage of lithic artefacts. The deposits date to approximately 500,000 years ago. Several lines of evidence suggest find-deposition took place in the back-waters of the Rhine Valley, close to a flood-plain pond. When the site was analysed in the mid 1990's, the role of hominins in the accumulation of the faunal assemblage was difficult to decipher and the character of the site could not be clearly defined. At that time, the evidence from Miesenheim I was compared with that of "home base" sites, "foraging" sites and "short-

stay" sites and failed to meet the predictions for each of these different types of localities. A fundamental problem appeared to be the site itself with complex, superimposed sequences of deposition and faunal remains subject to varying degrees of modification by different agents. Here the results of a critical re-appraisal of the evidence are presented.

The aim is to redefine the earlier results by re-assessing the archaeozoological, taphonomical and spatial, in particular refitting, analyses. In this way, processes of site formation can be reconsidered from a state of the art perspective and patterns pertaining to hominin activities can be more easily identified.

Just over 1,100 faunal remains could be identified to several species of smaller and larger mammals, birds and fish. Including species typical of warm phases, such as wild boar, the faunal assemblage is representative of the type of vertebrate community which would have been living in and around the Rhine Valley during an interglacial.

Although lithic artefacts were recovered and refitting showed that some of these had been produced at the site, the assemblage is relatively small ( $n = 113$ ). Strong evidence of human interaction with the faunal remains is lacking. A conchoidal flake scar, similar in form to notches produced by humans when opening bone shafts to obtain marrow, was observed on a fragment of a long bone of horse or large bovid. Fine linear incisions on three bones, superficially resembling cut marks, are probably of natural origin.

Currently, the evidence from Miesenheim I hints at a transient use of the site by hominins. This is in strong contrast to the evidence from large interglacial sites such as Schöningen and Neumark-Nord, where masses of faunal remains and abundant traces of hominin interaction indicate repeated visits along lake-shore margins. Despite this, sites such as Miesenheim I are important, since they provide not only additional information on hominin movement and land-use, but present another, ephemeral, facet of human behavioural adaptations in interglacials.

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ORAL

### **3. HOLISTIC ANALYSIS OF SCHÖNINGEN 13II-4 FAUNAL ASSEMBLAGE: NEW EVIDENCES OF MULTIPLE HUNTING EVENT ON AN INTERGLACIAL MIS9 LAKESHORE.**

*Villaluenga, Aritza (MONREPOS Archaeological research Centre and Museum for Human Behavioural Evolution, RGZM) villaluenga@rgzm.de*

*Hutson, Jarod (MONREPOS Archaeological research Centre and Museum for Human Behavioural Evolution, RGZM) hutson@rgzm.de*

*Garcia-Moreno, Alejandro (MONREPOS Archaeological research Centre and Museum for Human Behavioural Evolution, RGZM) garcia@rgzm.de*

*Turner, Elaine (MONREPOS Archaeological research Centre and Museum for Human Behavioural Evolution, RGZM) turner@rgzm.de*

*Gaudzinski-Windheuser, Sabine (MONREPOS Archaeological research Centre and Museum for Human Behavioural Evolution, RGZM) gaudzinski@rgzm.de*

The Schöningen archaeological site, located in Lower Saxony, Germany, has received much attention over the past twenty years for the remarkable discovery of well-preserved wooden spears in association with a large assemblage of Middle Pleistocene faunal remains. Geological and palaeoenvironmental contexts indicate an accumulation during an interglacial phase (MIS 9), roughly 300.000 years ago. Here we present preliminary interpretations of the faunal assemblage from the "Spear Horizon".

Through a combination of archaeozoological, taphonomic and spatial analyses, we aim to reconstruct the processes of the site formation and to identify patterns in the faunal assemblage that relate directly to Middle Pleistocene hominin subsistence behaviours.

The assemblage is clearly representative of an interglacial lake-shore environment, dominated overwhelmingly by horses (*Equus mosbachensis*), but also includes bovids (*Bos primigenius*, *Bison priscus*), cervids (*Megaloceros giganteus*, *Cervus elaphus* and *Capreolus capreolus*), smaller mammals, waterfowls and fish.

Preliminary results suggest the use of the site as a location of repeated ambush hunting along the lake-shore margin during the Middle Pleistocene. Age and sex profiles of the horse population indicate the presence of multiple herds and multiple hunting episodes. Evidence of systematic butchery (filleting, disarticulation and marrow extraction) indicates that the entire sequence of carcasses exploitation occurred at the hunting site. Secondly, medium-sized carnivore activity is present, but subsequent to abandonment by Middle Pleistocene hominins. The excellent preservation at the site allows for the study of other modifications produced by the use of different bone pieces as retouchers, soft hammers and anvils.

While the circumstances for preservation and discovery of the Schöningen 13II-4 "Spear Horizon" assemblage was quite fortuitous, the accumulation of the site was not a matter of chance. The warm interglacial environment provided the hominids groups with a variety of vegetal and animal resources to exploit. The site, situated along the margins of a large lake close to the foot of Elm hill range, represented a well-known location on the landscape for Middle Pleistocene hunter groups to ambush large ungulate, especially horses. This unique archaeological record provides an exceptional assemblage to analyse the functional organization of hominid behaviour during the Middle Pleistocene.

ORAL

#### 4. WHAT WERE THEY UP AGAINST? MIDDLE PLEISTOCENE CARNIVORES AND HOMININS AT SCHÖNINGEN (GERMANY)

Starkovich, Britt (University of Tübingen) [britt.starkovich@uni-tuebingen.de](mailto:britt.starkovich@uni-tuebingen.de)

Conard, Nicholas (University of Tübingen) [nicholas.conard@uni-tuebingen.de](mailto:nicholas.conard@uni-tuebingen.de)

The Lower Paleolithic site of Schöningen in north-central Germany preserves a unique set of archaeological materials, including multiple wooden spears and a large number of Pleistocene horse remains. The site is situated on the shores of a paleolake that attracted a range of herbivores as well as hominin and carnivore predators. The role of hominins as part of the carnivore guild at this time is significant in understanding the evolution of hominin subsistence strategies and cultural adaptations. This paper presents the results of an analysis of the faunal remains from the "Spear horizon south," a southern extension of the main excavation area that yielded the famous Schöningen spears (13II-4). In particular, we evaluate taphonomic modifications on the bones that were caused by carnivores, and highlight specific carnivore taxa recovered from the site, mostly two *Homotherium latidens* individuals. This large saber-toothed cat occupied Europe during much of the Pleistocene and, along with other large and small carnivore species, directly competed with hominins for meat resources. Carnivore remains were identified using standard zooarchaeological techniques and the length and breadth of gnaw marks on the faunal materials were measured using digital calipers. The resulting bite sizes were compared to experimental data presented by Dominguez-Rodrigo and Piqueras (2003) to determine the size and behavioral categories of

carnivores that impacted the faunas. Consistently large bites on both spongy and compact bone indicate that large-bodied taxa such as wolves, lions, or saber-toothed cats impacted the assemblage. In rare cases where cut marks and bites are both present on bones, bites tend to overlie cuts, indicating that hominins had primary access to the carcasses. This reinforces the idea that hominins were successful carnivores in their ecosystem as early as the late Lower Paleolithic in north-central Europe. The position of hominins toward the top of the Middle Pleistocene carnivore guild was undoubtedly the result of foraging strategies that included opportunistic scavenging alongside increasingly complex and cooperative hunting strategies. This flexibility in food procurement, facilitated by an organic and inorganic toolkit, set the stage for the long-term success of the human species.

ORAL

#### 5. MIDDLE PLEISTOCENE LAKE SHORE ENVIRONMENTS AND ARCHAEOLOGICAL SITES OF SCHÖNINGEN, LOWER SAXONY, GERMANY

Urban, Brigitte (Leuphana University) [b.urban@leuphana.de](mailto:b.urban@leuphana.de)

Kolfshoten van, Thijs (Leiden University) [T.van.Kolfschoten@arch.leidenuniv.nl](mailto:T.van.Kolfschoten@arch.leidenuniv.nl)

Serangeli, Jordi (Tübingen University) [jordi.serangeli@uni-tuebingen.de](mailto:jordi.serangeli@uni-tuebingen.de)

The long Quaternary terrestrial record of Open Mine Schöningen comprises glacial sediments as well as interglacial lake and fluvial deposits which serve as outstanding archives for reconstructing Western European climatic and environmental evolution since the Late Middle Pleistocene. Five interglacials including the Holocene have been identified succeeding the Elsterian glaciation and have been correlated with MIS 11, 9, 7, 5e and 1. More than 30 archaeological/paleontological sites have been examined in Schöningen, whereof the the hunting spear-bearing lake shore site Schöningen 13 II-4 of the Middle Pleistocene Reinsdorf sequence is the most prominent.

Our contribution focusses on the oldest archaeological site Schöningen 13 I and the Reinsdorf Interglacial lake succession at archaeological sites Schöningen 13 II and 12 II. Environmental reconstruction is mainly based on botanical data supported by faunal and sedimentological investigations.

From high resolution palynological and faunal investigations we can conclude that the deposits of the oldest archaeological find horizon Schöningen 13 I, which stratigraphically underlies the Reinsdorf sequence, most probably developed during a late boreal-steppe phase of an interglacial. As classical Holsteinian interglacial pollen assemblages described in the northern mining field differ significantly from the Reinsdorf vegetational succession, the Schöningen 13 I layers might relate to late Holsteinian (*sensu stricto*) phases. Sedimentation of Reinsdorf interglacial deposits was initiated on an eroded gleyic surface only during the interglacial thermal optimum indicative of a rising groundwater table (Schö 13 II-1). Subsequent layer 13 II(-2c5) has been U/Th dated and tentatively correlated with MIS 9. Based on palynological findings it correlates with archaeological find horizon Schöningen 12B, which is characteristic the late interglacial *Carpinus-Abies-Pinus-Picea* pollen zone. Several lake fluctuations were identified, succeeding the full interglacial phases, during a deteriorating and oscillating climate. During level 13 II-4, lake marls were deposited under a high ground water table that transitioned into an organic muddy/peaty horizon containing the hunting spears. Dry steppe-forest environmental conditions deduced from the pollen evidence, was supported by the macrofaunal remains that included some 20 carcasses of *Equus mosbachensis*, excavated from that horizon (Schö 12 II-4(c/b/a)).

The long term multidisciplinary research project has enabled reconstruction of the local and regional environmental conditions providing a required background for the interpretation of human behavior particularly during the late Middle Pleistocene of Western Europe.

With high resolution botanical, faunistic and sedimentological studies and the dating of the entire Schöningen sequence with multiple chronometric techniques, we will continue to contribute to the debate on the correlation of Western and Central European terrestrial records with the marine stratigraphy.

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#### ORAL

### 6. NEUMARK-NORD, A LAST INTERGLACIAL EEMIAN LAKESCAPE. AN INTRODUCTION.

*Gaudzinski-Windheuser, Sabine (MONREPOS Archaeological Research Centre and Museum for Human Behavioural Evolution, RGZM) gaudzinski@rgzm.de*  
*Roebroeks, Wil (Faculty of Archaeology, Leiden University)*

*j.w.m.roebroeks@arch.leidenuniv.nl*

*Kindler, Lutz (MONREPOS Archaeological Research Centre and Museum for Human Behavioural Evolution, RGZM) kindler@rgzm.de*

*Pop, Eduard (Faculty of Archaeology, Leiden University) E.A.L.Pop@Arch.leidenuniv.nl*

*Smith, Geoff (MONREPOS Archaeological Research Centre and Museum for Human Behavioural Evolution, RGZM) smith@rgzm.de*

*García-Moreno, Alejandro (MONREPOS Archaeological Research Centre and Museum for Human Behavioural Evolution, RGZM) garcia@rgzm.de*

“Being constantly on the move” seems to be among the various aspects that characterise Middle Palaeolithic hominins’ lifeways. These hominins exploited habitats which they controlled by continuous roaming. Against this background, the majority of our archaeological sites ideally provide us with only a static snapshot that we use to reconstruct a basically dynamic way of life. It is therefore of utmost importance to understand the whole repertoire of activities carried out in the wider landscape) as they actually represent Middle Palaeolithic hominins “homes”. However, the characterisation of these habitats provides us with some difficulties as Middle Palaeolithic open air sites often grant only very limited and blurred insights. Various factors are responsible. Among them are the small scale of our excavated areas, the variable quality of organic preservation at these sites and the fact that their palimpsest character can only rarely be unravelled. The exposure at Neumark-Nord (Germany) offers the unique opportunity to challenge our restricted knowledge on Middle Palaeolithic habitats.

The archive at Neumark-Nord (Germany) is exposed in an abandoned open cast lignite mine. It represents a large last interglacial Eemian lakescape. The preservation of organic material is outstanding. Two archaeological sites, Neumark-Nord 1 and Neumark-Nord 2 have been discovered. The Neumark-Nord 1 exposures were studied in the 1980’s and the 1990’s, over a period of 11 years by Dietrich Mania and colleagues. New studies are currently underway. Neumark-Nord 2 was excavated from 2004 until 2008 by our working group. A geological, palaeoenvironmental and palaeoecological framework for the analysis of Neumark-Nord was established as well as detailed analysis of fauna and lithics.

According to the pollen, sedimentary, AAR and other data, the archaeology of the two archaeological sites Neumark-Nord 1 and 2 is contemporaneous on a scale of resolution rarely achievable in Palaeolithic studies. Hence both sites represent a more than 25ha large part

of an Eemian Interglacial lakescape in which hominins were repeatedly present within an earlier stage of the Interglacial. Neumark-Nord 2 represents a small "puddle" at the margins of the larger Neumark-Nord 1 lake. Especially the role of hominins in the exploitation of the lakescape is a key issue which can be addressed by detailed analysis of the faunal remains in both assemblages.

The large scale of the exposure and the quality and quantity of the faunal remains, micro- and macrobotanical finds and the associated archaeology make the lakescape Neumark-Nord into one of the key sites of the European Palaeolithic. Neumark-Nord yields the potential to open a new chapter in understanding Middle Palaeolithic lifeways by moving away from a site perspective to a habitat perspective.

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ORAL

## 7. THE MIDDLE PALAEOOLITHIC SITE OF NEUMARK NORD 2: NEANDERTHAL ADAPTATION AND BEHAVIOUR WITHIN AN EEMIAN LAKE LAND ENVIRONMENT.

*Smith, Geoff (MONREPOS Archaeological Research Centre and Museum for Human Behavioural Evolution, RGZM) smith@rgzm.de*

*García-Moreno, Alejandro (MONREPOS Archaeological Research Centre and Museum for Human Behavioural Evolution, RGZM) garcia@rgzm.de*

*Kindler, Lutz (MONREPOS Archaeological Research Centre and Museum for Human Behavioural Evolution, RGZM) kindler@rgzm.de*

*Gaudzinski-Windheuser, Sabine (MONREPOS Archaeological Research Centre and Museum for Human Behavioural Evolution, RGZM) gaudzinski@rgzm.de*

During excavations of the large lake basin (c.24ha) of Neumark Nord 1 (NN1; Geiseltalsee, eastern Germany) an additional, smaller basin (1.6ha) was identified (Neumark Nord 2 [NN2]). Excavations of the sedimentary infill of NN2 were undertaken over an area of approximately 500m<sup>2</sup> and yielded c.20,000 flint artefacts and more than 120,000 faunal remains. Application of palaeomagnetism, combined with an extensive pollen and micromorphology record, position the main find bearing units to the first half of the Last Interglacial period, the Eemian (MIS 5e). Sedimentological studies suggest that the basin was infilled over a narrow time interval (c.500 years). Continuing research is investigating the specific site formation processes and taphonomic agents

operating at NN2 in order to contextualise Neanderthal behaviour at the site and provide a unique window into their subsistence behaviour during interglacials.

Detailed zooarchaeological analysis, combined with both experimental procedures and GIS analysis, has allowed for a more comprehensive understanding of both site formation and Neanderthal behaviour at NN2. To date, c.20,000 bones have been analysed, representing an almost complete north-south transect that encompasses both the margins and the deeper regions of the basin. Holistic taphonomic analysis has been used to identify and disentangle evidence for both natural and cultural modifications. GIS-based spatial analyses are being used to identify taphonomic process and Neanderthal use of space.

A variety of warm-stage fauna were identified including elephant, rhino, bovid, equid, cervids alongside carnivores such as bear and lion. Skeletal representation highlights both denser and more friable bone portions are preserved suggesting limited post-depositional destruction. Detailed bone surface studies have identified a predominance of human modifications, with a surprising absence of carnivore and other natural modifications (e.g. fluvial). This suggests a primary role for Neanderthals in faunal accumulation at NN2, supported by GIS analysis that illustrates no statistical correlation between bone remains and hydraulic flow. Further spatial analysis illustrates more fragmented remains in the northern areas of NN2 contrasting with larger, more complete remains, often in anatomical alignment, in the south. Thus, the highly fragmented nature of the assemblage in the north of the NN2 basin could be, largely, the result of Neanderthal butchery and marrow processing activities.

Because of its large excavated area and high resolution archive, NN2 provides a unique opportunity to identify, document and analyse taphonomic processes and provide a clearer understanding of Neanderthal exploitation in a lakeland environment during and interglacial. Multidisciplinary analyses suggest that the site was repeatedly used by Neanderthal populations for butchery and carcass processing. At NN2 natural accumulation agents appear to have had a reduced role in site formation. Instead, the site appears to represent a focal point to which Neanderthals both transported material and potentially exploited animals that had died naturally. Similar behavioural signatures were also noted around the nearby NN1 basin, illustrating that NN2 was only one focal point within this broader lakeland environment.

ORAL

**8. THE EEMIAN INTERGLACIAL (OIS5E) LAKE BASIN NEUMARK-NORD 2: VEGETATION OPENNESS AND HOMININ ACTIVITY AS A RESULT OF LARGE HERBIVORE PRESENCE?**

*Pop, Eduard (Leiden University, Faculty of Archaeology)  
e.a.l.pop@arch.leidenuniv.nl*

Were Neanderthals able to maintain themselves in forested interglacial conditions? Several sites provide conclusive evidence of their presence during the Eemian Interglacial, but how forested were the environments exactly? Interpretations regarding the character of Eemian interglacial landscapes range from fully forested environments ("high forests") to mosaic-like park landscapes ("wood pastures"), the latter being maintained by large herbivores. Others take a more intermediate position by suggesting a dominance of closed forests, but with local openings due to soil conditions or disturbances by grazing or fire. Grazing would especially occur near wetland areas where water and a diverse vegetation would attract (large) herbivores, as documented by Eemian floodplain localities in the UK. Known Eemian sites from the continent that also provide evidence for hominin presence show conditions ranging from closed forests to mixed environments. The basin site Neumark-Nord 2 yielded a detailed environmental record that covers the complete Eemian Interglacial, as well as the largest archaeological record known from this timeframe. This paper discusses these datasets in order to reconstruct the character of the vegetation during phases of hominin activity and study the interrelationship between water availability, large herbivore presence and vegetation openness.

The extensive sampling strategy employed at Neumark-Nord 2 provided a substantial environmental dataset covering the complete basin infill. The pollen record and more specifically the ratio between arboreal and non-arboreal pollen were used to reconstruct the (openness of the) vegetation surrounding the basin. Aquatic molluscs, water plants and ostracods were used to identify phases of increased and decreased water within the basin. These datasets have been correlated to the position of the archaeological find levels located at the margin of the basin.

The pollen data suggest relatively open environmental conditions during the Early Eemian, which covers all exposed find levels. Indications for vegetation openness however fluctuate and seem to correspond to fluctuating

water levels within the basin: phases of increased water within the basin are correlated to more open environmental conditions, while decreased presence of water correlates to a more closed vegetation. Although winnowing by overland flow led to a certain amount of "enrichment" of finds during wetter intervals, the lack or very low amount of archaeological material deposited during drier phases suggests that hominin activity is focused on phases of wetter basin conditions and more open environmental conditions.

The strong link between water availability within the Neumark-Nord 2 basin and vegetation openness is suggestive of being mediated by large herbivore activity, whose presence is well documented by the faunal assemblages of Neumark-Nord 2 and of the neighbouring basin Neumark-Nord 1. This scenario can also explain the focus of hominin activity on the same specific phases, as they would provide increased subsistence opportunities in the form of (large) game and possibly edible plants as well. This study suggests that small basins like Neumark-Nord 2 and other wetland localities played an important role in hominin survival within Eemian Interglacial environments.

ORAL

**9. METHODOICAL SUB-AQUATIC DISPOSAL OF BUTCHERING WASTE AT AN EARLY HOLOCENE MESOLITHIC CAMPSITE**

*Street, Martin (MONREPOS Archaeological Research Centre and Museum for Human Behavioural Evolution, RGZM)  
street@rgzm.de*

The early Mesolithic site of Bedburg-Königshoven was found at the end of the 1980s in the open-cast lignite mine of Garzweiler (German Lower Rhineland). The presence of well preserved faunal remains and the recognition of an intentionally modified antler frontlet broadly similar to those from the English site of Star Carr underlined the importance of the discovery and the necessity of carrying out an investigation. A rapidly carried out pollen analysis and radiocarbon dating already confirmed the Preboreal age of the site during excavation.

At the time of discovery the Bedburg site had already been severely truncated in all dimensions by earlier earth-moving activities. What remained of the site was investigated over just a few winter months by a salvage excavation which was nevertheless able to identify and



excavate the find-bearing horizon over most of the surviving site recording the 3D-location of all identified finds within a grid system set up to run parallel to the palaeotopography. The bulk of the excavated sediment was subsequently wet-sieved, ensuring a contextual recovery of even smaller material overlooked during excavation.

It became clear at an early stage of excavation that the find-bearing horizon consisted of a calcareous and organic limnic deposit (gyttja) formed under sub-aquatic conditions, probably in the still or very slow moving water of a palaeochannel of the River Erft. The surviving stratigraphy and topography and subsequent analyses confirmed that these deposits had been truncated vertically almost exactly at their transition to the original shoreline. In view of the loss of the originally present (semi-)terrestrial sediments it was not expected that the distribution of recovered finds would reveal any meaningful spatial patterning. In fact, in combination with the zooarchaeological analysis of the mainly large mammal fauna, it was possible to show a certain spatial sorting of material which even extended to the recognition of repetitive processes of butchery and disposal for specific elements of the carcass.

Since terrestrial surfaces upon which prehistoric butchery was primarily carried out will generally preserve faunal material poorly or not at all, it is self-evident that discard of waste into adjacent bodies of water will provide otherwise unavailable insights into butchery operations in the form of cut and impact marks which can show in detail how an animal carcass was processed. The analysis of a faunal assemblage from the early Mesolithic site Bedburg-Königshoven showed that an additional level of interpretation for butchering processes may be provided by meaningful spatial patterning which can in some cases be identified even when elements of the discarded carcass have been discarded into a sub-aquatic environment.

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ORAL

## 10. RE-THINKING THE FUNCTION OF THE EARLY MESOLITHIC SITE OF BEDBURG-KÖNIGSHOVEN

Wild, Markus (MONREPOS Archaeological Research Centre and Museum for Human Behavioural Evolution, RGZM)  
wild@rgzm.de

The Early Mesolithic lake site of Bedburg-Königshoven was discovered in 1987 within Erft valley during lignite

mining. Excavations exposed calcareous gyttja sediments of Early Holocene age that contained archaeological material. The common interpretation of the site is that of an off-bank discard zone showing a palimpsest, created by repeated visits of hunter-gatherers undertaking secondary butchery activities at the site (Street 1989; Street and Wild *in press*).

The faunal remains – dominated by *Bos primigenius* – indicate the systematic exploitation of typical large ungulates of the Central European Early Mesolithic. Some bird and fish remains represent background fauna and they cannot be linked directly to the human presence at the site.

The small lithic assemblage consists of a handful of cores, some scrapers, microliths, unretouched flakes and blades and a heavy pic. The assemblage suggests the deliberate discard of butchery tools used in animal butchery (Street 1998; Street and Wild *in press*).

During the re-analysis of *Hirschgeweihkappen* [deer antler caps] from Early Mesolithic sites the spatial character and function of Bedburg-Königshoven compared to other Early Mesolithic sites with antler frontlets (Friesack 4, Hohen Viecheln (Germany), Star Carr (UK)) was re-assessed. This was combined with experimental procedures that attempted to understand the production and function of a *Hirschgeweihkappe*.

Some features of the assemblage do not fit with the interpretation of Bedburg-Königshoven solely as a secondary butchering site. The close association of the only two bone tools from the site (a chisel and a point) suggests a more complex site function, as do the two perforated deer skulls. Indeed, the *Hirschgeweihkappen* seem to be half-finished and deliberately stored underwater, perhaps either to protect them from carnivore gnawing or as part of the manufacturing process. Together, these two lines of evidence suggest a more complex and longer-term use of the site that fits with the finds of other *Hirschgeweihkappen* underwater at sites like Star Carr.

Lyman (1992, 247–248) points to the fact that secondary butchering sites are often situated in the direct vicinity of camp sites. This might be supported by the fact that there is barely any evidence of further processing of meat at Bedburg-Königshoven, although the bones are completely defleshed. The off-bank discard zone may therefore reflect a highly specialised part of a camp, which could be compared with large Preboreal sites like Star Carr.

ORAL

## 11. MANAGEMENT AND EXPLOITATION OF ANIMAL RESOURCES IN LAKESHORE ENVIRONMENTS IN THE EARLY NEOLITHIC IN THE NORTH-EAST OF THE IBERIAN PENINSULA

*Verdún Castelló, Ester (Departament de Prehistòria, Universitat Autònoma de Barcelona) estercv@gmail.com*

*Navarrete, Vanessa - vanessa.navarrete@uab.cat (Departament de Prehistòria, Universitat Autònoma de Barcelona), Blanco, Àngel (Institut Català de Paleoecologia Humana i Evolució Social, Universitat Rovira i Virgili; 1Departament de Prehistòria, Universitat Autònoma de Barcelona) angel.blanco.geoterna@gmail.com*

*Garcia, Lluís (UMR 5140, Centre National de la Recherche Scientifique) lgp@pangea.org*

*Saña, Maria (Departament de Prehistòria, Universitat Autònoma de Barcelona) maria.sana@uab.cat*

La Draga site is located on the eastern shore of the Lake of Banyoles (Girona, Spain). Chronologically it corresponds to the early Neolithic. Two occupation phases have been distinguished: one corresponding to 5430-5000 cal BC and another one corresponding to 5210-4796 cal BC. The site has an extension of 8000m<sup>2</sup> and only 10% of it has been excavated. It is partially underwater, a characteristic that permitted the excellent conservation of the remains.

In La Draga, the presence of several kind of domestic and wild animals (mammals, fishes, birds, molluscs, reptiles...) (more than 50 species), has been documented and shows the exploitation of different environments. The exploitation of areas with different characteristics requires the combination of different techniques and economic practices (herding, hunting, fishing and collecting) and the implementation of a system of social organization to exploit and to manage the resources of these diverse environments.

A detailed analysis of each type of archaeofaunal remains has been carried out (taxonomic analyses, MNI quantification, biometrics...). All the obtained data have been integrated in order to offer a general explanation about the exploitation and management of the faunal resources.

Remains of birds, fishes, domestic and wild mammals, molluscs and turtles have been documented. This wide variety of animal resources shows: a) the exploitation of different environments (high mountain areas, forest, lakeshore, coastal areas, grazing areas; and b) the

implementation of adequate techniques of managing, obtaining and processing of each type of animal.

Chronologically La Draga site corresponds to the first moments of the implementation of agriculture and herding in the Iberian Peninsula. This characteristic together with the excellent conservation of the remains, makes La Draga an exceptional site to study the transition of an economy based on hunting and gathering to agriculture and herding and the social implications of this change. The study of the role of animal resources in La Draga and the interrelation among the different resources in a moment of economic change between two economic systems, could afford new data to reconstruct the social activities and the social organization system of the first agricultural and herding societies.

The analyses of the animal remains recovered in La Draga show a combination of different productive activities (herding, hunting, fishing and collecting of molluscs). All these activities, permitted the inhabitants of the settlement to exploit all the available resources. However it seems that the consumption of domestic animals would be more important than the other. Although the presence of different types of species denotes the consumption of resources from different environments, lake environment and forest areas surrounding the site were the most exploited.

ORAL

## 12. MESOLITHIC ANIMAL EXPLOITATION AND PAL-AEOECONOMY: DISCUSSION OF A NEW METHODOLOGICAL APPROACH

*Noack, Elisabeth (MONREPOS Archaeological Research Centre and Museum for Human Behavioural Evolution) noack@rgzm.de*

During the Holocene two economic systems pursued: "Neolithic" agriculture and stock breeding and "Mesolithic" exploitative hunting, gathering and fishing. To understand the relationship between these economic concepts, detailed study of economic practices applied during the Mesolithic is necessary. Against this background a new economically focussed methodology will be discussed.

Studies of economic systems consider basic questions related not only to subsistence but to a wide spectrum of physical and social requirements. Therefore economic behaviour encompasses all activity necessary to gain

sustenance and is manifested in various aspects of the archaeological record. One way to characterize these complex systems is the application of a methodology which is based on an economic concept currently used for discussion on Neolithic economy.

In a pilot study, the approach of "total" animal exploitation (see Fontana et al. 2009) is combined with an economic model. In this model the components of the entire economic system are defined and related to each other. To illustrate the potential of this methodological approach, one aspect of Mesolithic economic behaviour, the exploitation of hunted animals, is considered. Therefore big game species such as red deer, roe deer, elk, aurochs and boar are analysed in regard to different aspects of their exploitation. The faunal material originates from lakeshore sites including Hohen Viecheln and Rothenklempenow (Germany).

The pilot study demonstrates that human exploitation of various animal species is not solely based on nutritional requirements. To understand the contribution of each animal species within the economic system, the different aspects of their utility use have to be considered and related to each other.

Studies on the Mesolithic based on a holistic point of view gain new insights into past human behaviour. Based on this study, diachronic analysis of preceding and succeeding archaeological periods could improve our understanding of economic evolution during the Holocene.

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#### ORAL

### 13. ISLANDS IN THE SWAMP - MESOLITHIC SITES IN THE RHINLUCH AREA (GERMANY).

*Groß, Daniel (Centre for Baltic and Scandinavian Archaeology) daniel.gross@schloss-gottorf.de*

The Rhinluch in Brandenburg in eastern Germany is a valuable area for analyzing the function and use of a micro-region in the early Mesolithic in Europe. Near the modern town Friesack three sites are known of which one is thoroughly excavated (Friesack 4). Another site, Friesack 27a, is only known by small scale trenches and the third, Friesack 27b, just by surface finds. Nevertheless, this area bears great potential to analyse the taskscape of early Holocene hunter-gatherer-fishers, due to detailed excavation techniques and (archaeological) contemporaneity. Providing high potential for preservation of organic material, these sites also gave excellent results

for environmental reconstructions, too, which are supported by modern remote sensing techniques.

The excavations followed standard procedures for wet-land-sites. To reduce the pressure of groundwater pumps were used and the trenches were divided into sectors. During the excavations it became obvious that the use of sieves and shovels would destroy fragile finds like nets and strings. Due to this the use of spatulae and toothpicks became common practice and thus also tiny finds (e.g. fish scales and beetle elytra) were recovered. During the excavation campaigns a considerably large probing program was conducted between the sites to reconstruct the Pleistocene surface. Furthermore palynological, archaeozoological and macrobotanical investigations provided information on the palaeo-environment and for socio-economic analyses.

In the beginning of the Holocene the micro region around the sites of Friesack 4, 27a and 27b was characterized by large lakes and fens in the lower and forests on the higher and dryer areas. Humans were settling on rather small islands in the lakes and based their subsistence strategy mainly on hunting and fishing. There are only a few indications for plant gathering for nutritional purposes. The reconstruction of palaeo-riverbeds enabled us to embed the sites within their environment. It was proven that a connection to open waters was one of the relevant criteria for choosing a place as settlement area. The importance of infrastructural aspects was not only proven by finds like dugout-canoes but also by the point in time when a site was abandoned, as this coincided with specific environmental conditions.

The excavations in the Friesack area showed intrinsically how important careful and thorough excavations of wet-land-sites are for archaeological research. The potential of organic preservation expands our knowledge of the past far more comprehensively than dry-land-sites ever will. The former sites usually provide far more data than solely archaeological remains, for instance, extensive proxy data for environmental reconstructions and developments. By understanding the developments in the past, we are enabled to give prognosis for future developments with respect to environmental changes.

Apart from this, the investigations have shown that modern ways of agriculture are an enormous threat to archaeological material. The drainage of many wetlands results in an accelerated loss of organic soils and the attendant destruction of non-lithic artefacts. Therefore excavations on such sites have rather to be seen as salvage excavations.

# B33

## Environmental and cultural development during the Lower and Middle Palaeolithic in the Syrian Desert

Organiser: Jean-Marie Le Tensorer, Reto Jagher, Dorota Wojtczak  
Fabio Wegmüller and Hani Elsuede

Tuesday 2nd (14 :30 to 19 :30)  
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ORAL

**UNE RÉÉVALUATION DES DONNÉES YABROUDIENNES : ÉTUDE DU SITE DE YABROUD (SYRIE).**

*Al Qadi, Amjad (Université de Genève) amjad.alqadi@unige.ch*  
*Besse, Marie (Université de Genève) marie.besse@unige.ch*  
*Bourguignon, Laurence (INRAP) laurence.bourguignon@inrap.fr*

Dated around 350,000 years ago, the Yabroudian is a Paleolithic Levantine culture Stratigraphically and chronologically situated between the Acheulean and Mousterian periods. Its characteristic industry was defined by Alfred Rust during his excavations between 1930 and 1933 in a rock shelter in Yabroud, located 80 km north of Damascus, Syria (Rust 1950). The Yabroudien phase is distinguished primarily by scrapers, usually shaped from thick flakes and retouched with a scalarform technique (Bordes 1958 1984 Garrod, 1956, Bourguignon 1997 The Tensorer 2005 Al Qadi, 2011). The yabroudian industries have technological and typological similarities to the European industries of the Middle Paleolithic of south-west France, such as the Quina Mousterian and the Micoquian types (of Micoque) (Bordes, 1955, Bourguignon 1997). The yabroudian industries of these two collections, one from the excavations held in the 1930s (material of A. Rust's excavation, stored at the Institute of Prehistory, University of Cologne, Germany), and that from the 1960's excavations (the excavated material of R. Solecki, the museum of Deir Atieh near Damascus, Syria), were analyzed.

A technological approach was adopted that classified the artifacts by category and studied all known material concerning the processes carried out during knapping. This methodology involves a reconstruction of the steps taken from the initial processing block of raw material until the finished products (Tixier 1991 Pelegrin 1995).

The Yabroudian phase of Yabroud is oriented towards the production of thick yet short flakes with a wide and smooth butt demonstrating an alternation of recurring fabrication techniques on the two surfaces of the block. Scrapers are the most common tool found, with the more simple types being the most abundant. The resharpening flakes is seen in several variations, each presenting several stages of fabrication for these Yabroudian scrapers.

Bifacial tools also appear alongside the scrapers. In several layers of the Yabroud site, the Yabroudian industry has several similarities to those found in Quina, France (Bour-

guignon 1997). The cores have a different morphology (sub - triangular , sub- circular , sub- quadrangular ). The controlled shaping of the surfaces shows an alternation in the exploitation of several different core surfaces. At this site the industrial patterns coexists with others that tend towards the Levallois techniques.

Analyses of the yabroudian industries found at Yabroud help establish the systematic patterns of the yabroudian tool-shaping industry. The smooth and wide butt demonstrate the use of a hard hammer. Soft-hammer technique was used during the operations of retouching and resharpening the scrapers. The yabroudian bifacial tools detach from Acheulean handaxes, and while remaining the techno-complex that surmount it chrono-stratigraphically such as in several Levantine sites (Hummal, The Tensorer 2005 and Tabun, Garrod 1956). Typical scalariform/yabroudian retouch dominates. The Yabroudian and Quina Mousterian type have a technological resemblance as a specific debitage mode with the coexistence of Levallois scheme. The Yabroudian could be classified as belonging to the early Middle Paleolithic or archaic Middle Paleolithic.

ORAL

**LA SEQUENCE PLEISTOCENE DU SITE D'UMM EL TLEL, SYRIE.**

*Boeda, Eric (université Paris X) boeda.eric@gmail.com*  
*Griggo, Christophe (université Grenoble 1) christophe.griggo@ujf-grenoble.fr*  
*AlSakhel, Heba (Conservateur Musées de Syrie) christophe.griggo@ujf-grenoble.fr*  
*Bonilauri, Stephanie (UMR7041) stephanie.bonilauri@gmail.com*  
*Pagli, Marina (UMR 7041) marina.pagli@gmail.com*

Le site d'Umm el Tlel présente une séquence archéologique s'échelonnant de l'Acheuléen au début du Néolithique, sans discontinuité culturelle, sur plus de 20 mètres d'épaisseur. Les dépôts sédimentaires successifs : alluviaux, lacustres et éoliens, ont permis un enregistrement de près d'une centaine de niveaux archéologiques, comprenant des artefacts lithiques, bitumineux, osseux et végétaux particulièrement bien conservés. Ces vestiges permettent de restituer une évolution diachronique des comportements techniques liés aux matières minérales, animales et végétales. Si la technologie lithique indique, pour chacune des grandes périodes chronologiques, une grande variabilité de faciès corrélable aux changements sédimentaires, les analyses archéozoologiques et climatiques tempèrent cette cor-

relation. En effet, la zone steppique est extrêmement sensible au moindre changement climatique. Cela se marque très facilement par des enregistrements sédimentaires très variés, dont l'importance n'est pas liée à des changements climatiques d'ampleur générale. L'enregistrement est micro-régional, ce que confirme l'analyse archéozoologique qui montre que les comportements d'acquisition de matières animales transcendent ces changements.

The site of Umm el Tlel presents an archaeological sequence ranging between Acheulean and early Neolithic culture, without interruption, for more than 20 meters thick. Successive sedimentary deposits: alluvial, lacustrine and eolian, allowed a record of almost one hundred archaeological levels, including lithic artefacts, bitumen, bones and plants, particularly well preserved. These remains enable us to reconstruct a diachronic evolution of technical behaviors based on mineral, animal and vegetable material. If lithic technology shows for each major chronological periods of high variability of facies correlated with sedimentary changes, the archaeozoological and climate analyzes temper this corrélation. Indeed, the steppe area is extremely sensitive to any climate change. This is easily marked by very diverse sedimentary records, the importance of which is not linked to climate change in overall magnitude. Registration is micro-regional, which confirms the archaeozoological analysis that shows that the behavior acquisition of animal matters transcend these changes.

ORAL

### **HOMININS THROUGH GLACIALS AND INTERGLACIALS IN THE AZRAQ OASIS, JORDAN: THE CONCEPT OF PALEOLITHIC DESERT REFUGIA.**

*Cordova, Carlos (Oklahoma State University) carlos.cordova@okstate.edu*

*Nowell, April (University of Victoria) anowell@uvic.ca*

*Ames, Christopher (University of California at Berkeley) cjhames@gmail.com*

*Pokines, James (University of Boston) jamespokines@gmail.com*

A geoarchaeological study of sediments in the Azraq Oasis, in the Eastern Desert of Jordan, provides information on the fluctuations of the geomorphic and hydrologic systems in this region in relation to prehistoric occupations spanning the late Lower Paleolithic, Middle Paleolithic, Upper Paleolithic and Epipaleolithic. The study shows that local geomorphic and hydrological environments fluctuated between marsh, lake and playa

(dry lake bed with eolian activity and/or carbonate accumulation). In some instances, local wet conditions correlate with those registered in other regional paleoclimatic records, as is the case of the period comprising MIS 5c and probably early MIS 5a (Cordova et al. 2013; Ames et al. 2014). In other cases, paleoecological data obtained from the sedimentary sequences indicate local wet conditions and regional desert environment, which in turn suggests that the Azraq oases may have acted as desert refugia at times of regional adverse climatic conditions (Cordova et al. 2013). The fact that Azraq represents a potential desert refugium has important consequences for understanding major issues in the Middle Paleolithic of Southwest Asia, namely the arrival, survival, and extinction of populations of both Neanderthals and early modern humans. The location of Azraq at crossroads between the Levant, the Arabian Peninsula, and other regions of the Middle East, is also an important geographic aspect of desert refugia during the critical period of hominin dispersal in Southwest Asia. This study is part of the Azraq Marshes Archaeological and Paleoecological Project (AMAPP) aims at reconstructing the ancient environment and settlement patterns of hominins around the Azraq oases and the immediate desert areas around (Fig. 1). AMAPP is sponsored by the Social Sciences and Humanities Research Council of Canada and the team is composed of several specialists from Canada, the United States, Europe, and Jordan.

ORAL

### **THE SOIL RECORD OF GLOBAL/LOCAL CLIMATE INFLUENCE ON PALAEOOLITHIC SETTLEMENT IN THE SYRIAN DESERT.**

*Courty, Marie-Agnès (CNRS UPR 8521) marie-agnes.courty@promes.cnrs.fr*

*Le Tensorer, Jean-Marie (IPAS Univ. Basel) jean-marie.letensorer@unibas.ch*

*Boeda, Eric (Univ. Paris X) boeda.eric@gmail.com*

*Muhsen, Sultan (Damascus University) smuhsen@hotmail.com*

*Al Sakhel, Eba (Musée des Antiquités Nationales. Damas) alsakhel@mail.com*

*Wegmueller, Fabio (IPAS, Univ. Basel) fabio.wegmueller@unibas.ch*

The Syrian desert offers a unique potential to study effects of climate variability on hunter-gatherer communities throughout the Quaternary period. Its central position between Eastern continental, Western Mediterranean and Southern desertic influences provide a sensitive system to climate changes. Its endoreic configura-

ration and epithermal artesian springs have favoured sedimentation by hydric/aeolian processes, resulting into long finely stratified depositional sequences with interstratified paleosols. The aridity has favoured the recurrent fossilisation of paleosurfaces with traces left by hunter-gatherer communities and animal flocks. We present here a field/multi-analytical study of the ones showing a finely stratified organomineral facies which provide a high resolution record of human occupation and environmental changes.

The Paleolithic sites of Hummal and Umm El Tlel form prominent mounds at artesian springs, resulting from recurrent episodes of lacustrine, limnic and aeolian sedimentation in pseudo-karstic depressions. The 20 m thick sequence at Hummal provides a succession of archaeological levels from the Oldest Paleolithic (Oldowan) to the Upper Paleolithic. We focus on the black organogenic facies (layer 17) sealing the Oldowan occupation (layer 18) dating back far before the Brunhes-Matuyama boundary. The 10 m thick sequence at Umm el Tlel sequence displays 70 thin occupation stratum that are interstratified with aeolian, lacustrine and palustrine deposits. We focus here on the series of black organomineral facies that contains Middle Palaeolithic microstratified occupation floors. In addition to the field and micromorphological study of the organomineral facies, sampling by individual microstra was performed for tracing relevant components with respect to sediment sources and depositional conditions. They have been characterized by ESEM; MEB-EDA, XRD and Raman spectrometry.

The organomineral facies identified in the Hummal and Umm El Tlel sequences display a similar microstratification formed of authigenic lacustrine calcareous silty clay interlayered with dark brown organic rich clay and dull orange silty clay. The later display the characteristics of peat-like weakly decomposed organic matter finely mixed with exogenic aerosols that consist of distinctive carbonaceous (polymer filaments, graphitic charcoal, vesicular vitrous char, carbon fibres) and mineral components (breccia, quartz, fine quartzite, zircon, monazite, lime) with ribbon-shaped incrustations of Fe-Ni, Fe-Cr-Ni, Cu-Zn, Ag, Au. These components bear the diagnostic signatures of atmospheric aerosols that have been recycled by hypervelocity plasma processes linked to cosmic events, have suffered long distance transport and have accumulated at high rate during rainy episodes in regions marked by a strong climate contrast. When present in the other pedo-sedimentary facies, rounding of the singular aerosols and mixing with the local aeolian materials suggest a secondary position due to reworking by surface runoff and violent winds.

The peat-like organomineral facies with their singular aerosol assemblage are concluded to trace the recurrence of a particular climate configuration on the Syrian desert in response to a global increase of atmospheric dust loading and occurrence of cosmic events. These events marked by high rainfall due to cloud condensation nuclei effects, reduced albedo and weak winds have created throughout the Quaternary favourable conditions to the settlement of humans and flocks in the heart of the el Kowm basin.

ORAL

### **THE LARGE MAMMAL FOSSIL RECORD OF THE SITE OF HUMMAL (EL KOWM, CENTRAL SYRIA) AND ITS PALEOENVIRONMENTAL INDICATIONS (FIRST RESULTS).**

*Elsuede, Hani (Institut for Prehistory and Archaeological Science (IPAS) University of Basel Switzerland) hani.elsuede@unibas.ch*

The region of El Kowm, located in the desert area of the Levant (central Syria) is considered as a key area for the studies of the prehistory of the Middle East. The presence of natural resources in an arid area has attracted humans and animals to the area. The undertaken researches in this region have produced evidence of a very dense human occupation. This steppe territory has served as a passing zone during the ancient Paleolithic, along with the natural route of the "Levantine corridor", one of the main hominin routes out of Africa, situated at the meeting point of Africa and Eurasia, the Arabian deserts and the Mediterranean Sea, making it ideal for tracing climate variability. Climate change is frequently considered an important driver of hominin evolution and dispersal patterns. Palaeoecological investigations based on fossil assemblages are a useful tool to reconstruct key environmental changes. Studies of mammal fossils can contribute to our knowledge of how palaeoenvironmental circumstances affected the spread of hominins. In many cases, mammals shared their habitats with hominins and/or formed key resources for human subsistence.

The sites of Aïn Fil, Hummal, Nadaouiye Aïn Askar and Umm el Tlel, all situated and excavated in the region of El Kowm, possess an extraordinary richness of archaeological and palaeontological material. They therefore can allow us to reconstruct the evolution of cultures, to identify the key aspects of the occupation and to reconstruct the environmental changes of this region.

The present paper has the aim to shine light on the faunal assemblage of the site of Hummal, to compare it with

other sites in the region and to interpret its paleoenvironmental indications.

ORAL

### **EL KOWM OASIS, HUMAN SETTLEMENT IN THE SYRIAN DESERT DURING THE PLEISTOCENE.**

*Jagher, Reto (Institute of Prehistory and Archaeological Science - University of Basel) reto.jagher@unibas.ch*

The El Kowm area in the geographic centre of modern Syria is well known for its abundance of Palaeolithic sites covering more than one and a half million years of human history. Imbedded between two major mountain ranges, the area occupies an important transit route between the Euphrates River in the North and the vast expanses of the Arabian Desert in the South. The attraction for game and humans since the Lower Pleistocene is due to the presence of several dozens of natural springs within an area of less than 15 km across. The artesian groundwater is supplied by a geological reservoir independent of coeval precipitations hence these springs have been reliably running also under extreme dry climatic conditions. At any times water was available at a substantial number of places permitting a save subsistence for hunters and gatherers in this area. Secure supplies of water at the surface are scarce throughout Syria's interior. A further point of interest for Palaeolithic man is the unlimited availability of a first grade flint in nodules up of several decimetres in diameter in infinite quantities, within 5 to 20 km from the natural wells. Despite varied geologic conditions at the different spring sites, usually an intermittent but rapid sedimentation, provided an excellent preservation of Palaeolithic sites; tracing a steady human presence since at least 1.5 million years. The history of El Kowm Oasis clearly demonstrates that early humans did not depend on perfect environments alone, but easily adapted to different conditions. Since the first surges Out of Africa, humans regularly ventured far into the harsh environments of the desert and semi-desert of the Levant, revealing their capacities to adapt to the specific conditions and their independence of favourable environments alone. The particular situation, with the availability of water attracting game from afar and the presence of a first grade raw material for stone tools, made El Kowm Oasis a kind of early Paradise for Pleistocene humans despite its unfavourable setting.

ORAL

### **THE OLDOWAN SITE AÏN AL FIL (EL KOWM, SYRIA) AND THE FIRST HUMANS OF THE SYRIAN DESERT.**

*Le Tensorer, Jean-Marie (University of Basel IPNA) jean-marie.letensorer@unibas.ch*

*Le Tensorer, H  l  ne (University of Basel IPNA) hletensorer@wanadoo.fr*

*Martini, Pietro (University of Basel IPNA) pitemart@hotmail.com*

*Vallalain, Juan Jos   (University of Burgos) villa@ubu.es*

Nowadays, the oldest traces of human cultures are found in Eastern Africa. New discoveries set anew the questions about human and animal dispersal into Eurasia. Issuing from Africa, the first humans migrated at different periods. During these dispersal phases, the Near and Middle East played a leading role as a crossroads between the three continents.

In fact, for over 1.8 million years, humans have been present in the Levant. Alongside the corridor stretching from the River Jordan to the Orontes Valley, early Palaeolithic groups already found favourable places for settlements and a natural route towards new horizons. An extensive program of surveys and excavations in the Syrian Desert have been carried out over 30 years by the Institute for Prehistory and Archaeological Science of the Basel University, together with the General Directorate of Syrian Antiquities; these studies showed that this part of the world was also a very ancient land of settlement. In Central Syria, the oldest site, A  n al Fil was discovered in 2008 in the region of El Kowm, between the Euphrates basin and the desert steppe stretching from Palmyra to Deir-ez-Zor. The lithic industry in the lowest layer can be characterized by numerous unretouched flakes, pebble-tools and core-like artifacts. This assemblage is typical in a broad sense of archaic Palaeolithic the debitage of which corresponds to mode 1. From a techno-typological point of view, this industry tallies quite well with the so-called Oldowan stage. It shows remarkable similarities with the oldest African assemblages. From a chronologic point of view, these levels occur before two positive events in the Matuyama paleomagnetic sequence. According to the preliminary studies of faunal assemblage of large mammals they should be older than 1.5 million years at least. Together with those of the neighbouring site Hummal, these levels would be the oldest traces of human presence ever found in Syria.

In the Syrian Desert, the archaeological record from 1.8 to 0.8 million years points to at least three major waves of early migrations probably out of Africa. The earliest



dispersal involved core and flake industries (Oldowan) around or before 1.8 Ma. The second wave related to early handaxes producers possibly around 1.4 Ma. The third wave occurred around 1 - 0.8 Ma, and is represented by Acheulean groups who manufactured numerous elongated bifaces and sometimes large flake cleavers.

Since the very beginnings of human presence in the Levant, i.e. more than 1.8 million years ago, first humans not only occupied favourable zones but regularly ventured deep into less welcoming environments suggesting an astonishing flexibility in their behavioural and survival skills.

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ORAL

### PLEISTOCENE CAMELIDS FROM THE SYRIAN DESERT: THE DIVERSITY IN EL KOWM.

*Martini, Pietro (Universität Basel - IPNA) [pietro.martini@unibas.ch](mailto:pietro.martini@unibas.ch)*

*Costeur, Loïc (Naturhistorisches Museum Basel) [loic.costeur@bs.ch](mailto:loic.costeur@bs.ch)*

*Le Tensorer, Jean-Marie (Universität Basel - IPNA) [jean-marie.letensorer@unibas.ch](mailto:jean-marie.letensorer@unibas.ch)*

*Schmid, Peter (University of Witwatersrand - ESI) [smidi@aim.uzh.ch](mailto:smidi@aim.uzh.ch)*

The family Camelidae (Artiodactyla) originated in North America during the middle Eocene (~45 Ma). In the Miocene they became very successful, and diversified into many species and at least 20 genera. The first genus to reach the Old World was *Paracamelus*, which is recorded since the latest Miocene (MN13, ~7 Ma) and is considered ancestral to the Pleistocene and Recent genus *Camelus*. However, the evolution of Eurasian camelids is poorly known. Several species are recognized, but most of them are based on scarce material or have been described only superficially.

A good opportunity to study the diversity and evolutionary trends of Eurasian camelids is provided by the faunal record of the El Kowm Basin (central Syria). The many Palaeolithic archaeological sites of this region have provided with abundant mammalian fossils, among which camelid remains are the most frequent faunal element over all layers. We present the first results from the analysis of this camelid succession, which spans the early to late Pleistocene, from more than 1.5Ma to 50 ka. The material studied was excavated in three sites (Ain al Fil, Hummal and Nadaouiyeh Ain Askar) within few km from each other.

The oldest remains from Ain al Fil (Early Palaeolithic, Early Pleistocene, between 1.8 and 1.5 Ma) suggest the coexistence of two species, one dromedary-sized and the other much larger. Later forms from the lower section of Hummal are also larger than modern camels, with long limbs and small heads. A size reduction is seen from the Early to the Late Pleistocene. A rare Middle Pleistocene skull from the rich sample of Nadaouiyeh Ain Askar (Acheulean layers, 450 Ka) has a unique morphology, with many characteristic details. Fossils that are similar and somehow intermediate between the two modern species are frequent only in the Late Pleistocene of Hummal (Mousterian layers, 150 to 50 Ka). During this period they coexisted with a highly distinctive giant species, which is the most recent example of the formerly common giant camels.

The richness and uniqueness of the El Kowm camelid fauna make the study of this region fundamental to understand the evolution of these important domestic animals.

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ORAL

### THE MIDDLE PALAEOOLITHIC CULTURAL OCCURRENCES IN THE PALMYRA BASIN, SYRIA

*Nishiaki, Yoshihiro (The University of Tokyo) [nishiaki@umutokyo.ac.jp](mailto:nishiaki@umutokyo.ac.jp)*

*Akazawa, Takeru (Kochi University of Technology) [akazawa.takenu@kochi-tech.ac.jp](mailto:akazawa.takenu@kochi-tech.ac.jp)*

The Palmyra basin, central Syrian, was one of the major prehistoric research fields of the University Tokyo between 1967 and 1984. Along with the excavations of the Middle and Epi-Palaeolithic site of Douara Cave, a series of prehistoric surveys was conducted in its vicinity, which produced rich archaeological and palaeo-environmental data especially of the Middle Palaeolithic period. In this paper, we attempt to re-evaluate those records in the light of recent developments of the Middle Palaeolithic research in the arid environments of the Levant.

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ORAL

### CROSS-ZAGROS RELATIONS DURING UPPER PALEOLITHIC.

*Otte, Marcel (Université de Liège) [marcel.otte@ulg.ac.be](mailto:marcel.otte@ulg.ac.be)*

All the datas coming from Rust excavation in Near East

present close relationship with our own excavation in the Zagros mountain, in Iran.

There seems to be an east-west axis for the diffusion of early Aurignacian, which has been poorly known until now.

This reinforces the close land origin in this part of the world, leading to European Aurignacian.

ORAL

### **TECHNO-CULTURAL VARIABILITY AND SETTLEMENT PATTERNS IN THE SYRIAN DESERT DURING LATE MIDDLE PALAEO-LITHIC: A CASE FROM UMM EL TLEL (CENTRAL SYRIA).**

*Pagli, Marina (UMR 7041 archéologie et sciences de l'antiquité (ArScAn) - équipe "Anthropologie des Techniques, des Espaces et des Territoires au Pliocène et au Pléistocène (AnTET) marina.pagli@gmail.com*

*Bourguignon, Laurence (Institut national de recherches archéologiques préventives (INRAP) laurence.bourguignon@inrap.fr*

We propose a reconstitution of settlement dynamics in a semi-arid context considering the Mousterian sequence of Umm el Tlel. This open air site is located in the semi-arid steppe zone of Central Syria, in an area where aridity is attenuated by the presence of artesian springs. The Late Middle Palaeolithic sequence yielded a succession of occupations around a lake or backwaters, attributed to the Mousterian with Levallois reduction.

We present a double analysis of one part of this sequence, represented by the occupation levels of complex V2.

On one side technological analyses show the operative schemes variability for each level of this complex, suggesting a strong techno-cultural diversity of the human groups which occupied the site. On the other side, a comparison with experimental analyses shows the circulation of blanks, the introduction onto the site of some of the lithic artefacts, or their production in situ, and highlights the mobility patterns of each occupation, suggesting that the site was integrated in a complex network of places occupied by the human groups.

The integration of these components of lithic analysis contributes to show the settlement modalities of this semi-arid region and the techno-cultural identity of the populations who occupied the area.

ORAL

### **AN EARLY HOMININE IN AN ACHEULEAN CONTEXT.**

*Schmid, Peter smidi@aim.unizh.ch*

The Middle East is apparently the most important passage for the dispersal of early hominines. Numerous archaeological sites prove the existence of hominine populations in this region. Despite these rich cultural remains, hominine fossils are very rare. In 1997 a hominine left parietal was found in an Acheulean context. In addition, the faunal remains show a steppe environment. What does this single cranial fragment tell us? Based on new publications and especially on recent finds the value of isolated elements will be discussed.

ORAL

### **CONTEXTUALISING THE MOUSTERIAN OF HUMMAL (EL KOWM, SYRIA): LOCAL AND REGIONAL PATTERNS OF HUMAN ADAPTATION IN THE LEVANTINE MIDDLE PALAEO-LITHIC**

*Thomas Hauck - Thomas.Hauck@uni-koeln.de (Institute for Prehistoric Archaeology, University of Cologne)*

The well-site of Hummal in the arid steppe region of El Kowm (Central Syria) is scientifically important because of its long archaeological sequence. Beginning probably over a million years ago, humans visited the spring during a range of environmental conditions, and their remains can be found in more than 60 archaeological levels.

This paper focuses on the Mousterian deposits, which comprise the uppermost and longest section of the Hummal sequence. Over 30 archaeological levels display evidence of intermittent site frequentation by Mousterian hominids. The 5m sequence of littoral deposits mirrors a steady shift between water transgressions and regressions, which caused the development of a broad ecological spectrum ranging from extended, oxygen-rich lake systems to marshy ponds or water-depleted depressions. In this paper, we integrate the Mousterian of Hummal in the Levantine MP record by reviewing different levels of analytical scale.

ORAL

### **THE LOWER PALAEO-LITHIC OF HUMMAL**

*Wegmüller, Fabio (Institute of Prehistory and Archaeology)*

*cal Science (IPAS) University of Basel, Switzerland) fabio.wegmueller@unibas.ch*

The site of Hummal is situated in the region of El Kowm in central Syria. The site shows an archaeological sequence over the entire Pleistocene epoch which encompasses all major Palaeolithic complexes currently known in the Middle East. At the bottom of the site, 14 m below the actual surface several layers with lithic assemblage attributed to the Lower Palaeolithic were excavated during the last years. Today a lithic assemblage of 450 stone artefacts and more than 3000 bone fragments is available from this part of Hummal.

The lithic assemblage is characterized by a simple flaking technique and the presence of different pebble tools, such as choppers, hammerstones and sphaeroids. Additionally four handaxes were found which have a symmetric form and are rather flat and clearly bifacial, therefore these objects correspond rather with Upper Acheulean handaxes than with the Early Acheulean found in other archaic sites in the Levant (e.g. Ubeidiya)

The stratigraphic position in the sequence of Hummal as well as biostratigraphic indications of the microfauna and large vertebrate remains indicates an age of this assemblage surely older than 500 Ka, preliminary palaeomagnetic results suggest a chronological position below the Matuyama-Brunhes boundary and therefore older than 780 Ka.

In large part the lithic assemblage from the lowermost layers in Hummal resembles an Archaic Lower Palaeolithic and belongs to the so-called Oldowan or Mode 1 stage, but the presence of well-shaped and symmetric Handaxes questions the attribution to Mode 1, Oldowan or early Acheulean Stage and raises the question if these common classifications lithic industries are adequate to describe the archaeological record from this period in the Middle East.

: ORAL

### **NOT ONLY BLADES; THE PRODUCTION OF SMALL IMPLEMENTS IN HUMMALIAN.**

*Wojtczak, Dorota (Basel University) dorota.wojtczak@unibas.ch*

The Hummalian industry is known for the systematic production of large blades. Although blade reduction was certainly dominant in the Hummalian primary flaking processes, two additional reductions, directed towards production of different small-sized debitage

items are also clearly identifiable. There was a separate production of bladelets from burin-cores, and bladelet cores and small flakes from cores on flake. Additionally, recently undertaken refitting shows the targeted production of Janus small debitage pieces. These elements combined indicate an outstanding level of complexity in blank production.

The phenomenon of blade and bladelet production within Middle Palaeolithic context is widely recognized. Very small flakes have also been described in Lower and Middle Palaeolithic sites worldwide. But the eventual purpose of their production remained in more cases obscure with two exceptions Qesem Cave and Umm El Tlel. The former shows that tiny flakes were removed from the ventral face of cores-on-flake having two ventral, flat and smooth, faces (Janus flakes). Use-wear analyses have shown they were employed for precise meat-cutting activities. The production of tiny bladelets was recognised in Mousterian levels on the second site of Umm El Tlel. The bladelets were detached from the proximal part of elongated Levallois points. The micro-wear analysis displayed that they were used for working meat, bone and vegetal matter and they show hafting traces. These results change our view on the behaviour of early hominids and draw attention to importance of small specimens such as bladelets and small flakes found on other Palaeolithic sites within Hummal.

The aim here is to present and discuss the presence of the small implements discovered in Hummalian layers and if their existence is significant for this cultural horizon and possibly related to the site-function and specific task activities.

POSTER

POSTER

### **PALAEOECOLOGY OF THE SPRING OF NADAOUYEH AÏN ASKAR. - INFERENCES FROM OSTRACOD ANALYSIS OF A SEDIMENTARY SEQUENCE OF A PALAEOOLITHIC OASIS IN THE SYRIAN DESERT.**

*Kalbe, Johannes (Universität Potsdam, Institut für Erd- und Umweltwissenschaften, Karl-Liebknecht-Str. 24-25, D-14476 Potsdam-Golm) johanneskalbe@gmx.de*

*Jagher, Reto (Universität Basel, Integrative prähistorische und naturwissenschaftliche Archäologie (IPNA), Spalenring 145, CH-4055 Basel) reto.jagher@unibas.ch*

The site of Nadaouiyeh Aïn Askar with its main human

occupation from about 550 to 35 ka is located in the region of El Kowm, in the arid interior of Syria, 90 km north-east of Palmyra. This area is known for its rich archaeological legacy from the Lower to Upper Pleistocene (Jagher & Le Tensorer, 2011).

We present new sediment geochemical and first micro-paleontological data for limnic sediments of the artesian spring of Nadaouiyeh Ain Askar, which belongs to an important cluster of natural springs in the Syrian desert. This section is characterized by a lithic assemblage assigned to the Acheulean techno-complex (Nad-C: ~ 450 ka; Jagher, 2011).

The timing and regional significance of water availability and its environmental influence on local wetland and spring systems during the Pleistocene of this region is still poorly known. Studies on Quaternary ostracod faunas, which can be used to infer past environmental settings are scanty for the eastern Mediterranean region in general and missing for central Syria.

The studied sediments of Nadaouiyeh Ain Askar consists of carbonate rich silts, with particularly high amounts of ostracod carapaces. Ostracod abundances are higher in the upper section. *Heterocypris salina*, *Darwinula stevensoni*, *Plesiocypridopsis* sp., *Pseudocandona* sp. and *Ilyocypris* sp. are the common ostracods in these sediments. *Cyprideis torosa* is a frequent ostracod in some of the samples. Numerous charophyte gyrogonites are preserved in the topmost zone of the studied section.

The ostracods common in the sediments of the studied section are characteristic for a permanent and stagnant water body. *Cyprideis torosa* and *H. salina* suggests an influence of a higher degree of salinity in some ranges of the section. The charophyta found in the upper part of the section indicate a shallow oligohaline and probably permanent small water body.

Ostracod fauna of the site of Nadaouiyeh Ain Askar allows to reconstruct an environment of an oasis with a permanent and sometimes brackish water body during the deposition of the studied section, when the site was occupied by Lower Palaeolithic humans. Our study provides the first detailed ostracod record for the Pleistocene of central Syria.

#### POSTER

### **BIOSTRATIGRAPHICAL AND PALAEOECOLOGICAL IMPLICATIONS OF THE MICROVERTEBRATES FROM UNIT G/LAYER 17 OF THE ARCHAEOLOGICAL SITE OF HUMMAL (EL KOWM, CENTRAL SYRIA).**

*Maul, Lutz Christian (Senckenberg Research Station of Quaternary Palaeontology, Weimar, Germany) lmaul@senckenberg.de*

*Smith, K.T. (Senckenberg Research Institute and Natural History Museum Frankfurt, Germany)*

*Wegmüller, Fabio (Institute for Prehistory and Archaeological Science (IPAS), University of Basel, Switzerland) fabio.wegmueller@unibas.ch*

*Le Tensorer, Jean-Marie (Institute for Prehistory and Archaeological Science (IPAS), University of Basel, Switzerland) jean-marie.letensorer@unibas.ch*

A total of c. 2,000 microvertebrates (1,800 small mammals, 230 reptiles) was found in unit G/layer 17 of Hummal by screen washing sediments from an area of 4 square metres. The mammals are referred to: *Crocodyridae* indet., cf. *Suncus etruscus*, *Chiroptera* indet., *Lepus* cf. *capensis*, *Ellobius* ex gr. *fuscocapillus-lutescens-pedorychus*, *Microtus* cf. *guentheri*, *Meriones* ex gr. *tristramilibycus-persicus-crassus*, *Gerbillus* cf. *dasyurus*, *Mus* cf. *macedonicus*, and *Bandicota indica*. The reptile remains belong to *Gekkonidae* indet., cf. *Trapelus* sp., *Lacertidae* indet. (2-3 species), *Eryx* cf. *jaculus*, *Natricinae* indet., and *Testudinidae* indet.

The recorded arvicolids provide the first biostratigraphic information for layer 17 at Hummal. The presence of *Ellobius* indicates a minimum age of 200 ka as in the Near East, this species ranges from late Acheulean (Oumm Qatafa) to Early Mousterian (Tabun D and Hayonim E). The maximum age is given by the m1 of *Microtus* cf. *guentheri*, which displays (although based on a single fragment) significant features of a more advanced evolutionary level than the corresponding *Microtus* species from the Gesher Benot Ya'aqov locality in Israel, dated to 700 ka. However, detailed studies of the *Ellobius* finds will provide further refinement of the biostratigraphic age of this assemblage, although the preliminary result is broadly consistent with the fact that layer 17 is situated beneath Yabrudian, Hummalian and Mousterian horizons.

The ecological requirements of the recorded taxa indicate different, mainly open habitats, but also the presence of vegetation and wet condition, at least close to the site. *Lepus capensis*, *Ellobius*, *Meriones*, *Gerbillus*, *Trapelus* and *Eryx jaculus* live to various extents in open grasslands; in steppes, semi-deserts, and deserts respectively. *Bandicota* requires streams or other water bodies and occupies a variety of wooded habitats, grassland and savannah, but is recorded also from desert margins, provided that some water is available.

From the biogeographic point of view, *Ellobius* and *Bandidocota* are of special interest, since these taxa do not occur in Syria today. Their nearest populations are now in Transcaucasia and in westernmost India respectively, so that the region between Syria and India must have experienced much more humid conditions than now.

The fragmentary preservation of the microvertebrates suggests that they were accumulated as prey remains. The question of whether they were accumulated by owls, diurnal raptors or mammalian carnivores is the subject of ongoing investigations.

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POSTER

**PALAEOMAGNETISM IN EL KOWM ARCHAEOLOGICAL SITES (SYRIA)**

*Villalain Santamaría, Juan José (Universidad de Burgos · Department of Physics) villa@ubu.es*

*Wegmüller, Fabio (Institute of Prehistory and Archaeological Science (IPAS) University of Basel) fabio.wegmueller@unibas.ch*

*Le Tensorer, Jean-Marie (Institute of Prehistory and Archaeological Science (IPAS) University of Basel) jean-marie.letensorer@unibas.ch*

The El Kowm Region is well known for its archaeological record over the whole Pleistocene period. Since more than 20 years a research team from the University of Basel under the directorate of Jean-Marie le Tensorer excavates different sites in the El Kowm region. In two of these sites several layers were found bearing an archaeological and faunal material which most probably dates back to the Early Pleistocene.

In order to proof the age of this layers and to get a more detailed view on the paleomagnetism of the stratigraphy in 2009 Juan José Villalain from the „Grupo de Paleomagnetismo de la Universidad de Burgos“ carried out an extensive sampling in the sites of Hummal and Ain al Fil.

This poster presents the first results of the analysis of these samples and their implications for the dating of the oldest archaeological sites in Syria.

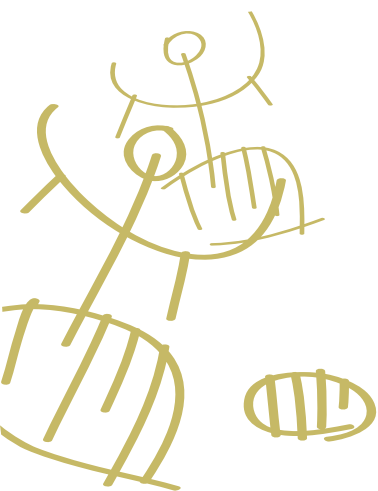
# B34

## Archaeometry approaches regard the study of networks of trade in raw materials and technological innovations in prehistory and protohistory

Organiser: João Carlos Baptista, Davide Delfino and Paolo Piccardo

Wednesday 3rd (9:00 to 14:00)

A12 Meeting Room



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ORAL CONTRIBUTIONS

ORAL

**1. PASSAGE OF TECHNOLOGIES - AN ARCHAEO-METRIC CASE STUDY OF IRON ARTIFACTS OF A SCYTHIAN AGE GRAVE FROM THE CARPATHIAN BASIN.**

*Török, Béla (University of Miskolc) bela.torok@uni-miskolc.hu*

*Gyucha, Attila (Hungarian National Museum) bureau@eu-far.net*

*Kovács, Árpád (University of Miskolc) femkov@uni-miskolc.hu*

*Barkóczy, Péter (University of Miskolc) fembarki@uni-miskolc.hu*

*Gulyás, Gyöngyi (Ásatárs Cultural, Archaeological Servicing and Commercial Ltd) gyongyi.gulyas@bcehok.hu*

During the Middle Iron Age the southern part of the Carpathian Basin was the contact zone for several major cultural groups of fundamentally different origins and traditions. The Great Hungarian Plain was characterized by the westernmost occurrence of the Scythian style material culture, while the easternmost Hallstatt groups occupied Northern Transdanubia. Moreover, southern Transdanubia and the Drava–Sava Interfluvium likely were inhabited by Illyrian and Venetic tribes. Examining the nature and direction of contacts between these contemporary cultural units in the aforementioned regions, this paper presents the results of typological and archaeometric analyses on Middle Iron Age iron artifacts from a grave excavated in the southern part of the Danube–Tisza Interfluvium (Bátmonostor–Szurdok) on the eastern bank of the Danube as a case study. The area is considered to be part of the Alföld group of the Great Hungarian Plain during the period however the site is located ca. 100 km apart from the nearest Alföld group sites.

The members of the ARGUM carried out a complex archaeometric investigation on six iron weapons (an adze-axe, a probable long axe, a shaft-hole axe, a trunnion axe, a larger spearhead and a sheath) using computer-operated optical microscopy, scanning electron microscopy with energy dispersive x-ray spectrometry (SEM-EDX), and micro-hardness testing (HV1). The analyses are unique in the Carpathian Basin with regards to the period.

Based on material structure and compositions of slag inclusions, the artifacts can be classified into two distinct

groups in terms of quality of material and supposed manufacturing technology. The trunnion axe, the shaft-hole axe and the long axe were produced by forging by means of multiple reheating, as evidenced by layers containing different amounts of carbon. The artifacts of the other group were individually made from a piece of single bloom. The blades of the adze-axe may be considered to be the hardest material among the relatively soft ferritic-perlitic structures of the samples. Grouping of the examined artifacts is also supported by the compositions of slag inclusions with special regard to different phosphorus contents.

The various analyses conducted on the artifacts imply that the burial assemblage may reflect shared cultural traditions between different regions. While the grave construction and the vast majority of ceramic, antler, bronze and iron findings revealed from the burial fit well in the Scythian Period of the Great Hungarian Plain and indicate that the individual was a member of the community of Alföld group, the quantity of grave-goods and several iron weapon types (long axe, shaft-hole axe and trunnion axe) bear resemblance to the Transdanubian Hallstatt Culture. The archaeometric investigations clearly indicate technological choices that might also have derived from different practices. The individual with whom the Bátmonostor–Szurdok feature is associated was a high-ranked person with significant economic and political power. The isolated position of the burial might be related to commercial activities between the communities of the southern part of the Carpathian Basin, and may be associated with a trading outpost that controlled the flow of commodities across the Danube during the 6-5<sup>th</sup> centuries BC.

POSTER

POSTER

**2. MIDDLE BRONZE AGE METALWORKING IN THE SOUTH-WEST SARDINIA (ITALY)**

*Paglietti, Giacomo (Dipartimento di Storia, Beni Culturali e Territorio, Cagliari University (Italy) gpaglietti@unica.it*

*Serra, Marco (Dipartimento di Scienze dell'Antichità, University of Rome "La Sapienza" (Italy) marco.serra@unica.it*

*Naitza, Stefano (Dipartimento di Ingegneria Civile, Ambientale e Architettura, Cagliari University (Italy) snaitza@unica.it*

*Tanda, Giuseppa (Dipartimento di Storia, Beni Culturali e Territorio, Cagliari University (Italy) gtanda@unica.it*

A metal work station and two metal artefacts of middle bronze age were founded in 2012 by the department of history, cultural heritage and territory of Cagliari university (Sardinia, Italy), during the excavation of the karst cave of Monte Meana-Santadi (south-west Sardinia, Italy). The metalwork station was composed of a digged fire place (probably a *bowl furnace*) with a number of charcoal fragments, smelting slags and pottery vessel sherds with vitrified inner surface, which confirm the metallurgical activity on the site. Two metal artifacts were founded in a crevice of the cave. They consist to a dagger with a simple base and two rivets, and an awl. Similar objects are known from the S. Iroxi phase (middle bronze age of Sardinia).

A radiocarbon measurement made on charcoals, dated the smelting furnace between 1920 and 1660 BC (cal.). The archaeometric investigations were carried out on two archaeological artefacts, five smelting slags and three vitrified remains of the furnace. The analysis was extended to certain portions of metalliferous ore sampled near the archaeological site.

A preliminary macroscopic analytical approach was aimed to define the visible "hand samples" characters: colour, presence of alterations such as oxides, porosity and blistering.

Subsequently, slags and artefacts were subjected to chemical analysis with non-destructive energy dispersive x-ray fluorescence spectrometry (ED-XRF). Micro-destructive inductively coupled plasma optical emission spectrometry (ICP-OES) and crystallographic x-ray diffraction tests (XRD) were run on powders of slags. Finally, several slags were observed by metallographic microscope.

The aim of this study is the definition of the qualitative and quantitative chemical characters and the mineralogical composition of the materials analyzed, for the reconstruction of ancient technological aspects of metallurgy, as the use of alloys, and definition of the raw materials used by local Nuragic people.

The investigations have shown that artefacts and slags are made primarily by copper, with significant amounts of iron (in the form of fayalite), zinc and traces of arsenic and manganese. All samples had calcium but only slags displayed small quantities of sulfur.

The minerals sampled and analyzed in this study, revealed the presence of arsenopyrite, chalcopyrite and malachite local ores.

Artefacts and slags are evidently composed of copper. The substantial presence of iron in both categories of samples, can be linked to the presence of this element in added blast furnace burdens or, most probably, in the mineral charge.

Arsenic identified in metal products and slags, is contained also in close metalliferous outcrops. This fact indicates the possible use of a local natural blend of copper and arsenic, with other impurities (zinc and manganese).

The presence of calcium suggests the ancient exploitation of malachite or the effect of karst activity on archaeological remains.

Sulfur, only included into the slags, indicates the absence of roasting before the smelting phase and shows the choice of sulphates or carbonates (chalcopyrite and malachite) for metallurgical activity.

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#### POSTER

### 3. COPPER METALLURGY IN THE SOUTHWEST OF THE IBERIAN PENINSULA IN THE III MILLENNIUM B.C.E.: TOWARDS A NEW MODEL OF INTERPRETATION FROM THE ANALYSIS OF PRODUCTION TECHNOLOGY BY METALLOGRAPHICS TECHNIQUES.

*Bayona, Moisés (Universidad de Huelva) moises.rodriguez@dhis1.uhu.es*

*Nocete, Francisco (Universidad de Huelva) nocete@dhis1.uhu.es*

*Inácio, Nuno (Universidad de Huelva) nuno.inacio@dhis1.uhu.es*

The metallurgy of copper, whose production, distribution and accumulation materialize the emergence of class relations among past societies, remains one of the central themes of prehistoric archaeology. Copper metallurgy defines an activity with one of the most historical projection and possibility of creating a regional scale of archaeological tracers, whose technological indicators are essential to the understanding of prehistoric societies.

Since the establishment and delimitation of one of the spatial frames associated with the oldest metallurgy throughout Europe, the Southwest of the Iberian Peninsula, we have selected two major casuistries for empirical evaluation: Cabezo Juré (Huelva) and Valencina de la Concepción (Sevilla). Their archaeological record



defines the first intensive and specialized metallurgical production of the Iberian Peninsula (ca. 3100 B.C.E.).

This paper\* presents the definition of technological process used in the manufacture of copper products of Cabezo Juré and Valencina de la Concepción, performed by the application of an archaeometric methodology based on traceological analysis, textural and compositional characterization and the study of the internal structure and mechanical properties of selected samples. The analysis included the study of the elemental chemical composition by Electron Microprobe (EPMA), the determination of the phases, inclusions and alteration products by Scanning Electron Microscope (SEM), microstructural analysis by metallographic microscopy and evaluation of mechanical properties by optical microhardness tester.

The characterization of the manufacturing process of copper products from Cabezo Juré and Valencina de la Concepción allowed us to define a "specific" technological model for the southwest Iberian Peninsula.

This study shows communities with an efficient knowledge of technology and metallurgical techniques, where the preferred implementation of complex manufacturing processes, by applying cycles of thermal and mechanical treatments and the determination of positive trends and statistical correlations, allow us to infer a intentionality control of production techniques and / or the characteristics and qualities of the resulting products. This model refutes the traditional interpretation of the technological levels metallurgy defined as rudimentary, primitive and domestic.

In that sense, this study of Cabezo Juré and Valencina de la Concepción, not only fills an important void in the knowledge of Archaeometallurgy discipline and established the validity of a model of technological competence for southwest peninsula (also discriminate in its means of production, archaeological contexts, circulation of raw materials and products, etc.) but substantially expands the boundaries of scientific debate, completing and changing concepts and perception of prehistoric metallurgy and its chronological, technological and social development.

**Agnowledgements:**The analysis developed in this work has been funded mainly by the *Atlantic Copper Foundation* (Huelva).

## ORAL CONTRIBUTIONS

### ORAL

#### 4. PREHISTORIC GOLD METALLURGY IN TRANSYLVANIA ? AN ARCHAEOMETRICAL STUDY

*Cristea-Stan, Daniela (National Institute for Nuclear Physics and Engineering, Bucharest, Romania) daniela@nipne.ro*  
*Constantinescu, Bogdan (National Institute for Nuclear Physics and Engineering, Bucharest, Romania) bconst@nipne.ro*

Transylvania is one of the richest in gold European region. Consequently, many gold artifacts were discovered here, dated from Late Neolithic, Bronze Age and Iron Age periods - see "Ancient gold and silver of Romania", National History Museum of Romania (Exhibition Catalogue), 2013. To clarify the metallurgical techniques used by our ancestors a compositional study on relevant gold artifacts from each period was realized.

We used X-Ray Fluorescence, a non-destructive elemental analysis method performed "in situ", directly on artifacts exposed in some representative Romanian Archaeological Museums.

For Late Neolithic period we analyzed some small beads found in the site of Pestera Ungureasca (Cheile Turzii), identifying the use of small alluvial gold nuggets, some of them cold hammered and others partially heated and hammered. The mean gold composition - Au=91.4%, Ag=7.7%, Cu=0.2%, Fe=0.8% - is practically identical with present alluvial gold composition from neighbor Aries river.

For Bronze Age period we analyzed artifacts from Smig, Cauas, Sacuieni, Pecica, Cacova and Valea Pianului. A very interesting case is a 3 cm diameter gold hair-ring, where XRF analysis showed four regions of very different composition: (1) Au=33.5%, Ag=64.9%, Cu=0.1%; (2) Au=40.4%, Ag=57%, Cu=0.1%; (3) Au=57.4%, Ag=42.5%, Cu=0.3% and (4) Au=60.3%, Ag=37.9%, Cu=0.7%, probably four different nuggets soldered together by local heating and hammering in one final object.

For Iron Age period a spectacular example is a bracelet found at Boarta, near Valea Pianului - the best known ancient area of gold placers from Transylvania. In the visual inspection of this bracelet, we noticed two different types of gold (one white and the other yellow), XRF results showing different elemental compositional patterns: Au=55%, Ag=44%, Cu=2.6% (white aspect) and Au=79%, Ag=19%, Cu=1%, Sn=traces (yellow aspect).

Most probably, different nuggets were put together, hammered and partially heated to obtain their "welding". A similar primitive metallurgy was also used in the case of 13 Dacian gold spiraled bracelets (1<sup>st</sup> Century BC) found in Sarmizegetusa, Dacian capital situated in Central Transylvania. The relative in-homogeneity of the ingots used for the manufacture of the Dacian bracelets could be caused by the fact that the technique implied incomplete melting of a mixture of gold dust and nuggets (not reaching the high melting point of gold), without perfect homogenization. The primitive sintering of the gold concentrates (simultaneous hammering and non-uniform or insufficient heating) into ingots is expected to preserve impurities like isolated mineral grains and micro-inclusions. Using micro-PIXE (Proton Induced X-ray Emission) we identified tin (from cassiterite), copper and iron (from chalcopyrite) micro-inclusions, proving the above mentioned primitive metallurgical procedure.

In conclusion, in Transylvania rich in gold, from Late Neolithic to Dacian period, during more than 2000 years practically the same relatively primitive metallurgy of alluvial gold was used to produce the spectacular artifacts exhibited now in Romanian Museums.

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#### ORAL

### 5. BRONZE AGE SILVER ARTIFACTS FROM ROMANIA? AN ARCHAEO-METALLURGICAL STUDY

*Constantinescu, Bogdan - (National Institute for Nuclear Physics and Engineering - Bucharest) bconst@nipne.ro*  
*Cristea Stan, Daniela (National Institute for Nuclear Physics and Engineering - Bucharest) daniela@nipne.ro*  
*Popescu, Anca Diana (Institute of Archaeology Vasile Parvan - Bucharest) anca\_diana\_popescu@yahoo.com*

Bronze Age silver artifacts were found only in Extra-Carpathian region of Romania, despite Inter-Carpathian region (Transylvania) is famous for its rich in silver (until 30%) native gold. The most spectacular aspect of these Bronze Age artifacts is the predominant presence of "exotic" alloys as auriferous silver and high-content copper silver alloy. Are these alloys natural (geologically) or anthropic (man made)? - this is the fundamental question.

To try to clarify it we performed an archaeo-metallurgical study using X-Ray Fluorescence (XRF) non-destructive elemental analysis technique.

The first case is the silver axes from Persinari hoard - see Al. Vulpe in "Prehistoire du Bas Danube/Prehistory

of the Lower Danube", XV, 1997. Their composition varies around Ag = 80%, Au = 17%, Cu = 3%. Because the axes are broken it was possible to investigate their bulk structure. The microscope examination revealed a mixture of silver alloys nuggets also including few gold nuggets, suggesting an incomplete melting.

Auriferous silver was also identified in a metallic disc of Vulchitrun type- see Dorel Bondoc, Bogdan Constantinescu "A Vulchitrun-type disc discovered at Calarasi", SCIVA, 54-56, 2003-2005. Its diameter is 30.4 cm, with a prominence in the centre - an umbo or omphalos with a middle of bronze, plated with silver and gold - with the diameter of the base of 11.3 cm and the height of 11.9 cm. The XRF analysis results are: Ag = 72%, Au = 24.5%, Cu = 3.5% for the silver foil, Au = 86.4%, Ag = 13%, Cu = 0.5%, Sn traces for the gold foil and Cu = 75%, Sn = 21%, Ag = 3%, As = 1%, Pb traces for the bronze part.

A strange silver-copper alloy was identified in a dagger found at Poduri, central Moldavia - see Bogdan Constantinescu et al "Considerations on the provenance of Poduri dagger as resulted from compositional analysis", SCIVA, 61, 2010: Ag = 70%, Cu = 30%, Pb traces.

A comparison with other Bronze Age artifacts realized from similar "exotic" alloys is discussed based on the papers:

- A. Hauptmann, A. Palmieri "Metal production in the Eastern Mediterranean at the transition of the 4th/3rd Millenium: case studies from Arslantepe", in Der Anschnitt Zeitschrift fuer Kunst und Kultur im Bergbau, 13, 2000

- M. Primas "Gold and silver during the 3rd Millenium B.C." in Prehistoric Gold in Europe. Mines, metallurgy and manufacture, G. Morteani and P. Northover editors, Dordrecht, 1995

- H. Born, S. Hansen "Helme und Waffen Alteuropas", Sammlung Axel Guttman, Berlin, 2001

The similarities with artifacts found in Eastern Mediterranean area (auriferous silver) and with Kozarac-type axes found in former Yugoslavia, now in Axel Guttman collection (high-content copper silver) are evident. Despite it is not possible to distinguish between natural and anthropic alloys, the provenance of our artifacts from Eastern Mediterranean area - including Anatolia and possibly Caucasus - is a credible hypothesis.

ORAL

## 6. EARLY IRON AGE POTTERY IN SOUTH-WESTERN IBERIA: ARCHAEOOMETRY AND CHRONOLOGY

*Krueger, Michal (Uniwersytet im. Adama Mickiewicza w Poznaniu) krueger@amu.edu.pl*

*Brandherm, Dirk (Queen's University Belfast) d.brandherm@qub.ac.uk*

The purpose of this paper is to present the first results of an ongoing project on the beginnings of the Early Iron Age in the south-western part of the Iberian Peninsula. Our current knowledge of many relevant aspects remains rather insufficient. Despite a long tradition of research on cultural contact in Iberia's Early Iron Age, basic problems still remain unsolved: the chronology and the nature of the first contacts between the Phoenicians and the native inhabitants of Andalusia, the Tartessians. The colonial impact on Tartessian society is often perceived as a unidirectional process in which the locals are mute consumers of imported goods. Such simplistic models go hand in hand with a lack of knowledge about patterns of long distance trade between the Phoenicians and the locals. Currently, the origin of foreign artefacts found in local contexts in most cases remains uncertain.

This paper argues that through systematic spectrographic analysis of pottery specimens from Tartessian sites (Setefilla and eleven other sites) it is possible to overcome these problems. The methodology is based on both destructive and non-destructive analysis of ceramic samples. For the latter a highly sensitive portable X-ray fluorescence device is employed. The proposed paper is also concerned with the strong need for a reliable C14-based chronology for the development of Tartessian material culture. Therefore, a new approach to refine our chronological framework for this period will be proposed that aims at providing us with a better grasp of the development of interdependences between the Phoenicians and the Tartessians over time.

As the purpose of this paper is to present the research design and objectives of a project still in its initial stage, no results are available at this time.

The ongoing investigations will have important consequences for our understanding of the development of the region during the transitional period between the Late Bronze Age and Early Iron Age, when for the first time indigenous communities were exposed to new social and economic models originating from the Eastern Mediterranean. Provenancing suspected imports

and establishing a reliable chronological framework will further our understanding of historical transformations in south-western Iberia during this crucial period.

ORAL

## 7. AN INDIGENOUS POTTERY PRODUCTION STRATEGY IN THE LATER EARLY BRONZE AGE SITE OF MURSIA, PANTELLERIA, ITALY. PERSPECTIVES ON SOCIAL COMPLEXITY AND INDIGENOUS INTERACTION PATTERNS

*Cantisani, Matteo (UTAD) matteo.cantisani@gmail.com*

A first analysis on the pottery production from Mursia was carried on in the 60s by tozzi (1968), followed by other typological studies aimed to understand both the settlement dynamics chronology and *rodindari-vallelunga* (RTV) morpho-stylistic patterns (tozzi 1978; ardesia et alii 2005; ardesia and cattani 2011). Archaeometric analyses on some samples have been carried on only recently (secondo et alii 2011), to infer differences in technology in between RTV and castelluccio productions. It is worth to note the absence of specific studies addressed to the comprehension of social organization of production first, as preliminary step towards a better understanding of material patterns of technological changes in between different communities. The preliminary results presented in this communication show first the existence of well-defined "islander" pottery production. It seems to own specific technological features and, as spatial analysis results show, it is related to a dynamic and articulated social context development.

Petrographic analyses and textural analyses by polarized optical microscope were first carried on 30 samples from the multiphase household B3. The potsherd samples were chosen according to specific criteria.

Spatial analysis using ArchGis platform (trial version) were subsequently led, to infer connectedness among production patterns and social organization of space.

The fabric characterization of the samples, as well observations on shape's vessel, permitted to identify two production patterns related to diversified raw material sources exploitation and pottery functionality. The presence of exploitation strategies and diversified fabrics preparation, according to the final purposes, as well as the relatedness between artifacts distributions, functionality and use of inner space, allowed to infer an

articulated household production. Evidences related to a possible kiln within the settlement appear to suggest a more specialized craft in the later period. At the same time the settlement development patterns support the hypothesis of a demographic growth.

The results enable to assess first the importance of technological knowledge for affecting, and be affected by, the context of transmission (eerkens 2007). Moreover, these partial results allow to define technological patterns of a specific pottery production. The importance of such a study to infer socio-cultural dynamics and connectedness between population size is evident. In this perspective, articulated comparisons both among different patterns of pottery productions and organization of inner/outer space in between multiphase sites well dated, shall permit to find out material patterns of technological changes and interpret innovations. As innovation rates, population size and interactions can be related (henrich 2004; kylene and boyd 2010), material patterns of technological changes in pottery production shall be useful to deduce indigenous exchange networks as potential means to explain local social development patterns.

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#### ORAL

### 8. BRONZE AGE CERAMICS FROM SARDINIA (ITALY): A TECHNOLOGICAL STUDY

*Gradoli, Maria Giuseppina (PhD researcher, School of Archaeology, University of Leicester (UK) ggradoli@yahoo.it*

The present work is based on my current PhD research *'Dynamic Social Changes and Identity. A petrological study of Bronze Age ceramics in Nuragic Sardinia'* carried out with the aim of investigating the pattern of pottery production, consumption and exchange at an inter-site level on the one hand, and the complex sequence of social changes accompanying the appearance of megalithic towers (nuraghi) during the Middle Bronze Age (1600 BC) and their later complexity during the Recent and Final Bronze Age (around 900 BC), on the other hand. Major phases of growing settlement complexity in a case-study area are studied in relation to 450 sherds of domestic pottery, looking deeper beneath their apparent 'static cultural homogeneity' through continuity and change in technology with the help, when possible, of the historical data and the anthropological and ethnographic approaches.

In Sardinia since now, local practices of prehistoric ceramic production and consumption have largely remained understudied, or have only focused on stylistic attributes and their use in assessing a chronological typology. The methodology here used - analysing ceramic fabric variability among selected common vessel forms and domestic architectures - represents thus an innovation. After the adoption of a broad theoretical context, based on both the physical and the social sciences, the process of pottery manufacturing is studied under the petrographic microscope considering: 1) *'pottery fabric'* or the arrangement, size, shape, frequency and composition of clay, minerals, and other materials added intentionally to improve the workability and firing performances of ceramic pastes; 2) the concept of *'chaîne opératoire'* and its individual steps to reconstruct part or the whole sequence of technical, physical and mental actions performed by potters, starting from the way natural resources (clays, sands, rocks, water) were acquired in the area, mixed together in different proportions, fashioned and then physically transformed by the process of firing; 3) the *'raw material provenance analysis'*, using analytical and geological approaches, to establish whether the sampled vessels were produced using clays and other naturally or intentionally added materials obtained from the investigated area or far away from it; 4) the *'experimental archaeology'*, that provides the opportunity to confirm potential hypothesis and conclusions with multiple trials and repeatable tests in a chemical/mineralogical laboratory and will be used for the reproduction of the ceramic pastes (according with the different proportion of mineral/rock inclusions and clays estimated under the microscope and their comparison with the archaeological ones under study).

The petrological study, supported by the clay chemical/mineralogical analyses, is shedding new light on the potters' cultural affiliation, drawing important comparative data about community practices, type of human activities and how nuragic ceramic production and culinary practices were organized at the scale of the micro-region.

In Sardinia since now, ceramic studies have mainly focused on stylistic attributes and their use in assessing a chronological typology. Analysing ceramic fabric variability among selected common vessel forms and domestic architectures inform on the way mundane pottery were manufactured, used, exchanged or circulated across the wide landscape through social networks of local groups.

POSTER

POSTER

**9. ARCHAEOLOGICAL STUDY OF THE AENEOLITHIC ANTHROPOMORPHIC STATUES FROM NURALLAO (CENTRAL SARDINIA, ITALY)**

*Serra, Marco (Dipartimento di Scienze dell'Antichità, University of Rome "La Sapienza" (Italy) marco.serra@unica.it*

*Cannas, Carla (Dipartimento di Scienze Chimiche e Geologiche, Cagliari University (Italy) ccannas@unica.it*

*Tanda, Giuseppa (Dipartimento di Storia, Beni Culturale e Territorio, Cagliari University (Italy) gtanda@unica.it*

In the 70s of twentieth century, the bronze age burial of aiodda-nurallao (sardinia, Italy) was investigated by the archaeologists of Cagliari University. During the excavations, a number of limestone's anthropomorphic sculptures ("menhir statues") were founded in the walls of the grave. They are probably from a local sanctuary of aeneolithic period (III millennium BC), and they were re-used as building material by nuragic people in the II millennium BC. Some of these megaliths were removed from the burial site, and were exposed at the national museum of Sassari.

Near the tomb of aiodda, in the perda tellada's area, an ancient quarry of limestone blocks probably used in prehistoric times, was discovered also.

A multi-technique instrumental and autoptic approach was carried out on 10 geological samples collected from the local fossiliferous limestone of "villagrecia unit", and on 14 statues from aiodda.

For the geological material we used geochemical and mineralogical analytical techniques such as ED-XRF, ICP-AES, ICP-MS, XRD and macroscopic survey. In agreement to conservative requirements, on sculptures we have achieved only non destructive ED-XRF measurements and autoptic observations.

This approach has allowed us to determine the characterization, the geochemical intra-source variability and the technological properties of local limestone. Through the comparison between artifacts and lithological outcrop's analytical data, we were able to define the sourcing phenomena about prehistoric megaliths and to establish spatial relationships between stone sources and the founding places of sculptures.

The macroscopic observation of the villagrecia lithology, manifests its fine structure with fossiliferous inclusions. All instrumental tests show that the calcium and its minerals are predominant in this rock. The ED-XRF qualitative data of geological material present a compositional set formed by K, Ca, Ti, Mn, Fe, Sr. The discriminant intensity ratios of these analytes, reveal a clear segregation between the samples taken from perda tellada and the other lithic fragments of Villagrecia limestone. It demonstrates the existence of two geochemical sub-groups. This intra-source variability was confirmed by ICP-AES and ICP-MS. These instrumental techniques also show a very low percentage of silica with a consequently good working properties of this rock. The XRD survey reveals a main mineralogical phases of calcite (Mohs 3) and subordinate quartz, in agreement that the villagrecia's limestone is a "soft-stone".

The fluorescence and the autoptic analysis achieved on anthropomorphic sculptures, reveal many geochemical, structural and mineralogical common characters between archaeological and geological materials. The main affinities are between statues and the limestone of perda tellada's quarry, located near the nuragic tomb. All analyzes show the calcareous nature of the micritic organogenic outcrop of villagrecia. Instrumental approach expose the geochemical differences within the geological unit, and its high workability by ancient technologies.

The comparison between geological and archaeological analytical data confirms the use of local limestone, especially from perda tellada's quarry, for the production of the aeneolithic statues of nurallao, according to the optimization of economic resources. In agreement with these criteria, is also the installation and the re-use of the sculptures near the area of the likely megalithic quarry of perda tellada.

ORAL CONTRIBUTIONS

ORAL

**10. INVESTIGATING WOOL TRADE AND NETWORKS DURING SCANDINAVIAN BRONZE AND IRON AGES BY THE STRONTIUM ISOTOPE TRACING SYSTEM**

*Frei, Karin Margarita (National Museum of Denmark) Karin.M.Frei@natmus.dk*

*Bergerbrant, Sophie (Gothenburg University; Sweden) sophie.bergerbrant@gu.se*

*Kristiansen, Kristian (Gothenburg University; Sweden) kris-*

*tian.kristiansen@archaeology.gu.se*  
*Mannering, Ulla (National Museum of Denmark) Ulla.Mannering@natmus.dk*

New developments in the field of the strontium isotope tracing system have provided new means to investigate the provenance of ancient textiles raw materials. This presentation aims at giving a brief overview of the methodology as well as discussing key-case studies from the exceptional well-preserved Bronze and Iron Age wool textile collections from Scandinavia.

Archaeological textile research is today a growing field, proving to be an important source of information for prehistoric societies at the social as well as the economical level. As Scandinavia and in particular Denmark, possesses one of the best textile collections from Bronze and Iron Ages they provide a unique window to investigate the textiles raw materials provenance. Hence, we applied the strontium isotope tracing method ( $^{87}\text{Sr}/^{86}\text{Sr}$ ) to wool and plant fibers textile threads samples from these collections.

Our investigations -which are still ongoing- reveal a high complexity behind textile production and trade. For example, single large textile pieces could be made of wool coming from a large variety of geographical areas including non-local areas, as in the example of the pre-Roman Iron Age Huldremose garment. However, other contemporaneous garments could be made of only local wool. Similarly, we also show that textiles made of plant fibers were sometimes made of non-local raw materials, even though the plant fibers they were made of were locally available, as in the example of the Bronze Age Lusehøj nettle textile. Therefore, we will explore trade networks based on textile's raw material provenance as well as discuss technological issues behind wool production in prehistory.

POSTER

POSTER

## **11. ORNAMENTS EXCHANGE, MANUFACTURE AND USE AMONG HUNTER-GATHERERS FROM CENTRAL-EASTERN SECTOR OF PAMPEAN REGION (ARGENTINA)**

*Acosta, Alejandro (INAPL-CONICET) acosta@retina.ar*  
*Buc, Natacha (INAPL-CONICET) natchabuc@gmail.com*  
*Davireux, M. Natalia (INAPL) mnataliadavireux@gmail.com*

Archaeological ornaments were object of several studies among hunter-gatherers and/or societies with emerging systems for food production. Focus is usually on manufacture techniques, raw material acquisition and their "non-utilitarian" functions (related to symbolic or identity behaviors). The aim of this communication is to test different aspects related to exchange, manufacture and use of items found in different archaeological sites from central-eastern sector of Pampean Region (Argentina) dated in the last 2000 radiocarbon years (Late Holocene). In this regional study we consider sites from different ecological units, including Low Riverine floodplains, Delta sectors and sites from High Plains of Pampa sector. Most of them are hunter-gatherer campsites, although we also include one assemblage made after horticulturalist groups.

For this purpose we identify different items that can be considered as ornaments, and classify them according to raw materials used. It includes teeth, bones, shells, clays, rocks and metals. Each one is analyzed according to their own properties. For example, to test provenance local macro comparison with actual databases were used for most cases; however, X diffraction was needed in metals materials to state the chemical composition. Metrical and microscopic structures are considered in all assemblages to discuss homogeneous and/or heterogeneous manufacture centers.

Results show that different materials behave through different paths. For example, we can state a local production for teeth pendants and malacological items (beads and *tembetás*) which appear in high proportions in sites from Low Riverine floodplains. In general terms, assemblages show inter-site homogeneous properties which suggest similar behaviors with these raw materials. On the other hand, beads made from specific lithic materials (such as malachite), items made after marine shells, and metals, are coming from distant sources of production or availability.

On that basis and considering environmental local aspects, including ecological and social particularities of societies under study, we propose different provision and exchange networks for interpreting these materials. These include distant areas such as the northwest region of Argentina, the area of Central Ranges in Córdoba province, and the marine coast of the Atlantic Ocean. At this regard, variability in ornament's use and distribution enhanced cultural complexity among local societies during Late Holocene.

# B35 Paleolithic Archaeozoology: Advances on hunter-gatherer's subsistence

Organiser: J. Carlos Díez Fernández-Lomana and Jean-Philip Brugal

Tuesday 2nd (9:00 to 13:30 15:00 to 19:30)

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ORAL CONTRIBUTIONS

ORAL

**1. CARCASS CONSUMPTION AND CARNIVORE COMPETITION DURING THE LOWER PLEISTOCENE AT THE LA MINA SITE (BARRANC DE LA BOELLA, TARRAGONA, SPAIN)**

*Pineda Alcalá, Antonio (Àrea de Prehistòria. Universitat Rovira i Virgili (URV), Campus Catalunya, Avinguda de Catalunya 35, 43002 Tarragona, Spain; IPHES) apineda.alcala@gmail.com*

*Saladié Ballesté, Palmira (IPHES, Institut Català de Paleoecologia Humana i Evolució Social. C/ Marcel·lí Domingo s/n, Campus Sescelades URV (Edifici W3) E3, 43700 Tarragona, Spain; URV; GQP-CG, Grupo Quaternário e Pré-História do Centro de Geociências (ul&D 73 FCT.) ) psaladie@iphes.cat*  
*Huguet Pàmies, Rosa (IPHES; URV; Unit Associated to CSIC. Departamento de Paleobiología, Museo Nacional de Ciencias Naturales (MNCN), Consejo Superior de Investigaciones Científicas (CSIC). Calle José Gutiérrez Abascal, 2. 28006 Madrid, Spain.) rhuguet@iphes.cat*  
*Cáceres Cuello de Oro, Isabel (URV; IPHES) icaceres@iphes.cat*

*Rosas González, Antonio (Departamento de Paleobiología, Museo Nacional de Ciencias Naturales (MNCN), Consejo Superior de Investigaciones Científicas (CSIC). Calle José Gutiérrez Abascal, 2. 28006 Madrid, Spain.) arosas@mncn.csic.es*  
*Vallverdú Poch, Josep (IPHES; URV; Unit Associated to CSIC) jvallverdu@iphes.cat*

Barranc de la Boella integrates several outdoor archaeological sites dating to the Lower-Middle Pleistocene transition whose formation is related to a deltaic sedimentary environment. Its age makes it a key-site for studying the behavior of early hominins groups of the Iberian Peninsula.

Scheduled excavation began in the gully in 2007 and now is carried out in three different archaeological sites (Centre de Convencions, la Mina and el Forn). Work at the la Mina site started in 2008. Three archaeostratigraphic levels have been identified, being the level two the richest in faunal, coprolite and stone tools remains recovered.

Cervids (*Cervus* sp., *Dama* cf. *vallonetensis*, and *Megaloceros savini*) and equids (*Equus* cf. *stenonis*) are the most represented taxa. Elements of *Hippopotamus antiquus*, Bovidae, *Mammuthus meridionalis* and *Macaca sylvanus* were also recovered. Among the carnivores, few fossils of *Ursus* sp., *Panthera* cf. *gombaszoegensis*, *Canis*

*mosbachensis* and coprolites belonging to a hyaenid have been found.

The different correlation index of the mineral density indicates no relationship among the elements recovered. Carnivore activity is notably documented. Tooth marks have been recognized in 7.4% of the bones, mostly in the shaft of the long bones as a result of the pronounced lack of epiphyses (the epiphysis-diaphysis ratio is 0,46). Tooth marks affect all weight categories and all skeletal elements, although long bones of medium-sized carcasses are the most affected. Were also documented other modifications caused by carnivores as digested bones, pitting, lacking or some diaphyseal cylinder. Some features related to carnivore activity suggest the presence at least of a bone-cracking carnivore above the assemblage.

Anthropic activities above the remains are scarce and prevent realize inferences above the carcass acquisition mode. Chemical alteration of the bones, usually caused by rinsing soluble sediments, prevents the identification of cut marks, although stone tools are abundant and fresh. However, percussion impacts are documented in some large bones. Different ratios of anatomical profiles analysis suggest high levels of competition among predators during the assemblage formation context.

The palaeoecological context inferred at the Barranc de la Boella site was an optimal spot for hominins to visit in order to acquire resources. The taxonomical diversity is indicative of an open landscape at the edge of a pond where animals came to drink and predators came to hunt their prey.

ORAL

**2. THE IMPORTANCE OF DEFINING AND NORMALIZING THE FUNCTION OF THE SITE. AN EXAMPLE IN THE CUEVA DEL ANGEL (LUCENA, CÓRDOBA).**

*García-Solano, José - jgsolano@outlook.com (Universidad de Granada)*

*Moigne, Anne Marie - moigne@mnhn.fr (European Centre for Prehistoric Research at Tautavel)*

*Celiberti, Vincenzo - vceliberti@hotmail.com (European Centre for Prehistoric Research at Tautavel)*

*Barroso Ruiz, Cecilio - ceciliobarroso1@hotmail.com (Foundation prehistoric and human evolution research institute)*

In the research work on the Paleolithic homotaxiality criteria based on lithic technology and absolute and/



or relative chronologies as an indispensable way to establishing periodization, regional sequences, changes in lifestyles or making comparisons and parallels between different sites are used. Great importance is given to contemporaneity in order to make generalizations between archaeological records. This is obviously significant; however, many regional interpretations and systematization are made without regard to the type of occupation or site functionality, which causes confusion or misleading conclusions. The lower frequency of information on sites of former periods, conservation issues/problems or taphonomic biases, has a definite influence on this work, in which it's possible to use, for example, data from a non-defined stop-hunting place and a residential place in order to create, for instance, a model of dynamics of livelihood or settlement similar to regional scale (contemporary or evolutionary). Thus, the importance of defining, standardizing and systematizing the function and form of the anthropic occupation of establishments is raised.

In the scientific literature there is a wide and scattered variety of terms used to review or nominate the types of establishments or anthropogenic occupations. However, the criteria used in the nomenclature are not always the same, as it is possible to find similar sites with a different name and the same function and vice versa. From a literature review on the functional scheme of the deposits and some examples of European sites, standardization is proposed on the possible functions that can be developed in different sites of intervention.

ORAL

### 3. ZOOARCHAEOLOGICAL STUDY OF JARAMA VI (UPPER PLEISTOCENE, SPAIN)

Díez, J. Carlos (Universidad de Burgos) [clomana@ubu.es](mailto:clomana@ubu.es)  
Romero, Antonio (UPV/EHU) [romeroalonsoaj@hotmail.es](mailto:romeroalonsoaj@hotmail.es)  
García-Solano, José (IGME) [jg.solano@igme.es](mailto:jg.solano@igme.es)  
Arceredillo, Diego (Universidad de Burgos) [diego.arceredillo@hotmail.com](mailto:diego.arceredillo@hotmail.com)  
Jordá, Jesús F. (UNED) [jjorda@geo.uned.es](mailto:jjorda@geo.uned.es)

The latest datings and studies of the Jarama VI site (Valdesotos, Guadalajara) support the attribution of the archaeological levels to Neanderthal occupations. The upper (JVI.1) and lower (JVI.3) units are markedly clastic and were formed in cold conditions. The middle unit (JVI.2) corresponds to fluvial deposits. At the top of this level, a floodplain developed where a hearth was detected (JVI.2.1). The environment was very moist

with a high rate of sedimentation. All units contain lithic Middle Palaeolithic technology.

We conducted a taphonomic study of the remains from units JVI.1 and JVI.2, along with an anatomical and species determination and an analysis of the differential representation. We studied all fractures and marks made by humans and the action of other agents in the pre- or post-burial phases. We took into account the differences between levels in order to ascertain whether the bone assemblage was determined by climate, sedimentary patterns or taphonomical conditions.

The similarity between the remains of the two levels suggests that the behavior of the Neanderthals was equivalent in both periods, independently of the climatic and environmental factors and without postdepositional features determining the final composition.

ORAL

### 4. TRANSPORT STRATEGIES OF UNGULATES CARCASSES DURING THE MIDDLE PALEOLITHIC: THE LEVEL M OF ABRIC ROMANI (CAPELLADES, BARCELONA).

Marín, Juan (IPHES, Institut Català de Paleoeologia Humana i Evolució Social, C. Marcel·lí Domingo s/n, Campus Sescelades URV (Edifici W3), 43007 Tarragona, Spain./Àrea de Prehistòria, Universitat Rovira i Virgili (URV), Avinguda de Catalunya 35, 43002 Tarragona, Sp) [juan.marin.hernando@gmail.com](mailto:juan.marin.hernando@gmail.com)

Saladié, Palmira (IPHES, Institut Català de Paleoeologia Humana i Evolució Social, C. Marcel·lí Domingo s/n, Campus Sescelades URV (Edifici W3), 43007 Tarragona, Spain./Àrea de Prehistòria, Universitat Rovira i Virgili (URV), Avinguda de Catalunya 35, 43002 Tarragona, Sp) [psaladie@iphes.cat](mailto:psaladie@iphes.cat)

Rodríguez-Hidalgo, Antonio (IPHES, Institut Català de Paleoeologia Humana i Evolució Social, C. Marcel·lí Domingo s/n, Campus Sescelades URV (Edifici W3), 43007 Tarragona, Spain./Àrea de Prehistòria, Universitat Rovira i Virgili (URV), Avinguda de Catalunya 35, 43002 Tarragona, Sp) [arodriguez@iphes.cat](mailto:arodriguez@iphes.cat)

The characterization of the faunal assemblages present on Neanderthals deposits has been performed mainly based on the anatomical representation patterns and the application of different utility indexes. Through them have been established recruitment strategies and transportation which define a large part of economic skills that might have got the Neanderthals groups.

Our object of study is faunal assemblage of level M of Abric Romani (51-55 ka BP). We have applied a taphonomic and zooarchaeological analysis over whole remains bigger than 2cm. We have reconstructed the original anatomical representation through MNI, MNE and MAU, in addition we have also analyzed the bone surface to identified pre/postdepositional alterations. With the aim of identify potential transport strategies have been applied SFUI and Shannon diversity index on the elements of high survival.

The faunal assemblage of level M of Abric Romani is a fully anthropic accumulation. Neanderthals carried out a transport strategy Unconstrained, where the anatomical elements were introduced based on their abundance in a complete skeleton. We observed a similar anatomical representation in all animal sizes, so transportation was not differentially performed according to the animal weight. With the aim of understand the behavioral implications of this type of transport strategy we have applied the same statistical model sets generated by Hadza groups. We know that they have at least six different transport strategies conditioned by various causes. However, the application of SFUI and Shannon diversity index pointing to unconstrained transport strategy, with similar results to those found in the level M.

The principal characteristic of the M level of Abric Romani, as well as the Hadzas assemblages analyzed are the overlapping hunting and transportation events. The successive occupations and depositions hide each specific event. This apparently results in a homogeneous assemblage, but that is a result of a behavior characterized by variability. The transport of the different elements is not determined exclusively by the animal size or nutritional value of the elements. The main characteristic of transport is the high diversity of elements that can be transported in each hunting event. This behavior requires highly organizational capacity, resulting from a high sociocultural complexity which characterized the Neanderthal groups.

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#### ORAL

### **5. ABRIGO DE LA QUEBRADA (CHELVA, VALENCIA, SPAIN): ARCHAEOZOOLOGICAL STUDY OF A NEANDERTHAL HUNTING GROUND IN CENTRAL MEDITERRANEAN IBERIA**

*Real Margalef, Cristina (Universitat de València) cristina.real@uv.es*

*Sanchis Serra, Alfred (Museu de Prehistòria de València) alfred.sanchis@dival.es*

*Morales Pérez, Juan Vicente (Universitat de València) juan.morales@uv.es*

*Eixea Vilanova, Aleix (Universitat de València) alejo.eixea@uv.es*

*Zilhao, Joao (Universitat de Barcelona) joao.zilhao@ub.edu*

*Villaverde, Valentín (Universitat de València) valentin.villaverde@uv.es*

Abrigo de la Quebrada (Chelva, Valencia) is an archaeological site with various levels of Neanderthal occupation. Human presence in the shelter has been favoured by its location in a narrowing ravine, giving rise to a kind of natural trap where hunting animals would be feasible. Moreover, the immediate environment is varied (abrupt and plain zones), allowing the presence of a wide range of preys.

The seven excavation seasons conducted (24 m<sup>2</sup>) have determined eight sedimentary levels. It has been obtained three AMS radiocarbon datings, one in level III of 40 500 ± 530 BP (Beta-244003); and two at level IV of 43 930 ± 750 BP (Beta-244002) and >50.8 ka BP (OxA-24855).

The materials presented in this work are from level IV, whose formation reflects a slower rate of sedimentation, favoured the typical structure of palimpsest, with a high density of lithic and bone elements and a large number of combustion structural remains.

The faunal sample (103 510 remains) has a high level of fragmentation, which represent a low rate of determination. A large number of bones are affected by fire and post-depositional processes that have complicated the characterization of prey processing and consumption. This problem has led to the application of a specific methodology for small indeterminate fragments. The species and anatomical elements identification has been done using reference collections. It has been established the age structure of the preys, the fragmentation level of the remains, the origin of fractures and it has been described the bone surface modifications to determine the origin of the accumulations.

It has been taxonomically identified only the 1.3% of the sample, including different families: Bovidae, Equidae, Cervidae, Leporidae, Testudinidae, Suidae, Rhinocerotidae, Felidae and Canidae, where Spanish ibex, horse and red deer are the predominant species. Among the indeterminate remains highlights small fragments of long bones, sometimes with fire modifications,

corresponding mostly to the Spanish ibex and red deer sizes. The anatomical representation data show that medium size preys carcasses have been transported complete; while the large size ones indicate a certain parts selection processes. The age structure of the three main species is characterized by the predominance of adult individuals.

Percussion impacts and cut marks have been identified on some remains that confirm the human character of the sample. The modifications related to the action of other non-human predators, as carnivores or bird of prey, are very scarce. The remains also show high frequencies of calcareous deposits.

The faunal accumulations are the result of repeated occupation of the shelter by Neanderthals groups.

The shelter has functioned as a hunting ground, where it has been transported and processed hunted animals in the immediate environment. With this study we obtained more extended information on the subsistence of Neanderthals groups in central Mediterranean Iberia.

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ORAL

## 6. NEANDERTHAL-MAMMOTH INTERACTIONS: RE-EVALUATING EVIDENCE FOR REPEATED "MAMMOTH DRIVES" AT LA COTTE DE ST BRELADE (JERSEY).

*Smith, Geoff (MONREPOS Archaeological Research Centre and Museum for Human Behavioural Evolution, RGZM) smith@rgzm.de*

La Cotte de St Brelade is one of the most prolific Middle Palaeolithic localities in Western Europe (ca. 96,000 lithic and 1,500 faunal remains). Two distinct "bone heap" levels (Layers 3 and 6), composed almost entirely of megafaunal remains, have been suggested as the remnants of Neanderthal game drives. Since final publication the interpretation of the site as a mammoth drive locality has remained a unique, if untested, hypothesis. Presently, such structured and repetitive subsistence behaviour has been suggested, but never concisely argued, for any other European Middle Palaeolithic site, calling for a re-evaluation of the CSB fauna.

This paper presents new faunal analysis of material from the McBurney excavations (1961-78). 1,494 faunal remains were recorded from all horizons, placing the two "bone heaps" within context. Species and body

part were allied with a range of attributes (weathering, abrasion and root-etching) to fully understand the site formation processes. Furthermore, an oblique light source and hand lens (20x magnification) allowed for a detailed assessment of bone surface modifications.

Results confirm the dominance of mammoth and woolly rhino with smaller quantities of horse, wolf and bear. Overall, per layer, Minimum Number of Individuals (MNI) are very low, usually 1 or 2. Only within the "bone heaps" of Units 3 and 6 do mammoths dominate with MNIs of 7 and 11, respectively. Further data, however, indicates complex site formation and preservation. Bone weathering throughout all horizons suggests more prolonged exposure, repeated input of faunal material and differential preservation, potentially related to shelter from the granite walls.

Neanderthal presence was identified within all deposits through either burnt bone or butchery modifications suggesting the exploitation of these individuals, throughout all contexts. Newly identified carnivore modifications were only recorded on faunal material from the "bone heap" horizons. Detailed analysis of the quantity and distribution of these modifications suggests a more complex Neanderthal subsistence pattern than previously acknowledged, and questions the interpretation of CSB as game drive locality.

Contextualising this new data at a broader European scale provides more detail about the importance of megafauna in Middle Palaeolithic diet. Whilst regular megafaunal exploitation by Neanderthals has been suggested, there is no evidence for the systematic hunting of these species and hence their dietary contribution appears limited. Whilst CSB remains exceptional, being unique in the recurrent presence of mammoth remains and Neanderthal stone tools, a more intricate behavioural and site formation scenario presents itself. Rather than Neanderthal occupation, punctuated by large-scale game drives, the site is similar to other cave faunas from Europe, with an accumulative role for both hominins and carnivores. Over a long duration, Neanderthals regularly utilised the CSB landscape, exploiting various species, including mammoth. The CSB ravine system could have provided the perfect location to track and hunt animals, whilst the enclosed site structure provided protection and shelter for butchery and processing. The CSB locality would have proved similarly attractive to carnivores, meaning that faunal accumulation was a composite mix of Neanderthal hunts, carnivore kills and natural deaths, and not merely the results of mammoth drives.

ORAL

**7. NEANDERTHALS AND THEIR FELLOW TRAVELERS ON THE "MAMMOTH STEPPE": A HORSE-DOMINATED FAUNAL ASSEMBLAGE FROM THE 50 KY BP MIDDLE PALAEOLOGIC WFL-SITE AT VELDWEZELT-HEZERWATER, BELGIUM**

*Bringmans, Patrick M.M.A. (The 'Veldwezelt-Hezerwater' Neanderthal Research Centre - Belgium) Patrick.Bringmans@hotmail.com*

*de Warrimont, Jean-Pierre (Archeologische Vereniging Limburg - The Netherlands) Patrick.Bringmans@hotmail.com*

*Cordy, Jean-Marie (Université de Liège - Belgium) JM.Cordy@ulg.ac.be*

The lithic artefacts (N=133) and the animal bones (N=225) from the WFL-Site at Veldwezelt-Hezerwater were excavated in a sealed lithostratigraphical unit. The WFL soil formation phase seems to represent an important phase of Middle Weichselian pedogenesis, which could be dated around 50 ky BP. It is known that the interstadials of Marine Isotope Stage (MIS) 3 were characterised by high-frequency and high-amplitude oscillations of the order of 1,000–2,000 years duration. It is likely that Neanderthal occupation of North-West Europe was sporadic and restricted to these relatively warm interstadials.

The mammalian fauna from the WFL-Site at Veldwezelt-Hezerwater has been identified as mammoth (MNI=1), woolly rhinoceros (MNI=2), horse (MNI=5), European ass (MNI=1), steppe bison (MNI=2), reindeer (MNI=1), arctic fox (MNI=1), cave lion (MNI=1), cave hyaena (MNI=2), badger (MNI=1) and hare (MNI=1). The WFL-fauna thus shows a series of cold-adapted species. There is only one warm-adapted species present and that is the badger. Overall, the character of the WFL-fauna shows the existence of continental conditions, with fairly warm summers, but harsh winters. This would result in the dominance of rich open grasslands (i.e. the 'Mammoth Steppe' of Guthrie 1990).

The WFL faunal assemblage seems to be an example of a so-called 'species-dominated' assemblage. In this case, a 'horse-dominated' faunal assemblage, could be an indication for the anthropic origin of the assemblage. On the other hand, the presence of a 'hyena den' in the immediate surroundings of the WFL-Site, is indicated by the simultaneous presence of corroded and/or partially digested bones, by the remains of a coprolite and by the presence of some bones and teeth of the hyena itself. In the latter case, it is significant to note that practically all

the excavated remains belong to very young individuals, proven by the presence of unfused long bones and milk teeth. They were probably still-born individuals. These data imply that the place of parturition (i.e., the 'hyena den') is very close. This would indicate that both Neanderthals and hyaenas were sympatric, thus existing in the same geographical area, around 50 ky BP. It is easy to envisage how Neanderthals and hyaenas might co-exist. As hyaenas are active almost entirely at night and spend the day in dens, there would be little direct competition for resources with the Neanderthals. As hyaenas consume organs and bones, little would remain.

The WFL-Site probably represents a very brief occupation by a Neanderthal task group, whose main technological activity appears to have been maintaining a heavily curated tool-kit, suggesting high mobility and planning. The WFL faunal assemblage corresponds in its composition to a typical steppe fauna. The development of large deforested spaces, characterised by the expansion of grasses during summer, allowed the development of herds of large herbivores. In such a context, the cave hyena and the Neanderthals represent the most adapted super-predators. The presence of a 'hyena den' complicates the interpretation of the bones excavated at the WFL-Site, since there obviously is a mixture between a human occupation site and a carnivore habitat.

ORAL

**8. FAUNAL ASSOCIATIONS AT THE END OF MIDDLE PALEOLITHIC IN THE SOUTH OF FRANCE FROM THE PALEOBIOLOGICAL AND ZOOARCHAEOLOGICAL STUDIES OF THE UPPER SEQUENCE OF MANDRIN**

*Brugal, Jean-Philip (CNRS) brugal@mms.univ-aix.fr*

The upper sequence of final middle Paleolithic site of Mandrin located in the Rhône valley (left bank) is dated to the beginning of isotopic stage 3 (e. 52-42 ka cal BP) and yielded four levels with six human occupation with rich and diversified bone assemblages (more of 60.000 remains). Paleobiological and zooarchaeological studies would give a synthetic overview about faunal associations with 13 herbivore species (horse and deer dominant), 9 carnivore taxa (wolf and red fox dominant) and mésofauna (leporids, large rodent). The structure and composition are similar to the animal communities known for this period in the South of France although we can notice some regional differences. Indications about anatomical representation, age structure,

taphonomy, biological marks allow to precise the origin of assemblages, essentially due to Neanderthal groups for ungulates. These data allow us to discuss about socio-economical factors and site functions. The humans occupations are dense, recurrent and pluri-seasonal demonstrating some stability through time in human hunting behavior on areas exploited during long period. However, settlements are less intense in the upper levels probably related with changes in mobility and/or group size. Those groups are the last evidence of Neanderthals in this mediterranean region, and some hypothesis on their reduction, then disappearance can be hypothesized within a more general frame.

ORAL

### 9. ARE THE TIMES CHANGING? A ZOOARCHAEOLOGICAL APERCU TO THE MIDDLE-UPPER PALEOLITHIC TRANSITION IN COVA GRAN (SOUTHEASTERN PRE-PYRENEES, IBERIA)

*Samper Carro, Sofia Cristina (Dept. Archaeology & Natural History, CAP, Australian National University; Centre d'Estudis del Patrimoni Arqueologic de la Prehistoria (CEPAP), Universitat Autònoma de Barcelona) sofia.samper@anu.edu.au*

*Martinez Moreno, Jorge (Centre d'Estudis del Patrimoni Arqueologic de la Prehistoria (CEPAP), Universitat Autònoma de Barcelona) jorge.martinez@uab.cat*

*Mora, Rafael (Centre d'Estudis del Patrimoni Arqueologic de la Prehistoria (CEPAP), Universitat Autònoma de Barcelona; Program ICREA-Academia, Institut Català Recerca Avançada (ICREA) rafael.mora@uab.cat*

The Middle to Upper Palaeolithic (MP/UP) transition constitutes a central focus in European Paleanthropological studies. Within this research line, the study of subsistence patterns is a key element to understand Neanderthals and anatomically modern humans (AMHs) behaviour.

Zooarchaeological analyses from late Middle Palaeolithic and early Upper Palaeolithic contexts provide insights about the subsistence behaviour of last Neanderthals and first AMHs.

The material analysed comprises the zooarchaeological assemblages recovered in Cova Gran, a rock shelter located in the southeastern Pre-Pyrenees (Lleida, Iberia). We discuss the skeletal part representation, age at death, and bone modifications observed in the assemblages from two Middle Palaeolithic units and the earliest Upper Palaeolithic level documented.

The taphonomical analysis conducted attempt to identify similarities and differences in these assemblages, which could be related to changes in Neanderthals and AMHs subsistence strategies.

The taxonomic representation of species (in terms of MNI) varies from Middle to Upper Palaeolithic occupations, with a greater amount of large-size mammals from Middle Palaeolithic levels. Breakage patterns and cut marks suggest the anthropogenic origin of the accumulations, although syn/post-depositional processes have affected bone fragmentation.

The small number of individuals identified, compared to the number of bone remains and the excavated area results from intense syn/post-depositional processes affecting bone preservation. Nevertheless, these assemblages might reflect sporadic visits to the rock shelter, which could be related to human mobility.

Zooarchaeological results show remarkable changes related to Neanderthals and AMHs subsistence. Shifts observed in the taxonomic composition could be linked to environmental changes and prey availability, but also might reflect variations in prey acquisition practices.

ORAL

### 10. PALAEOLOGICAL SUBSISTENCE ACTIVITIES AND ENVIRONMENT IN QUERCY: THE FAUNAL ASSEMBLAGES FROM LES FIEUX (LOT).

*Gerbe, Magali (UMR 7269) gerbemagali@yahoo.fr*

*Brugal, Jean-Philip (CNRS UMR 7269) brugal@mmsh.univ-aix.fr*

The site of Les Fieux (Miers, Lot, France) is one of the major archeosequence for the end of Middle Palaeolithic (MP) and the early Paleolithic (late OIS 4 to OIS 2) in southwestern France. The study of bone assemblages gives us the opportunity to understand subsistence behaviours of Neanderthals and Modern human, especially about the acquisition and exploitation of faunal resources through time and in the same spot.

The taphonomical and archeozoological analysis of bone assemblages from different archaeological levels (Mousterian, Aurignacian and Gravettian) shows the predominance of bison and red deer during the Middle Palaeolithic when reindeer and horse-bison are the main hunted species during the Upper Palaeolithic (UP). This change is considered in relation with palaeoenvironment

and climate changes, marked by cooling condition starting at the beginning of Upper Palaeolithic.

The socio-economical interpretations demonstrate repeated occupations of the site by Neandertals for seasonal hunting combined with the use of the cave by carnivores for denning (hyaena, wolf and fox). During the Upper Palaeolithic, the occupations' purposes are still the exploitation of ungulates within a wider exploited territory according to the lithic raw materials; the site corresponds more to a shelter than a kill site because of the evolution of its topography. The study of the faunal association of Les Fieux constitutes an original opportunity to envision and interface data from climate, technology and subsistence during the transitional period MP-UP within a same geo-topographical context.

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ORAL

### **11. THE CONTRIBUTION OF DATED PALEONTOLOGICAL SITES TO THE UNDERSTANDING OF HUMAN BEHAVIOURS AND THEIR ENVIRONMENT ? THE PIT FALL OF IGUE DU GRAL AND THE UPPER PALEOLITHIC OF QUERCY**

*Castel, Jean-Christophe (Muséum de Genève) jean-christophe.castel@ville-ge.ch*

*Boudadi-Maligne, Myriam (PACEA-CNRS, Université de Bordeaux) m.boudadi-maligne@pacea.u-bordeaux1.fr*

Reconstruction of the Paleolithic paleoenvironment of Western Europe have been based since at least the 1990s on the analyses of the faunal spectrum identified from prehistoric sites. The scientific community has become more and more aware of the potential disjunction between prey spectrum and paleoenvironment, and thus to question the extent to which habitation sites represent the best proxies for such reconstructions, particularly during the Upper Paleolithic. Meanwhile, the discovery of numerous paleontological sites in the Quercy region (Southwestern France) has revealed the existence of a very varied mammal fauna in the late Pleistocene. Unfortunately, most of these sites could not be dated sufficiently accurately to allow a precise chronological comparison with human occupations.

In 2001 we commenced excavation of a natural accumulation of remains in a pit fall, the Igue du Gral close to the decorated Pech Merle cave, at the heart of a relatively densely populated region. This site is important because of a combination of three elements: rich and well conserved assemblages, a succession of

easily identifiable horizontal deposits and the possibility of obtaining a large number of radiocarbon dates.

The excavation has produced nearly 25,000 taxonomically and anatomically identified objects as well as forty dates spread among the six main levels that correspond to the Last Glacial Maximum and Late Glacial. In contrast with what is seen in the archaeological sites of the second half of the Upper Paleolithic of the eastern margin of Aquitaine, the larger species (bison, horse) are well represented in the pit fall. These are accompanied by reindeer, as expected, but also by a great variety of other taxa including a large amount of hare remains, a species that was apparently not hunted before the second part of the Magdalenian.

The diversity of the fauna thus revealed places the richness of the environment and the often very restricted choice of prey by the late Upper Paleolithic populations in stark contrast.

With the collaboration of: Jean-Philip Brugal, Hubert Camus, François-Xavier Chauvière, Delphine Kuntz, Véronique Laroulandie and Jean-Baptiste Mallye

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ORAL

### **12. THE RABBIT IN EARLY UPPER PALEOLITHIC HUMAN DIETS OF THE IBERIAN MEDITERRANEAN CENTRAL REGION**

*Pérez Ripoll, Manuel (Universitat de València) manuel.perez@uv.es*

*Sanchis Serra, Alfred (Museu de Prehistòria de València) alfred.sanchis@dival.es*

*Real Margalef, Cristina (Universitat de València) cristina.real@uv.es*

*Villaverde Bonilla, Valentín (Universitat de València) valentin.villaverde@uv.es*

The rabbit is a very abundant species in the archaeological sites of the Upper Pleistocene and early Holocene from the Mediterranean area of the Iberian Peninsula. In some general theoretical models, has proposed the intensive use of rabbits from the beginning of the AMH occupation in the Mediterranean Iberia. However, in most Aurignacian sites in this area, there are not concluding taphonomic studies, samples are reduced and in some cases there are conservation problems (Cova de les Malladetes, Cova Beneito, Cova Foradada, Cova de l'Arbreda). As to the Gravettian, the human origin of the samples is defined from the analysis of one site.

The present work aims to conduct a review and a taphonomic study of various rabbit accumulations of the Early Upper Paleolithic of the Iberian Mediterranean area, to determine the moment when the rabbit starts to be a predominant resource in the diets of AMH.

The rabbit assemblages studied come from the Aurignacian and Gravettian levels of Cova de les Malladetes (Barx, Valencia), that belong to the excavations of the 40s (unpublished materials) and 70s (review of Davidson work, 1989) with an area about 13m<sup>2</sup>. The Gravettian samples of Cova de les Cendres come from the study made by Pérez Ripoll in 2004 (2 m<sup>2</sup>) and new excavations (2 m<sup>2</sup>).

The remains have been identified taxonomically and anatomically using reference collections. For quantification it has been used the NISP, MNE, MNI and %R. The age structure has been estimated from degree of joint fusion. A complete taphonomic analysis has been realized: fragmentation, origin of fractures and bone surface modification (anthropogenic, other predators or post-depositional origin).

The Aurignacian samples of Malladetes show two types of accumulations: (1) a majority of non-anthropogenic remains (bones with digestive corrosion) that come mostly from the interior area; and (2) a reduced set of bones of anthropogenic origin (cut marks and fractures), located in the entrance area. The Gravettian samples are very scarce and do not provide crucial information about its origin.

The Gravettian sample of Cendres, as opposed to Malladetes, is very important in number and the remains are mainly of anthropogenic origin (marks, fractures and fire modification).

The Aurignacian anthropogenic samples (Malladetes) are very scarce and it is possibly that they can be related to sporadic human occupations (important role of carnivores). The emergence of rabbit prominently in the AMH diets of the regional Upper Paleolithic is determined from the Gravettian of Cendres but not in Malladetes.

All this results takes us away from a specific model for the Early Upper Paleolithic in this area, and suggest the fact that the role of the rabbit in human diets may vary depending on the features and functionality of human occupations and the settlements localization.

### 13. ZOOARCHAEOLOGY OF A FINAL GRAVETTIAN SITE. EXAMPLE OF THE ABRI PATAUD, LEVEL 2.

*Crépin, Laurent (Department of Prehistory of National Museum of Natural History, UMR 7194, IPH 1 rue René Panhard, 75013 Paris France) l.crepin@mnhn.fr*

*Vercoutère, Carole (Department of Prehistory of National Museum of Natural History, UMR 7194, IPH 1 rue René Panhard, 75013 Paris France) cvercout@mnhn.fr*

*Drucker, Dorothee (Department of Geosciences, Univ. of Tübingen, Tübingen, Germany) dorothee.drucker@ifg.uni-tuebingen.de*

*Chiotti, Laurent (Department of Prehistory of National Museum of Natural History, UMR 7194, IPH 1 rue René Panhard, 75013 Paris France ; Abri Pataud, 20 rue du Moyen-âge, 24620 Les Eyzies-de-Tayac France) lchiotti@mnhn.fr*

*Henry-Gambier, Dominique (PACEA, UMR 5199, Univ. of Bordeaux, 1 av. des Facultés, 33405 Talence France) d.gambier@pacea.u-bordeaux1.fr*

*Nespoulet, Roland (Department of Prehistory of National Museum of Natural History, UMR 7194, IPH 1 rue René Panhard, 75013 Paris France) roland.nespoulet@mnhn.fr*

The site of abri Pataud (Dordogne, France) is one of the four French sites that provided a well defined Final Gravettian facies (historically named "Protomagdalenian"), around 22,000 years BP. Because of the rarity of evidence of this culture, the abri Pataud is a key site in order to improve our knowledge about human behaviour at the end of the Gravettian period. The Final Gravettian of level 2 of the abri Pataud was first excavated by H. L. Movius in 1958 and 1963, who discovered numerous human remains. Since 2005, a new multidisciplinary research project has been conducted, under the direction of R. Nespoulet and L. Chiotti, in order to re-examine the archaeological context and the status of these human remains, including new excavations (in connection to those of Movius), new studies of Movius' collections and analysis of Movius' archives.

The results have clarified the context of the human remains deposit as the result of funerary practices. The results also allowed us to a better understanding of the modalities of the successive occupations of this level, although the surface of excavation was voluntarily limited.

The level 2 is very rich in archaeological remains especially faunal ones: more than 8 000 bones remains inventoried since 2005.

The Reindeer (*Rangifer tarandus*) is the most numerous species. This species was not only hunted for food but also used for some non-dietary activities, providing raw material (bones, antlers and teeth) for tools, weapons and body ornaments. Then, Reindeer could be considered as the species on which the economy of people who lived at the abri Pataud was mainly founded. But, thanks to the new research project, in particular the study of osseous artefacts and the biogeochemical analyses, we could demonstrate now that the subsistence behaviour was more diversified than this initial point of view. The global study of all faunal remains (butchery wastes and osseous artefacts) for the entire collection allowed us to show that others species had a significant importance for the Final Gravettian people (Mammoth, Bovine, Red deer, Wolf...).

We present here our results of the archaeozoological, biogeochemical and osseous artefacts studies to discuss the place of the different mammals during the Final Gravettian at the abri Pataud and over a larger regional context.

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#### 14. DOLNÍ VESTONICE I (PAVLOVIAN, CZECH REPUBLIC) - RESULTS OF ARCHAEOZOOLOGICAL STUDIES OF THE ANIMAL REMAINS DISCOVERED AT DWELLINGS AREA

Wilczynski, Jaroslaw (Institute of Systematics and Evolution of Animals, Polish Academy of Sciences, Slawkowska 17, 31-016 Kraków, Poland) wilczynski@isez.pan.krakow.pl

Wojtal, Piotr (Institute of Systematics and Evolution of Animals, Polish Academy of Sciences, Slawkowska 17, 31-016 Kraków, Poland) wojtal@isez.pan.krakow.pl

Roblickova, Martina (Anthropos Institute, Moravian Museum, Zelný trh 6, 659 37 Brno, Czech Republic) mroblickova@mzm.cz

Oliva, Martin (Anthropos Institute, Moravian Museum, Zelný trh 6, 659 37 Brno, Czech Republic) moliva@mzm.cz

Dolní Vestonice I site is one of the most significant Pavlovian localities known from southern Moravia. It was excavated for the first time in 1924, by K. Absolon, and later, by B. Klima (Absolon 1945; Klíma 1963). During fieldworks different areas of the site were investigated, from where numerous lithic artefacts, bone products, human remains, and art objects with famous "Dark Venus" were discovered. Human artefacts are accompanied by a vast assemblage of animal bone, which were collected from the whole surface of the site. In the upper part of

the site (excavations carried out in 1924-28 and 1948-50) mammoth bone accumulations and dwellings where five dwelling structures, accompanied with fireplaces and mammoth bone concentrations were described (Klima 2001). Unfortunately the fully taphonomic and zooarchaeologic studies of this materials were newer done. From this site we have only short information about fauna representation is known (Musil 1959). On the basis of the recent studies we can conclude that in the area of dwelling structures remains of different mammals species were found. Bones and teeth of wolf, wolverine, reindeer and woolly mammoth are most numerous. In the contrast to the Pavlov I site the presence of mammoth bones is very high, and other game species like reindeer and hare are much less numerous (Wojtal et al., 2012). At the same time numerous bones of carnivores (especially wolf and wolverine) bear marks of cut marks. On this basis, we can conclude that the carnivores beside mammoth were an important component of the diet of Pavlovian hunters.

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#### 15. THE EQUINES OF FAUSTIN SHELTER (CESSAC, GIRONDE): A TAPHONOMIC AND ZOOARCHEOLOGICAL STUDY OF A LATE GLACIAL SITE IN GIRONDE

Feyfant, Léa (PACEA) lea.feyf@gmail.com

Thanks to the high resolution of archaeological record, paleoenvironmental and chronological data, the Magdalenian society is one of the most documented cultures of the Upper Paleolithic. Through the last fifteen years, several sites of *Entre-deux-mers* (Gironde), in the South-west of France, were the center of zooarchaeological work. In the Paris Basin, horses provided main part of the subsistence of this society, and a new socio-economical organization model based on the concomitant exploitation of the horses and the reindeers was proposed. In this communication we attempt to compare our data through a zooarchaeological study of a new late Magdalenian site with this model.

Faustin shelter is a Late Magdalenian site in Gironde with an abundance of horses in the faunal assemblage. Lithic and bone industries (*pointes à crans*, *pointes de Laugerie-Basse*, Magdalenians harpoons) and new C14 datings provided a good setting chrono-cultural. This site also



yields engraved bones and particularly a female figure on a horse bone.

The taphonomic and zooarchaeological study of the faunal assemblage aims to understand the hunting processes, the carcass transport strategies and the butchery processes employed by hunter-gatherers on horse.

This work, carry out by the Magdatis project, focuses primarily on horse remains. The methods that were used are conventional in zooarchaeology: age determination, quantification of skeletal elements and observation and quantification of natural and anthropogenic marks. These analyses provided relevant information on seasonality, prey choices and hunting strategies.

The bone assemblage (NISP = 1393) is well preserved with numerous bone refits. This allows a good identification of butchery processes. All skeletal elements of the horses are represented. It indicates that whole carcasses of the horses were transported from the kill site to the base camp. Moreover, all the 'chaîne opératoire' of butchery is documented (from skinning to the percussion of bones to extract grease and marrow). The analyses of mortality curves show that horses were hunted throughout the year and family groups are preferentially hunted.

Preferential hunting on family groups does not preclude opportunist hunting of isolated horses or on single groups. These variations may be related to the seasonal horses' behavior. The optimal exploitation and the transport of whole carcasses are raising the question about the number of horses hunted per hunting events. Like in all base camps of south of France, the carcass exploitation is optimal with extraction of grease and marrow on all long bones. Moreover, we assume a predetermination in the fracture of metacarpal or radius in order to make needle or punch. On the account of the geographic and the topographic position of the site, results are compatible with a hypothesis about a deliberated choice of Magdalenian for horse hunting.

We conclude that Magdalenian in Gironde could have employed similar hunting and socio-economic strategies than the ones described in the Paris Basin: hunting throughout the year focused on family groups and proximity between kill site and base camp and the optimal exploitation.

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## 16. ARCHAEOZOOLOGY IN UPPER PALAEOLITHIC BONE ASSEMBLAGES. A TOOL FOR INTERPRETING THE CAU DEL ROURE (SERINYÀ, NE IBERIAN PENINSULA)

*Maroto, Julià (Universitat de Girona) julia.maroto@udg.edu*  
*Albizuri, Silvia (Universitat Politècnica de Catalunya) silvia.albizuri@upc.edu*

*Rivals, Florent (Institut Català de Paleoecologia Humana i Evolució Social (IPHES) frivals@iphes.cat*

*Allué, Ethel (Institut Català de Paleoecologia Humana i Evolució Social (IPHES) eallue@iphes.cat*

*Vaquero, Manuel (Institut Català de Paleoecologia Humana i Evolució Social (IPHES) manuel.vaquero@urv.cat*

*Roqué, Carles (Universitat de Girona) carles.roque@udg.edu*

*Agustí, Bibiana (In Situ SCP) bagusti@gmail.com*

*Rufí, Isaac (Universitat de Girona) u1901889@campus.udg.edu*

*Ventura, Helena (Universitat de Girona) u1904732@correu.udg.edu*

The Cau del Roure is a small cavity, with a vertical access, which is part of the Reclau Caves (Serinyà, Girona, NE Iberian Peninsula). Excavation work performed in 1972 permitted to know the site. Recently, the archaeological excavation started again with the intention to better study the human occupation during the Paleolithic at the site.

The archaeostratigraphy indicates that below a Chalcolithic level with human burials, which was totally excavated by early excavations, there is a sedimentary package belonging to the Upper Paleolithic age, according to the C14 dates. This package, about 1.40 m thick, is homogeneous from a sedimentary point of view. It contains materials of diverse nature. Continental mollusks and rabbit remains are abundant, as well as the remains of microvertebrates. Conversely, the remains of large mammal are not very abundant, but different taxa were identified: *Equus ferus*, *Cervus elaphus*, *Sus scrofa*, *Canis lupus*, *Vulpes vulpes* and Felidae. The elements of material culture are very rare; however we can highlight some elements of ornamentation - perforated marine gastropods. In addition, the anthropic presence is proven by various human skeletal fragments.

While the recent excavation is still modest and therefore the results are preliminary, the archaeozoological study is resulting to be a key to interpret the origin of the material and the functionality of the site during the Upper Paleolithic. Taxonomic richness and relative

diversity or abundance of each taxon are raising various possible scenarios, but the comprehensive study of the bone assemblage is permitting to attribute the origin of the accumulation of large mammals to the most likely agent.

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### 17. THE FEARLESS ICE AGE BEAST KILLERS. THE GRAVETTIAN HUNTERS IN CENTRAL EUROPE

*Wojtal, Piotr (Institute of Systematics and Evolution of Animals, Polish Academy of Sciences, Slawkowska ) wojtal@isez.pan.krakow.pl*

*Wilczynski, Jaroslaw (Institute of Systematics and Evolution of Animals, Polish Academy of Sciences, Slawkowska ) jaslov@wp.pl*

The Gravettian culture emerged about thirty thousand years ago and during the next millennia spread across much of Europe. The most distinctive features of individual stages in the development of the cultures of the Gravettian technocomplex include the presence of characteristic stone tools (backed bladelets and shouldered points) and figurative art, such as zoomorphic and anthropomorphic objects. In South Moravia (Czech Republic) the Gravettian is documented by an exceptional complex system of early sites, dated to about 27-25,000 BP. They are located at the foot of the Pavlovské Hills and include such large and well known open-air long-term camp sites as Pavlov I, Dolní Vestonice I, and Dolní Vestonice II. In Poland, Slovakia and the Czech Republic the later phase of the Gravettian is documented by the presence of sites dated to about 24 – 20 ka BP.

On the evidence from the Gravettian sites of the older phase – Pavlov I and VI, Dolní Vestonice I and II (Czech Republic) - the hunters had a varied diet as documented by the presence in the osteological material of several animal species, mostly small (birds, hare, fox) and medium animals (wolf, reindeer, wolverine), but also with a smaller percentage of large mammals (bear, cave lion, horse and mammoth). All taxa are represented by more or less equal proportions, showing that the prey spectrum of hunters was wide. Osteological material recovered from sites of the younger phase of the Gravettian – Kraków Spadzista Street, Jaksice II (Poland), Moravany Lopata II (Slovakia) and Milovice I (Czech Republic) is visibly dominated by woolly mammoth and reindeer. This suggests specialisation in mammoth or reindeer hunting.

Thus it seems obvious that reindeer, woolly mammoth, horse and hare were very significant taxa in the everyday life of the Gravettian people. They provided both meat and raw materials. All parts of the body were used – the hide, the marrow, meat, bone, teeth, tusk and antler – a source of food and material in the manufacture of tools, personal ornaments and art.

Many older and younger Gravettian sites of Central Europe have yielded the remains of bears (brown bear and cave bear) and cave lions. This shows that during this age hunting large and dangerous carnivores was not accidental but intentional.

A striking feature of older sites in South Moravia is the presence of a large amount of carnivore and bird remains belonging to dozens, and sometimes, even hundred individuals (wolf, tetraonid, raven and fox, respectively). Birds were certainly a source of food but feathers also could have been an important raw material. Carnivores – two species of fox, the wolf, and the wolverine – were mainly the source of hides and raw material for the production of tools and ornaments. Probably, the meat of these carnivores was also consumed by the Gravettian hunters.

Our studies show that the Gravettian people were efficient and skilful hunters, not afraid to confront the larger and more dangerous representatives of the Pleistocene fauna. What is more, they knew how to utilise the resources of the environment in which they lived.

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ORAL

### 18. SELECTING, STORING AND SHARING FAUNAL RESOURCES IN THE EARLY EPIPALAEOLITHIC: A CASE STUDY FROM EASTERN JORDAN

*Allentuck, Adam (University College London) a.allentuck@ucl.ac.uk*

*Martin, Louise (University College London) louise.martin@ucl.ac.uk*

Ongoing zooarchaeological investigations of Early Epipalaeolithic deposits at Kharaneh IV in the eastern steppe of Jordan provide a rare opportunity to examine

intra-site spatial manifestations of repeated seasonal occupations. At Kharaneh IV dense accumulations of faunal remains have been excavated from hearths, middens, caches and some of the earliest and best preserved hut structures in the Near East. The combination of a high density of faunal deposits and a constrained series of radiometric dates indicates that Kharaneh IV was intensively and repeatedly occupied by large groups of people over a maximum span of twelve hundred years.

Patterned spatial distributions of faunal remains from floor and superstructure deposits from a well-preserved and systematically excavated hut structure are examined in terms of frequency and density data from taphonomic, taxonomic, anatomical, butchery, and combustion variables.

The question of how large human groups organized their food preparation activities within circumscribed spaces is of particular relevance. In this presentation, we examine architectural boundaries and contextually variable patterns of zooarchaeological remains as a means of discerning differential uses of space.

The case of Kharaneh IV indicates that Early Epipalaeolithic foragers in eastern Jordan performed different domestic tasks in spatially circumscribed locations within their dwellings. This work suggests that early seasonal sedentism entailed highly organized and innovative strategies of procuring, preparing, storing and sharing faunal resources.

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ORAL

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### **19. THE RIGHT ITEMS FOR A NEW MENU: ENVIRONMENTAL CONSTRAINTS AND CULTURAL CHOICES IN HUNTER-GATHERER SUBSISTENCE DURING THE LATE UPPER PALAEOOLITHIC AND MESOLITHIC IN THE BALKAN PENINSULA**

*Lopicic, Milica (University of Belgrade, Faculty of Philosophy)  
milica.lopicic@f.bg.ac.rs*

Nutritional stress which provoked the inclusion of low-ranked food items in the diet of Late Upper Palaeolithic and Mesolithic communities has been observed in a number of regions. Several sites in the Balkan Peninsula exhibit the same trend, although its manifestations differed regarding chronology and environmental characteristics. The uneven timing of the shift in

subsistence was explained by a difference in the extent of the modification of the coastal geography caused by the sea-level rise, but an encompassing research is lacking. Research was done to investigate the change in the meat diet breadth as related to a number of environmental factors as well as human decisions. They include 1) territorial diminution during the Late Pleistocene and Early Holocene in coastal areas, 2) geographical position of sites, 3) site function, and 4) socio-cultural preferences.

Faunal assemblages originating from the Late Upper Palaeolithic and Mesolithic period, c. 18000-6000 cal BC were characterized by the abundance of animal taxa, their percentage and the index of diversity (Inverse of Simpson's index) based on NISP values. The analysis was done separately for large and small animals in order to determine the human behaviour regarding prey choice of high-cost and low-cost resources. The assemblages had been ascribed to several categories following chronological and environmental criteria, along with attribution of site functions and social groups based on the analyses of lithic artifacts. Their comparison enabled us to observe the interplay of diverse factors.

The general trend in broadening the spectrum of hunted species is present regarding the total of the assemblages from the Balkan Peninsula. Variations in the diet breadth are observed on regional level, as well as between sites presenting diverse geographical characteristics and human activities, although the differences in the index of diversity were not statistically significant in all situations.

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ORAL

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### **20. THE ORIGIN OF BONE ACCUMULATIONS AND ITS CONTINUITY IN THE STRATIGRAPHIC SEQUENCE AT CUEVA DEL ANGEL (LUCENA, CORDOBA).**

*García-Solano, José (University of Granada) jgsolano@outlook.com*

*Moigne, Anne Marie (Centre Européen de Recherches Préhistoriques de Tautavel) moigne@tautavel.univ-perp.fr*

*Celiberti, Vincenzo (Centre Européen de Recherches Préhistoriques de Tautavel) celiberti@cerptautavel.com*

*Barroso, Cecilio (Foundation Institute for Research in Human Evolution and Prehistory) barroso.cecilio@gmail.com*

Cueva del Angel's stratigraphic sequence, which is about 5 m deep, has a large amount of faunal remains and lithic

artifacts in each level. There is a clear continuity of the fossil record along the entire sequence without any archaeological and paleontological record gaps during the filling process. Zooarchaeological and taphonomic analysis of the fossil record has revealed that the origin of the accumulation has a marked anthropogenic character.

Carnivores frequency within the fossil assemblage of each level is very low and there is also an extremely low damage in all the remains analyzed. However, anatomical representation and the strong presence of human-induced changes (thermal alterations, intentional breaking, cut marks) especially faunal spectrum (including carnivores) indicate that the single accumulating agent at each level was likely human. This repeated anthropogenic pattern at all stratigraphic levels suggests a human recursive occupation of the site without any registered alternations of occupation by carnivores.

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ORAL

**21.A NEW OVERVIEW OF THE POITOU-CHARENTES AREA DURING LATE MIDDLE PALEOLITHIC: HUMAN SETTLEMENT DYNAMICS AND UNGULATES HANDLING.**

*Voeltzel, Bénédicte. INRAP. benedicte.voeltzel@inrap.fr*

"Population dynamics and settlements in the "Seuil du Poitou" area in France during the Middle Palaeolithic (300 000/40 000)", is a Research Program directed by Sylvain Soriano (CNRS) from 2009 to 2012. It was initiated by the drastic lack of recent data and valuable chronological frames for Late Middle Paleolithic studies in Central-western France. The area between Poitiers and Angers appears as a "no man's land" during the Mousterian period, except for the site of Roc-en-Pail (Maine-et-Loire) which did not draw any attention since Dr Gruet's last excavation in 1970. The Poitou-Charentes region (northward the Charente river) has many archeological sites of great interest so it is suggested that, due to the geographical interface between human settlements in the North and in the South-west, a complete review and update of archeological data is necessary. It is proposed that archeological collections, including faunal and lithic artefacts, as well as sites, require further investigations.

The zooarcheological research we have undertaken so far concerns faunal assemblages collected at l'Ermitage

(Vienne) and Hauteroche (Charente,) where the last excavation was carried out by A. Debenath in 1974. Exploitation of the heuristic potential of existing collections, made possible by accurate stratigraphies and previous high standard field work on both those sites, will develop knowledge of Neandertal groups' behaviors, economic choices, mobility and settlement patterns on a seasonal basis. Preliminary results already suggest patterns using reindeer toothwear analysis. Understanding ungulates herd structures and death curves for reindeer was made possible according to toothwear degrees and osteological measurements.

Both at Hauteroche and l'Ermitage, hunting and butchering strategies as well as meat consumption appear similar for large size game such as Horse and Bovids, but different for middle-size game such as reindeer. These results appear quite similar to those delivered on the nearby site of Jonzac (Charente-Maritime). Hauteroche also reveals varying butchering strategies, depending on cultural levels - Quina and Denticulate - and type and duration of sites occupation? Seasonality has been clearly identified : although covering a large temporal span, occupations took place limited either to summer or winter season. Links between faunal spectrae and species associations also deliver information on IOS 3 climate and paleoenvironmental context.

New excavations and datings to come at Hauteroche and Roc-en-Pail will provide components for a better understanding of the previous findings and their archaeological context. They will also add to the results obtained at neighbouring sites like Marillac-le-Franc-Les Pradelles and Jonzac, in order to try to decipher the functions of those sites.

SESIÓN B33 (en el último lugar de todo, al final de los posters, es decir, nº3. Ya está incluido en el programa, sólo hace falta meter el texto del resumen en el libro, que es lo que te mando)

The El Kowm Region is well known for its archaeological record over the whole Pleistocene period. Since more than 20 years a research team from the University of Basel under the directorate of Jean-Marie Le Tensorer excavates different sites in the El Kowm region. In two of these sites several layers were found bearing an archaeological and faunal material which most probably dates back to the Early Pleistocene.

In order to proof the age of this layers and to get a

more detailed view on the paleomagnetism of the stratigraphy in 2009 Juan José Villalain from the „Grupo de Paleomagnetismo de la Universidad de Burgos“ carried out an extensive sampling in the sites of Hummal and Ain al Fil.

This poster presents the first results of the analysis of these samples and their implications for the dating of the oldest archaeological sites in Syria..

POSTER

POSTER

**22. BROKEN TO SPLINTERS. ROCA SAN MIGUEL (ARÉN, HUESCA) AND THE GAME MANAGEMENT IN A NEW OPEN-AIR MOUSTERIAN SITE.**

*Domingo Martínez, Rafael (Universidad Zaragoza) rdomingo@unizar.es*

*Montes Ramírez, Lourdes (Universidad Zaragoza) lmontes@unizar.es*

*Sola Almagro, Cristina (Universidad Zaragoza) csola@unizar.es*

Roca San Miguel is an open-air site recently found next to the right margin of the river Noguera Ribagorzana, in a small hill that controls the transit along the valley. Our first researches in 2013 have shown a common Mousterian industry based on the exploitation of some small nodules of flint and larger non-siliceous rocks (quartzite-type, basalts...) that can be found locally. The tools include the usual sidescrapers and denticulates as well as some points, with centripetal *débitage*.

We have detected a striking management of the faunal remains, which appear reduced to small splinters in various states of combustion (non-cremated, burnt and even calcined). These amounts of burnt bones may reflect their employment as fuel after their consumption for food purposes. A taphonomical analysis is being applied in order to explain the faunal exploitation patterns. That behaviour adds a difficulty to the identification of the bones, but we have been able to detect the presence of large herbivores and, thanks of the integrity of some teeth, horses in particular.

This site is in the heart of one of the main areas for the study of the Middle Palaeolithic in Spain, the Cinca-Segre and its tributaries. These rivers occupy a wide territory in the northeastern Ebro basin, in a crooked landscape that articulates through them. Up to ten Mousterian sites have been extensively excavated in the last years:

between them, Fuente del Trucho, Moros de Gabasa, Cova Gran or Roca dels Bous are well-known settlements that have yielded an enormous amount of information about the economics and the social behaviour of Neanderthal people. The infrequent finding of open-air sites makes us hope that Roca San Miguel will contribute to our knowledge of this period with new accurate data that will allow sketching a wider perspective of the Neanderthal people's activities.

POSTER

**23. MOUSTERIAN LEVELS OF EL CASTILLO CAVE (PUENTE VIESGO, CANTABRIA, SPAIN): AN ARCHAEOZOOLOGICAL STUDY**

*Luret, Mathieu (Section of Earth and Environmental Sciences, Forel Institute, Laboratory of Prehistoric Archaeology and Anthropology, University of Geneva, 18 Acacias, CH 1211 Geneva 4) matluret@msn.com*

*Burke, Ariane (Université de Montréal, Département d'Anthropologie, C.P. 6128, succursale Centre-Ville, Montréal, QC, Canada H3C 3J7) a.burke@umontreal.ca*

*Bernaldo De Quiros, Federico (Area de Prehistoria, Universidad de Leon, Campus de Vegazana, 26071 Leon, Spain) f.bquiros@unileon.es*

*Besse, Marie (Section of Earth and Environmental Sciences, Forel Institute, Laboratory of Prehistoric Archaeology and Anthropology, University of Geneva, 18 Acacias, CH 1211 Geneva 4) marie.besse@unige.ch*

El Castillo cave is of particular significance because human occupation of the cave spans the Middle to Upper Palaeolithic transition. Here, we present the our analysis of faunal remains attributed to the Mousterian occupation of the cave, which includes level 21, dated to 69300 ±9100 BP (average date, Rink and *al.*, 1997), and level 20, dated to 43300 ±3800 BP (GifA92506). This research was carried out in the context of our thesis project, *Paleo-environment and subsistence behaviours of the last Neanderthals and early modern humans: taphonomic fauna study of El Castillo cave (Spain)*.

The faunal remains under analysis were recovered during excavations conducted by Cabrera Valdès and Federico Bernaldo de Quiros between 1980-2004. The faunal assemblage from levels 20 and 21. A total of 6495 bones were identifiable, including N=2419 bones for level 21 and N=4076 bones for level 20. A quantitative analysis of the material was conducted in order to evaluate the role of differential conservation and transport on the proportional representation of anatomical elements.

This was followed by a taphonomic analysis; each bone fragment was subjected to a thorough macroscopic examination with the aid of a 20X magnifier hand lens and all non-anthropogenic and anthropogenic traces were catalogued. The location and morphology of the anthropogenic traces (cut-marks, percussion marks) was inventoried in order to assess the exploitation patterns of the carcasses. Bones recovered from sieve residues were classified by type of tissue (compact, spongy, rib) and by class size (0-20mm, 20-30mm, ...) and traces of burning were quantified.

Red deer (*C. elaphus*) is the dominant species in levels 20 and 21, followed by large Bovidae, horse, chamois, roe deer and rhinoceros. Carnivores are poorly represented with 9 bones remains.

The state of conservation of the bones is poor and most of the remains are highly fragmented, with the exception of podial elements. This may reflect intentional bone breakage by humans in order to exploit the marrow of long bones. The presence of impacts on shaft fragments and breakage patterns of first and second phalanges confirms this hypothesis. The absence of taphonomic traces attributable to carnivores (and the small number of carnivore remains) suggests that neither level results from carnivore activities. Skeletal part representation for deer, horse, and large Bovidae indicate that the axial skeleton is less well represented than the limbs and teeth, which occur in higher frequencies. A comparison between levels 20 and 21 revealed no significant differences in patterning.

Preliminary results indicate that the two Mousterian occupations at El Castillo cave share similar patterns of faunal exploitation. Red deer is the dominant species in both levels and bone was transported to the cave for butchering and consumption. Although butchering marks are rare, human bone-breakage is present in both levels. Future analyses will explore whether these levels are characterised by the exploitation of anatomical parts with low nutritive yields, a potential indicator of nutritive stress. The analysis of the Aurignacien occupation (level 18), which is underway, will allow us to compare the subsistence behaviours of Neanderthals and modern humans.

# B36 Analysis of the economic foundations supporting the social supremacy of the Beaker groups

Organiser: Elisa Guerra Doce and Corina Liesau von Lettow-Vorbeck

Wednesday 3rd (9:00 to 14:00)  
A13 Meeting Room



2014 burgos  
1-7 sept.

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ORAL CONTRIBUTION

ORAL

## 1. GRAVES OF METALLURGISTS IN MORAVIAN BEAKER CULTURES

*Jaroslav, Peska (Archaeological Centre Olomouc, Czech Republic) peska@ac-olomouc.cz*

Despite advanced skills of the Beaker people as regards metalworking and metallurgy of all available metals (copper, gold, silver, electrum) in the 3<sup>rd</sup> millennia BC, archaeological contexts yielded only little exact evidence of these technological processes. Technological equipment is lacking and individual components of metalworking tools are most often found as parts of prestigious artefacts of grave goods in forms of symbolic packages in clearly defined deposits. It is significant that they were fixed to rich male burials (even cenotaphs!), often at a leading position within the burial ground. They were found on the vast territory between England (Amersbury) and the Carpathian Basin and they significantly accumulated on the territory of the Czech Republic, particularly in Moravia. Together with other attributes, they strengthened and emphasized the social level, position, power and identity of their owners. At the same time, they could reflect the ritualised control over important technologies through the high position within the hierarchising society, leading – in the case of the early Bell Beaker Culture – to the creation of regional élites.

Evidence of metal casting is minimum (Ludé ov - mould, Szigentszentmiklós - nozzle). The number of documented metalworking tools is higher (hammers and anvils) in Moravian Corded Ware pottery (Nechvalín, T šetice, Velešovice) as well as in the Bell Beaker Culture (Turovice, Holešov, Maršovice-Jezelany, etc. – total of about 17 graves), which is even more numerous. New microscopic analyses (using scanning electron microscope) have brought further evidence confirming the function and practical use of these tools (high presence of gold, silver and copper) prior to their deposition in graves. Examples thereof are new burial grounds in Central Moravia Hulín 1, Hulín-Pravice 2 and Opatovice). Similar analyses of a number of other tools will have to be performed. In addition, it would be interesting to conduct a multi-elementary chemical analysis of metal content in bones (teeth) of the buried metallurgists with an attempt to determine health impact in connection with their assumed regular contact and work with metals.

ORAL

## 2. BELL BEAKER HORIZON IN THE LOWER EBRO VALLEY: CULTURAL SUBSTRATE AND EXCHANGE ELEMENTS.

*Ríos Mendoza, Patricia (Universidad Autónoma de Barcelona) patricia.rios@uab.cat*

*Piera, Marc (Universidad Autónoma de Barcelona) piera-tex@hotmail.com*

*Gómez Bach, Anna (Universidad Autónoma de Barcelona) anna.gomez@uab.cat*

*Molist Montaña, Miquel (Universidad Autónoma de Barcelona) miquel.molist@uab.cat*

The Ebro valley is an important space for the development of the first settlements of farmers, over Recent Prehistory. The backbone is undoubtedly the river itself that acts as a route of communication and movement of goods and products that unite a broad and complex territory.

The Ebro valley is elected by different societies, between the third and second millennium cal BC. Through various economic and spatial strategies, these groups structure a complex pattern of settlement that today is still under study and understanding.

Traditionally in this area is considered that after a first phase, represented by international and /or corded Bell Beakers, a more recent stage represented by the regional style of Salomó is developed.

In this communication we aim to provide a critical review of Bell Beaker in the Lower Ebro valley from updated documentation, and focusing mainly the presence of elements that appear in the record as a reflection of the inclusion of this valley in exchange networks present in the rest of the Iberian Peninsula. Among these elements that must circulate within the territory are metal weapons -mainly daggers, and v perforated buttons to which should add some raw materials.

Access to these objects and surely control of exchange routes seems must have been key to the emergence of bell beaker elites of the region, which are well represented in known burial caves.



ORAL

### **3. EL PEÑÓN DE LA ZORRA (VILLENA, ALICANTE, SPAIN): CHANGE AND CONTINUITY IN SETTLEMENT PATTERN AND BURIAL PRACTICES DURING BELL BEAKER CULTURE**

*García Atiénzar, Gabriel (Universidad de Alicante) g.garcia@ua.es*

In this paper we will discuss the results of the recent excavations in the archaeological site of the Peñón de la Zorra, and the revision of the burial caves associated with this settlement. On the basis of this work we will propose a reinterpretation of the transition between the Chalcolithic and Bronze Age in the Alto Vinalopó region. Traditionally, this site had been interpreted as the first evidence of a fortified settlement in high areas. This change in the settlement pattern was linked to the first evidence of individual burials associated with small caves opened at the same elevation. However, archaeological surveys undertaken in 2011 allow us to propose a reinterpretation of the historical process developed between 2400 and 1700 cal BC in the north of the province of Alicante.

Several proposals will be made. Firstly, we would like to argue that plain settlements and settlements in height were occupied at the same time, although the first ones seem to have been abandoned earlier. Secondly, the settlements are not uniform, for, as seen at the Peñón de la Zorra, in this settlement a singular space was built next to a defensive building type tower, associated with a lot of bell-beaker pottery. This feature is not found in other similar high sites.

Furthermore, we have been able to demonstrate a long-term use of at least some settlements like the Peñón de la Zorra, for in it there is a clear stratigraphic continuity from Bell-Beaker to Bronze Age structures. The site continued to be occupied at least until 1700 cal BC, a date close in time to the abandonment of the high sites and the emergence of large settlements such as Cabezo Redondo.

Finally, the radiocarbon analysis of human remains found in burial caves in the area show the continuation of this ritual practice during the Bronze Age. We see this as an evidence of the origin of this type of funeral - burial caves are associated with settlements - in the Bell-Beaker period.

In sum, on the basis of our recent work in Chalcolithic and Bronze Age sites in the Alto Vinalopó region we argue

that many of the characteristic features of the Bronze Age originated during the Beaker period. Furthermore, this process of change was not simultaneous in the whole area, for we can see changes occurring earlier in the south than in the north extremes of the region. Similar transformations are apparent to the south of the River Segura at the beginning of the third millennium cal BC, but transformations only take place to the north of this border around 2600 cal BC and finally appear in the Alto Vinalopó around 2400 cal BC. In this sense, it can be argued that the intensification of contacts of these territories with the cultural group of Millares, at first, and later with the Argar Culture was one of the basis for the changes observed in the communities located in River Vinalopó.

ORAL

### **4. EVIDENCE OF INTERACTION BETWEEN BRITISH BEAKERS AND CIEMPOZUELOS GROUPS: THE CASE OF GOLD ORNAMENTS.**

*Delibes de Castro, Germán (Universidad de Valladolid) delibes@fyl.uva.es*

In this paper, we will examine some prestige items found in Beaker graves from Central Iberia that illustrate contacts with the British Isles. More specifically, we will focus our attention on gold ornaments. Although they are not unusual in the Ciempozuelos tombs, their designs are very simple: beads or small plaques, and less frequently diadems. The discovery of a pair of basket-shaped earrings at a non-megalithic mound in the province of Burgos (Spain), where they occur in association to Ciempozuelos pottery, is therefore quite exceptional. We find parallels for these ornaments in the Atlantic regions, mainly in Britain, where most of the finds are associated to adult male burials. They were a sign of high status, as the gold discs were in Ireland. The pieces from Burgos suggest the existence of long-distance exchange networks that connected the British Isles and Iberia.

ORAL

### **5. LA PANOPLIA SÍMBOLO DE SUPREMACÍA DE LAS ÉLITES CAMPANIFORMES**

*Blasco Bosqued, Concepcion (UAM) concepcion.blasco@uam.es*

Entre los elementos que integran el *package* campaniforme destaca la panoplia, sin duda mucho más escasa que la vajilla cerámica, en especial en su versión más completa. Entre los campaniformes peninsulares dicha panoplia está compuesta por una o varias puntas palmelas, el puñal de lengüeta y el brazal de arquero, todas las armas ofensivas funerarias están elaboradas en cobre y, de manera general, se asocian a varones de edades muy distintas.

Si bien es cierto que se ha enfatizado en que la presencia de armas en los ajuares de los líderes más destacados se justifica como instrumento y símbolo de sumisión, sin embargo, no podemos ignorar una segunda vertiente que destacamos en el trabajo: el hecho de ser, además, los primeros objetos de la Prehistoria ibérica en los que, de manera normalizada, se amortiza el metal, una materia prima todavía en estos momentos, al alcance de muy pocos, aunque hay que reconocer que la cantidad de metal utilizado en la confección de una de estas panoplias rara vez supera los 100 grs. teniendo en cuenta que el peso tanto de las puntas, como los puñales, no suele superar los 30 grs.

Teniendo en cuenta el papel desempeñado por la confección de las armas en el desarrollo de la metalurgia inicial, nuestro trabajo pone el acento, sobre todo, en que por primera vez hemos podido contrastar que a la tradicional panoplia de los campaniformes ibéricos, al menos en el Valle del Tajo Medio, se suma un elemento más: la albarda, lo que supone un considerable salto cuantitativo y cualitativo de la importancia de las armas entre las élites campaniformes, tanto por la complejidad tecnológica y las novedades funcionales que incorpora, como por la visualización que ofrece esta arma de tamaño considerablemente superior al de los puñales y, sobre todo por la cantidad de metal que se amortiza en ella, a lo que se suma un segundo avance: el haber obtenido una datación que supone subir, de manera considerable, la cronología de estas armas complejas en el panorama de la metalurgia ibérica a la par que de aumenta el grado exaltación de los líderes campaniformes mediante símbolos más visibles y costosos.

El trabajo ofrece como novedades más destacadas tres conclusiones:

a) Haber obtenido una primera contextualización funeraria de una albarda de tipo atlántico, hasta ahora aparecidas en depósitos o hallazgos aislados.

b) Contrastar que la metalurgia campaniforme es más compleja y antigua de lo que se conocía.

c) Haber obtenido una datación que supone subir, de manera considerable, la cronología de estas armas complejas en el panorama de la metalurgia ibérica.

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ORAL

## 6. INDICATIVE OF PRESTIGE AND BELL-BEAKER IN VALENCINA DE LA CONCEPCIÓN (SEVILLA).

*López-Aldana, Pedro M. (Departamento de Prehistoria y Arqueología, Universidad de Sevilla) [aldanap@supercable.es](mailto:aldanap@supercable.es)  
Pajuelo Pando, Ana (Departamento de Prehistoria y Arqueología, Universidad de Sevilla) [anpando@supercable.es](mailto:anpando@supercable.es)*

The settlement of the third millennium a.n.e. Valencina de la Concepción possesses dimensions that exceed 400 ha. , and since the nineteenth century have been making countless archaeological excavations increased in number from the 80s of last century. However, the bell-ceramic waste form appeared very often limited to isolated findings. In recent years, some archaeological work conducted under the administrative form of "preventive excavations" have provided a remarkable volume of this type of ceramic products that enrich the scientific knowledge of this phenomenon in the peninsular sw.

The findings come from both residential and funerary contexts, in some cases, associated with metallic elements copper and gold. In this sense we performed various analyzes to ceramic pastes and metal elements that point, a priori, to local production and manufacturing.

Therefore, the association bell-beaker and metallurgy indicates consolidation of a social elite that sinks its emergence in the transition from IV-III millennium BC that control the production, distribution and exchange.

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ORAL

## 7. EXCHANGE NETWORKS OF PRESTIGE GOODS AND BELL BEAKER TOMBS IN CENTRAL IBERIA

*Liesau von Lettow-Vorbeck, Corina (Universidad Autónoma de Madrid) [corina.liesau@uam.es](mailto:corina.liesau@uam.es)*

Throughout the latter years, new lines of research on Bell Beaker grave goods have broaden our knowledge of the burial practices in this horizon. The traditional typological and stylistic approach to the study of pottery

and copper artefacts has given way to an archaeometric approach in them, which also has become essential in order to determine the origin of other raw materials used to elaborate some of the objects accompanying the Beaker *package* itself.

By applying different non-destructive methods (FTIR, IRMS,  $\mu$ -CT), bone ornaments, such as V-perforated buttons recovered from Bell Beaker graves have been studied to determine the origin and characteristics of their raw materials. Likewise we have analyzed (DRX) some red pigments scattered over skeletal remains or on some grave goods.

The combination of different methods has led to identify several raw materials used to elaborate some of these ornaments. The key question is, if the origin of these raw materials has a local origin or reveals long distance interactions, as the results do not exclude any of both possibilities. In a similar manner, the use of red pigments in some of the burials also implies an intentional selection of certain minerals with a high symbolic meaning.

The identification of the raw materials employed for several ornaments in some Bell Beaker tombs allows us to emphasize the exclusivity of V-perforated buttons and other ornaments made of different types of so-called *ivories*. These items, in combination with other artefacts and the use of cinnabar reinforce the elitist character of several Beaker tombs and the existence of relatively standardized burial practices in Madrid region.

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ORAL

## 8. THE ROLE OF FLINT ARROWHEADS IN BELL BEAKER GROUPS OF THE CENTRAL IBERIAN PENINSULA.

*Ríos Mendoza, Patricia (Universidad Autónoma de Barcelona) patricia.rios@uab.cat*

Among the objects of Bell Beaker package, arrowheads have been traditionally interpreted as part of archer equipment together with wristguards. But rarely their role in beaker exchange networks has been assessed. Arrowheads exchange occurred? Were they circulated as finished pieces or as raw materials? Was there control over the raw material, or the production or distribution? The frequent association of flint arrowheads and the metal weapons raises another question that researchers have been asking: Are these grave goods reflecting warriors or hunters? More recent interpretations have been about an idealized identity of warriors, especially

male. In this sense, weapons and appearance of warrior should play a central role among beakers.

Trying to approach these issues, in this paper we analyze data from various sites in the center of the Iberian Peninsula, where the record documented in recent years could shed light on the matter. The presence of Beaker cemeteries with a total absence of any type of weapons and arrowheads compared to other cemeteries where it does appear, could be talking about Beaker groups with different status or prestige symbols? Does this presence answer to a true reflection of beaker hunters or warriors? Or is it the reflection of the access and control of exchange networks of these objects? And what is even more interesting in this regard: can be related documentation of specialized areas in the production of arrowheads on these sites with Beaker burials with the monopoly of its production and distribution to Beaker elites? Was there an increased of arrowheads production in Beaker time to satisfy the demand of the exchange networks?

This latter issue allows us to raise the question of the true value that these "prestige items" had for beaker elites, allowing them distinguishable from the rest of society.

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ORAL

## 9. SALT AND BEAKERS IN THE COPPER AGE.

*Guerra Doce, Elisa (Universidad de Valladolid) elisa.guerra@uva.es*

Salt was a commodity of great importance in prehistoric times. Apart from its use as a condiment and as a dietary supplement for livestock, it played a very important role in the preservation of foodstuffs and in a range of industries (leather tanning, cloth dyeing, among others). However, it is only in the last decade that salt has emerged as an important issue in European prehistory. An increasing number of sites confirm that salt was intensively exploited in prehistoric Europe from the Neolithic onwards. The excavations carried out at the Beaker salt-processing factory of Molino Sanchón II, in the natural reserve of Las Lagunas de Villafáfila (Zamora, Spain) confirm that Ciempozuelos elites in Central Iberia obtained salt through the method of boiling brine. Other sites in this geographical setting also suggest the importance of salt among Beaker groups. The aim of this paper is to examine the role of salt in the Beaker exchange networks.

# B37 Lithics, Evolution, Science

Organiser: Mark Collard and Steven L. Kuhn

Tuesday 2th (14:30-19:30) Wednesday 3th (9:00-13:30)  
Meeting Room A04



2014 burgos  
1-7 sept.

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ORAL CONTRIBUTION

ORAL

### 1. NATURALISTIC FRACTURE MECHANICS: TECHNOLOGY, SKILL, AND DEBITAGE MORPHOLOGY

*Stout, Dietrich (Emory University) [dwstout@emory.edu](mailto:dwstout@emory.edu)*

Controlled fracture experiments have identified causal relations between platform variables (thickness, breadth, angle) and the size and shape of flakes produced. Whether they are explicitly aware of them or not, knappers must work with these underlying relations to achieve technological goals. Study of platform variables thus offers a potential window on prehistoric knapping choices and skills. However, in contrast to controlled experiments, actual knapping takes place under highly variable natural conditions. It is not well known how additional factors such as percussive technique, reduction strategy and stage, platform shape and preparation, differential fragmentation, and/or knapper skill might interact with platform size and angle to produce observed flake morphologies.

To address these questions in the case of bifacial reduction, we conducted naturalistic knapping experiments in which each blow was recorded (percussor, posture, marginal/non-marginal percussion, core face, preparation) and directly associated with the piece(s) detached. We then collected detailed morphological data (weight, dimensions, cross-sections, partial volumes) for all whole flakes using scales, calipers, 2D image analysis of digital photos, and 3D laser scans. Finally, these experimental samples were compared to debitage from the early Middle Pleistocene site of Boxgrove, UK.

Preliminary results confirm that known platform-mass relations are robust across changes in other variables, but suggest that the relative distribution of volume (i.e. flake shape) is more labile to manipulation in multiple ways.

Understanding the sources of variation in flake shape under naturalistic knapping conditions has more important implications for assessing utility and economization during tool production as well as for identifying the expression and cultural transmission of technological skill and understanding.

ORAL

### 2. USING THE FUNDAMENTAL PROCESSES OF FLAKE FORMATION AS A WAY OF UNDERSTANDING STONE ARTEFACT ASSEMBLAGE VARIABILITY IN EARLY TO MID-HOLOCENE FAYUM, EGYPT

*Holdaway, Simon (University of Auckland)*

*[sj.holdaway@auckland.ac.nz](mailto:sj.holdaway@auckland.ac.nz)*

*Phillipps, Rebecca (University of Auckland)*

*[rphi025@aucklanduni.ac.nz](mailto:rphi025@aucklanduni.ac.nz)*

*Wendrich, Willeke (UCLA) [wendrich@humnet.ucla.edu](mailto:wendrich@humnet.ucla.edu)*

Stone artefacts dating from the period 10 000 BP through 6 000 BP are abundant in the Fayum, Egypt. In this paper we report new analyses that show changes in the way raw materials of different forms were made, used and discarded during this period.

Attributes for analysis were selected based on the results of controlled flake formation experiments. These were applied to stone artefact assemblages numbering in the thousands of items recently recorded from locations in the Fayum and associated with dated hearths.

By understanding the fundamental processes of flake formation based on the results of controlled experiments we are able to develop a firm basis from which to make inferences about the utilization of stone artefacts at a landscape scale in the Fayum. We are able to show changes in the way raw material was acquired and flaked over this period as well as changes in the way the products of flaking were moved.

When combined with information on the palaeoenvironment, site structure and fauna we are able to make inferences about changes in past socio-economies from the early to mid-Holocene.

ORAL

### 3. CAN LITHIC ATTRIBUTE ANALYSES IDENTIFY DISCRETE REDUCTION TRAJECTORIES FROM REFITTED CORES?

*Scerri, Eleanor (University of Bordeaux)*

*[eleanor.scerri@icloud.com](mailto:eleanor.scerri@icloud.com)*

*Blinkhorn, James (University of Bordeaux)*

*[jblinkhorn@outlook.com](mailto:jblinkhorn@outlook.com)*

*Faivre, Jean-Philippe (University of Bordeaux)*

*[jp.faire@pacea.u-bordeaux1.fr](mailto:jp.faire@pacea.u-bordeaux1.fr)*

*Delagnes, Anne (University of Bordeaux)*  
*anne.delagnes@free.fr*  
*Gravina, Brad (University of Bordeaux)*  
*gravina.brad@gmail.com*

Anglo-American and French approaches to lithic analysis have dominated technological studies but continue to remain epistemologically separate, underpinned by very different research histories. French approaches have largely emphasised qualitative analyses supported by experimental archaeology and refitting studies, a methodology refined through long-term engagement with the rich cave sequences of the French Palaeolithic. This approach highlights the conceptual and technological domains of analysis. Anglo-American approaches have instead focused on quantitative attribute-based analyses with investigations of fracture mechanics in which refitting artefacts can be lacking. This approach highlights measurable and comparative domains of analysis. Owing to their differences, the equivalence and applicability of these two approaches has been the subject of intense debate amongst lithic analysts (e.g. Bar-Yosef and Van Peer, 2009; Tostevin, 2011).

In this paper, we test the extent to which the two approaches are complementary to each other and investigate what unique information regarding lithic technology each method provides. We first conducted multivariate attribute analyses of several lithic chaînes opératoires from the Middle Palaeolithic site of Le Pucueil in France. We then compared the goodness-of-fit between the results of the attribute analysis and the known sequence of the same refitted cores.

The results permit the first comparative evaluation of these approaches and show how the different schools of analysis articulate with a range of research questions and types of data.

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ORAL

#### **4. MIDDLE PALAEOOLITHIC LITHIC REDUCTION STRATEGIES: LOOKING PAST TECHNOLOGICAL ANALYSIS**

*Sandgathe, Dennis (Simon Fraser University) dms@sfu.ca*  
*Dibble, Harold (University of Pennsylvania) hdibble@upenn.edu*  
*Goldberg, Paul (Boston University) paulberg@bu.edu*  
*Iovita, Radu (Römisch-Germanisches Zentralmuseum)*  
*iovita@rgzm.de*  
*Lin, Sam (University of Pennsylvania) yoid50@gmail.com*

*McPherron, Shannon (Max Planck Institute for Evolutionary Anthropology) mcpherron@eva.mpg.de*  
*Turq, Alain (Musée National de Préhistoire, France)*  
*alain.turq@culture.gouv.fr*  
*Rezek, Jelyko (University of Pennsylvania) rezek@sas.upenn.edu*

The analysis of Middle Palaeolithic (Mousterian) assemblages in Eurasia was initially dominated by culture history approaches based in large part on Bordes' Mousterian Facies. In more recent decades technological analysis (following the Chaîne Opératoire approach among some researchers and adaptation and settlement patterns among others) has dominated attempts to understand the nature of Middle Palaeolithic lithic variability. Here, based on data from Middle Palaeolithic sites in SW France, we attempt to return to more basic (and generally interpretation-free) characteristics of lithic assemblages in order to identify broad patterns of chronological change in Middle Palaeolithic stone tool production. These patterns can then be placed in the context of changes in climate/environment and faunal exploitation. The goal of the analysis is to attempt to identify meaningful patterns in Middle Palaeolithic lithic assemblages, that represent changes in lithic reduction/production strategies, while avoiding the interpretive pitfalls inherent in the use of interpretation-based technological classification schemes (such as 'Levallois').

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ORAL

#### **5. LITHIC ANALYSIS AND HUMAN BEHAVIOUR DURING THE MIDDLE PALAEOOLITHIC. ANALYSING EXPEDIENCY THROUGH REFITS AT ABRIC ROMANÍ (CAPELLADES, SPAIN).**

*Romagnoli, Francesca (Università degli Studi di Firenze)*  
*fromagnoli2@gmail.com*  
*Chacón, María Gema (Universitat Rovira i Virgili; Institut Català de Paleoecologia Humana i Evolució Social (IPHES); Muséum national d'Histoire naturelle Paris)*  
*gchacon@iphes.cat; gema.chacon@mnhn.fr*  
*Bargalló, Amèlia (Universitat Rovira i Virgili; Institut Català de Paleoecologia Humana i Evolució Social (IPHES))*  
*ameliabarg@gmail.com*  
*Gómez de Soler, Bruno (Universitat Rovira i Virgili; Institut Català de Paleoecologia Humana i Evolució Social (IPHES))*  
*bgomez@iphes.cat*  
*Picin, Andrea (Universitat Rovira i Virgili; Institut Català de Paleoecologia Humana i Evolució Social (IPHES))*  
*a.picin@hotmail.com*  
*Vaquero, Manuel (Universitat Rovira i Virgili; Institut Ca-*

*talà de Paleoeologia Humana i Evolució Social (IPHES)*  
*manuel.vaquero@urv.cat*

According to the chaîne opératoire method reduction sequences have been defined as the result of a volumetric conception. In the last years this conception is debated in discoïd method, due to many studies that have shown an important variability within this method. This variability is usually considered an expression of mental concepts based on the alternation of predetermining and predetermined flakes during the recurrent centripetal reduction of the core: short centripetal flakes, pseudo-levallouis points and débordant flakes. This technical system had a wide geographical and chronological spread and was often associated with other knapping systems corresponding to an expedient behaviour in which the mental concept related to the volumetric structure of the core was absent and the technical aim of the core reduction was the production of flakes, without control of the morphology, in search of cutting edges.

The aim of this study is to ascertain whether the discoïd technology could also represent an expedient behaviour, going beyond the simple geometric definition of the knapping sequence and trying to find a way for interpret the technical behaviour in a social and cultural perspective. Our hypothesis is that this knapping strategy had a great flexibility to adapt the organisation of the removals to raw material morphology allowing a transition between orthogonal and bifacial conception. The "holistic" approach that we use will be very useful for the discussion of cultural traditions and differences between assemblages.

The study was based on refitting data from layer M of the Abric Romani site. This Middle Palaeolithic layer has been dated between 51 and 55 kyr BP. The lithic assemblage has been studied from a technological perspective to reconstruct the productive sequences first through a diacritical approach and then through systematic Raw Material Unit analysis and refitting of all the finds. The lithic industry is composed by more than 4,800 finds greater than 1 cm.

Discoïd cores are well represented as well as the typical product of discoïd recurrence. Refitting data show a less clear scenario, displaying a knapping strategy without rigid volumetric conception or a well structured method. Some of the most complete refits found in this assemblage will be presented as example. Our results suggest that discoïd knapping were the expression of an expedient adaptation to the morphology of raw material, therefore may have been an expedient

behaviour. The rigid criteria used so far to identify the mental concept and the volumetric structure of this knapping strategy may therefore not be really accurate to understand the technical behaviour behind "discoïd" products. Also, from a methodological standpoint, refits appear of outmost importance for a detailed comprehension of technical behaviour and for compare on large scale assemblages in order to reconstruct human behaviour.

ORAL

## 6. INDIVIDUALS, SOCIAL GROUPS, AND CULTURAL EVOLUTION? WHAT CAN WE LEARN FROM LITHIC ARTIFACTS?

*Hovers, Erella (Institute of archaeology, The Hebrew University of Jerusalem) hovers@mscc.huji.ac.il*

Being the most ubiquitous find from prehistoric records, lithic artifacts served as the basis for broad-range inferences about evolutionary changes in human behavior in relation to environmental, functional and social factors. Notably, the use lives of stone tools reflect actions based on individual decision-making in highly circumscribed temporal (i.e., historical) contexts, a framework that contrasts strongly with the one necessary for studying evolutionary processes of cultural stasis, variability, and change. To bring stone tools into the cultural evolutionary arena, it is necessary to consider lithic assemblages as the time-averaged outcome of processes of information transfer.

Despite a plethora of recent theoretical, analytical and methodological thinking along similar lines, the application of this worldview in the analysis of prehistoric lithic assemblages has been limited and often problematic. Major difficulties involve isolating elements of lithic artifacts that are most likely to reflect socially-biased transmission of technological knowledge, and may result in prolonged 'technological traditions,' rather than convergence of practices due to external factors (e.g., raw material properties or the constraints of flaking mechanics, environmental conditions or functional demands).

Here I discuss the potentials and limitations of this approach, through specific case studies from the Levantine Middle Paleolithic, using differences in stratigraphic modes (continuities vs. breaks) to formulate expectations about the intra- and inter-site patterning of transmission of technical knowledge. On a broader scale, this approach provides tools for identifying parallelisms, convergences

(analogies) and potentially, shared ancestry (homologies) in lithic (and other) technological practices.

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ORAL

## 7. POPULATION SIZE AS AN EXPLANATION FOR PATTERNS IN THE PALAEOLITHIC ARCHAEOLOGICAL RECORD: MORE CAUTION IS NEEDED

*Collard, Mark (Simon Fraser University and University of Aberdeen) mcollard@sfu.ca*

*Buchanan, Briggs (University of Tulsa) briggs-buchanan@utulsa.edu*

*O'Brien, Michael (University of Missouri) obrienm@missouri.edu*

It has become commonplace over the last several years to use population size to explain patterns in the Palaeolithic archaeological record. Among the patterns that have been argued to reflect the impact of population size are the “creative explosion” of the late Middle Stone Age and Upper Palaeolithic; the absence of directional technological change and the reappearance of previously existing cultural behaviors in the Middle Palaeolithic and Middle Stone Age archaeological records; and the emergence of the Bromme and Perstunian technocomplexes in Northern Europe during the Late Glacial. A number of modeling papers support the hypothesis that population size can affect cultural evolution, but the results of empirical studies are ambiguous. Here we report a study that used technological data from recent hunter–gatherers, in conjunction with correlation analysis and regression analysis, to test the population-size hypothesis.

Three samples were used: a global sample consisting of populations from several continents; a continental sample of populations from North America; and a regional sample of populations from the Pacific Northwest.

The results of the analyses do not support the population size hypothesis. Simple correlation analyses indicated that population size was correlated with two of the three toolkit variables in the global sample. However, these relationships disappeared when we used partial correlation analysis to control for two factors that have previously been found to affect the richness and complexity of hunter-gatherer toolkits—risk of resource failure and mobility. Population size was not correlated with the toolkit variables in the correlation analyses that focused on the North American and Pacific Northwest samples. Standard multiple regression analyses yielded

results that are compatible with the results of the partial correlation analyses: Population size was not a significant determinant of toolkit richness or toolkit complexity in any of the samples.

Our study challenges the use of population size to explain patterns in the Palaeolithic archaeological record. Population size may explain some of the patterns in question, but this needs to be demonstrated on a case-by-case basis through tests in which the population size hypothesis is pitted against competing hypotheses, such as adaptation to shifting ecological conditions. Simply attributing patterns in the Palaeolithic archaeological record to population size is not a defensible course of action.

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ORAL

## 8. EVOLUTIONARY MODELS AND LITHIC TECHNOLOGICAL VARIATION IN LATE PLEISTOCENE SOUTHERN AFRICA

*Mackay, Alex (University of Wollongong) amackay@uow.edu.au*

*Steele, Teresa E. (University of California, Davis)*

*testeele@ucdavis.edu*

Evolutionary models of technological change in southern Africa's late Pleistocene have focussed on environmental constraints or demographic pressures as key causal mechanisms. Alternative ‘non-evolutionary’ models have focussed on technology as cultural expression without consideration of the forces underlying information transmission. In this paper we review the southern African record with a particular focus on the well-known Howiesons Poort industry, a technocomplex associated with complex lithic technologies and distinctive symboling systems that flourished in southern Africa from 65-60 ka. We examine lithic and faunal data drawn from sites across the region and evaluate competing explanations for the causes underlying the appearance, form and disappearance of the industry.

Lithics from the late Pleistocene sites across southern Africa are assessed with respect to patterns of provisioning, core reduction, and tool form. These are taken to reflect adaptive constraints (provisioning), and potential extent of population interconnection (core reduction and tool form). Climate regions and faunal data are taken to reflect underlying subsistence conditions as a measure of environmental similarity between sites. Changes in the size of Angulate tortoise from the deep sequence site of Diepkloof are used as a proxy for local



human population size.

We find that: not all technological change is accounted for by adaptation to environments, increased complexity is probably not related to population increase, and cultural expression manifests in ways consistent with information transmission through variably interconnected populations.

Single cause explanations for technological change in late Pleistocene southern Africa are unsatisfying. We propose that the changes observed in the Howiesons Poort are best explained in terms of information diffusion between variably interconnected populations under differing environmental conditions. The relative complexity of the classic Howiesons Poort reflects a time in which widely spread populations were most strongly connected.

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ORAL

## 9. THE USE OF ECOLOGICAL NICHE MODELING METHODS IN THE INVESTIGATION OF MECHANISMS AT WORK IN CULTURE-ENVIRONMENT RELATIONSHIPS

*Banks, William (Université de Bordeaux)*

*william.banks@u-bordeaux.fr*

*d'Errico, Francesco (CNRS) f.derrico@pacea.u-bordeaux1.fr*

The examinations of numerous regional archaeological sequences have recognized the appearance and disappearance of complex cultural behaviors, many of which have been associated with the emergence of cultural modernity. The vast majority of the scenarios proposed to explain the origin of this multitude of behaviors have been based on single-caused models. Such models, however, cannot sufficiently explain the complex paths and the multitude of cultural adaptations inferred from the archaeological records associated with various hominin populations in different regions of the world. There is a need for our discipline to develop and implement approaches that focus on the identification of mechanisms that influenced the development of specific cultural adaptations as means for coping with both environmental and cultural stimuli. To this end, we have argued that one such approach is the integration of cultural, chronological, and paleoenvironmental datasets via ecological niche modeling architectures, with the goal of understanding how environmental dynamics may have influenced prehistoric human adaptations and distributions. It is in this way that one can move away from analyses

focused on documentation towards studies in which one examines cultural variability and change through time with respect to ecological dynamics. It is through such interrogations of the archaeological record that we should be able to effectively identify short- and long-term mechanisms at work in the evolution of cultural adaptations within their respective environmental frameworks. In this vein, this presentation first outlines the theoretical and methodological underpinnings of this approach and provides the results of its application to the Western European early Upper Paleolithic as a case study demonstrating its potential.

To examine culture-environment relationships between ca. 42 ka cal BP and ca. 31 ka cal BP, we use genetic algorithm (GARP) and maximum entropy (Maxent) techniques to estimate the ecological niches occupied by different archaeological cultures that were present during this period. For data inputs, GARP and Maxent require the geographic coordinates where the target population has been observed and raster GIS data layers summarizing environmental dimensions. The occurrence data consist of archaeological sites from which material culture assemblages have been recovered and identified as belonging to the temporal variants of the broader Aurignacian and Gravettian archaeological cultures. The environmental data layers are derived from high-resolution paleoclimatic simulations derived from the LMDZ3.3 Atmospheric General Circulation Model and a regional zoom, as well as the ETOPO datasets. Preliminary results for the time frame between Greenland Interstadial 8 (ca. 38 ka cal BP) and Heinrich Stadial 3 (ca. 31 ka cal BP) will be presented and interpreted in light of patterns observed for the initial Upper Paleolithic.

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ORAL

## 10. WHAT'S THE DIFFERENCE? COMPARATIVE ANALYSES OF COMPLEXITY IN TOOL BEHAVIOR USING COGNIGRAMS AND EFFECTIVE CHAINS.

*Haidle, Miriam Noël (Research Project The Role of Culture in Early Expansions of Humans ROCEEH, Senckenberg Research Institute and University of Tübingen, Germany)*  
*miriam.haidle@uni-tuebingen.de*

The use of tools to reach an aim represents an extension of the problem-solution distance. While zebras simply bow their neck to feed on grass, chimpanzees are able to shift their focus for some time from the target (nut) to a tool (hammerstone) in order to satisfy a need (eating). Tool behavior can open up new 'resources' via extrasomatic

faculties associated to the tool-using subject; primates are especially versatile in using tools in several contexts. In human evolution, the inhibition of direct fulfillment of basic needs is markedly increasing. The first stone tools show an expansion of the problem-solution distance by using a tool (hammerstone) to produce a tool (flake) to reach an aim (cut off meat from a carcass e.g.). Tools were increasingly used as exchangeable modules in different problem-solution settings. Since the Middle Pleistocene tools were also combined with other tools to create new tool entities with new qualities (composite tools). Since the Late Pleistocene tools were interdependently developed as parts of complementary tool sets, and finally they were plated with notional concepts. The expansion of the problem-solution distance and the increase of complexity in tool behavior can systematically be analyzed by coding the processes of tool manufacture and use in cognigrams and effective chains. The approach allows the comparison of different aspects of complexity across all types of tools from various raw materials and across different species. It has been used to set up a model of the development of cultural capacities in the course of human evolution (Tübingen model).t.

ORAL

### 11. PATTERNS IN OBJECTS OR BEHAVIORS: TECHNOLOGICAL EVOLUTION IN THE EARLY STONE AGE OF THE KOOBI FORA FORMATION

*Braun, David R. (Center for the Advanced Study of Hominin Paleobiology George Washington University) david\_braun@gwu.edu*

*Harris, J. W. K. (Rutgers University) jwharris@rci.rutgers.edu*

The archaeological record of stone artifacts in the Paleolithic provides possibly one of the best preserved records of evolutionary mechanisms on human behaviors. Unfortunately we have little understanding of how to interpret the variation in these chipped stone tools through time. Other than the relatively coarse measures of shape variation in artifacts through time, we have very little information about the evolutionary significance of the variations in artifact manufacture. Models of evolutionary change in behavior have been suggested by Bettinger (2009) to indicate the mechanism through which these patterns of behavior are transmitted. We use his model of adaptive landscapes to investigate patterns of behavior through time to indicate the different trajectories of change for different types of behavior. We suggest that some

types of behavior (transport, movement) may be more informative than others (production, manufacture) for understanding adaptive changes in through the Early Stone Age. These patterns are particularly relevant as we increase our understanding of the finer scale variation in environmental influences on hominin behavior. We investigate these models using the rich Early Stone Age archaeological record from East Turkana from 2.1 to 1.4 million years ago.

ORAL

### 12. STONE ARTIFACT MOVEMENT, CURATION AND ASSEMBLAGE FORMATION

*Douglass, Matthew (UNL) matt.j.douglass@gmail.com*

*Lin, Sam (UPenn) samlin@sas.upenn.edu*

Variation in the movement of groups and individuals represents a fundamental means by which humans have adapted to the varied conditions of the world's habitats. Differences in the nature and extent of these movement patterns are driven by environmental, ecological, and social processes that act across multiple temporal and spatial scales. Past movement patterns, however, are difficult to observe directly from the archaeological record. Here we present ongoing research into the quantification of cortical surface area in stone artifact assemblages as an approach with which to link patterns in stone artifact assemblages to past patterns of human movement. Using archaeological and simulation data, this study provides key insights into the relationships between rates of artifact production, selection, and transport onto the formation of the lithic archaeological record. A key outcome of this study are the insights it provides onto the important interrelationship between the assemblage units archaeologists employ, the behavioral patterning these units present, and their representation of the broader suite of behaviors that transpired in the past.

ORAL

### 13. UNRAVELING THE INITIAL UPPER PALEOLITHIC

*Kuhn, Steven (University of Arizona) skuhn@email.arizona.edu*

*Zwyns, Nicolas (University of California, Davis) nicolas\_zwyns@eva.mpg.de*

Paleolithic "cultures" or culture complexes such as Acheulean or Aurignacian can be extraordinarily

widespread and persistent. Archaeologists have given relatively little attention to the processes that could lead to the dispersal and fixation of certain cultural traits across very large areas. Similarities in lithic technology are often presumed to track hominin dispersals. Similar outcomes could also be results of convergence in technological solutions, guided by the fracture mechanics of isotropic stone or responses to similar ecological challenges. The so-called Initial Upper Paleolithic (IUP) illustrates the methodological challenges of very broadly-distributed Paleolithic cultural phenomena.

Originally proposed to describe a small group of assemblages from the Levant, the term Initial Upper Paleolithic has subsequently been broadened to include any early Upper Paleolithic or transitional assemblage characterized by forms of blade production that combine elements of Levallois method (faceted platforms, hard hammer percussion, flat-faced cores) with features more typical of Upper Paleolithic blade technologies. Lithic assemblages conforming to this broader definition have been identified throughout most of Eurasia, from the southern Levant through central and eastern Europe to the Siberian Altai and Northwest China. Although some researchers believe the IUP tracks a major dispersal of *Homo sapiens*, we must be prepared to recognize that this global phenomenon could also be a consequence of technological convergence, with subsequent dispersal from multiple centers of origin. It is not disputed that lithic technologies from all of these areas exhibit similar features. However it is not self-evident that they represent a unified cultural phenomenon: in fact, a great deal of variability in forms of shaped tools and processes of débitage can be recognized among IUP assemblages.

Untangling the processes leading to very broad dispersal of lithic technological packages such as the IUP requires a more explicit differentiation between analogies (results of convergence) and homologies (results of common descent) in lithic assemblages.

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ORAL

#### 14. UNRAVELING THE INITIAL UPPER PALEOLITHIC

*Kuhn, Steven (University of Arizona) skuhn@email.arizona.edu*  
*Zwyns, Nicolas (University of California, Davis) nicolas\_zwyns@eva.mpg.de*

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widespread and persistent. Archaeologists have given relatively little attention to the processes that could lead to the dispersal and fixation of certain cultural traits across very large areas. Similarities in lithic technology are often presumed to track hominin dispersals. Similar outcomes could also be results of convergence in technological solutions, guided by the fracture mechanics of isotropic stone or responses to similar ecological challenges. The so-called Initial Upper Paleolithic (IUP) illustrates the methodological challenges of very broadly-distributed Paleolithic cultural phenomena.

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ORAL

#### 15. THE EARLY UPPER PALAEOOLITHIC OF THE MIDDLE DANUBE REGION: MODERN HUMAN DISPERSAL OR LOCAL EVOLUTION?

*Nigst, Philip R (University of Cambridge & Max-Planck-Institute for Evolutionary Anthropology) prn25@cam.ac.uk*

The Early Upper Palaeolithic (EUP) record throughout Europe is characterized by various changes in human behaviour. Different models explaining these changes

and the emergence of the EUP have been proposed over the past decades. The research presented here focuses on answering the question of whether the EUP changes in human behaviour are due to local evolution or diffusion processes. The applied approach is based on the methodology developed by Tostevin (2000, 2012) including an attribute analysis and the use of the individual steps in the knapping process as units of analysis. Building on Tostevin's work, knapping behaviours are compared between assemblages, but in an attempt to further develop Tostevin's approach the analysis is structured along the reduction sequence (Nigst 2012). Using such a methodology, the models of local evolution, diffusion, and stimulus diffusion are tested against the archaeological record of the Middle Danube region. The Middle Danube region was selected as a test case as it is located along one of the proposed dispersal routes of modern humans into Europe, shows variability of EUP technocomplexes (Bohunician, Szeletian, Aurignacian), provides a secure chronostratigraphic framework for the time period in question (appr. 45 to 30 ka BP) and a climatic context for the discussed assemblages. The results suggest the rejection of the local evolution model for the development of the Szeletian and the support of the model of early modern human dispersal into Europe as manifested by the Bohunician.

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ORAL

## **16. THE TRIANGULAR FLAKES FROM THE MIDDLE STONE AGE AT DIEPKLOOF (SOUTH AFRICA): INNOVATION, CONVERGENCES**

*Porraz, Guillaume (CNRS, IFAS / ESI, University of the Witwatersrand) guillaume.porraz@mae.u-paris10.fr*

Triangular flakes are one of the technological ideas that typified the Middle Paleolithic and the Middle Stone Age. They appeared and disappeared at different times and in different geographic contexts, mostly in association with Levallois reduction strategies, but not only. Here,

we present a new case study from the MSA of Diepkloof Rock Shelter (West Coast, South Africa). We identified an original and previously non-described reduction strategy dedicated toward the production of flakes of triangular morphology (called *accourcies* points). This reduction strategy documents an independent innovation and presently finds no equivalent outside of southern Africa. Though original, this technological manifestation echoes many other Stone Age contexts, and contributes to fuel discussion on innovations and convergence through time.

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ORAL

## **17. EVOLUTIONARY IMAGES OF AUSTRALIAN MICROLITHIC INDUSTRIES**

*Hiscock, Peter (University of Sydney)*

*peter.hiscock@sydney.edu.au*

*O'Brien, Michael (University of Missouri)*

*ObrienM@missouri.edu*

Australian microliths (backed artefacts) display a continental-wide variation in shape that has long been noted but which has not been systematically explored. We examine the proposition that this geographical variation reflects transmission history as microliths dispersed to different localities during the Holocene. Our dataset allows an initial testing/exploration of a phylogenetic signal in the lithic assemblages of Australia.

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ORAL

## **18. LITHIC EVIDENCE FOR THE COLONIZATION OF EURASIA AND OCEANIA BY MODERN HUMANS**

*Clarkson, Chris (University of Queensland)*

*c.clarkson@uq.edu.au*

*Collard, Mark (Simon Fraser University) mcollard@sfu.ca*

*Buchanan, Briggs (Simon Fraser University) briggsb@sfu.ca*

*Shipton, Ceri (University of Queensland) c.shipton@uq.edu.au*

Debates over the timing and routes of modern human dispersal out of Africa have relied primarily on fossil and genetic evidence. Here we employ tool-type richness and phylogenetic analyses of stone tool assemblages to test three competing models of modern human migration out of Africa to Eurasia and Oceania: 1) early out of Africa with Middle Stone Age technology model, 2) late out of Africa with microlithic technology model, and 3) late out of Africa with Middle Stone Age technology. Results of

the richness analysis indicate that the number of tool types declines with distance from Africa, as predicted by all three models. Results of the phylogenetic analyses are only consistent with the late out of Africa with Middle Stone Age technology model. Together, the analyses support the idea that modern humans dispersed out of Africa after 75kya with a Middle Stone Age technology lacking microlithic elements, and the notion that the Indian microlithic and European Aurignacian were later offshoots of the migrants' Middle Stone Age technology.

# B38 Advances in the dating of human dispersals, interactions and extinctions in the Palaeolithic

Organiser: Katerina Douka and Rachel Wood

Wednesday 3rd, (9:00-13:30)

Meeting Room A14



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XVII Congreso Mundial de UISPP

ORAL CONTRIBUTIONS

ORAL

**1. DATA FROM PLEISTOCENE OF SARDINIA (ITALY):  
THE PALEOLITHIC LANDSCAPE**

*Ginesu, Sergio (University) ginesu@uniss.it*  
*Carboni, Donatella (University) carbonid@uniss.it*

The particular condition of the Sardinia's landscape, produced by the prevailing erosive morphogenetic activity during all the Pleistocene, imposes the search of the pre-protolithic landscape a particular survey. Most geoarchaeologic researches use mainly land surface prospecting in order to identify archaeological features existing in a chosen area. These investigations will serve "natural" subjects as the territorial geography and geomorphology in attempt to reconstruct the paleoenvironment through the study of supply basins (two to five kilometers to the agricultural areas, and 10 kilometers to hunting and gathering areas). This geographic approach can be applied starting from the Neolithic into account the wide variation in the coastline that affected the whole Mediterranean sea, producing a great variation in Sardinia where the continental shelf is more extensive. The reconstruction of the paleolandscape becomes more difficult when you consider the study of the Paleolithic Age, particularly in the lower levels. It appears evident by the geomorphologic reconstructions performed in the northern Sardinia where the territory has changed faster, to become unrecognizable today.

Starting from literature data, in the island five sites attributed to the Lower Paleolithic are known, these are located in different spatial contexts. The sites were surveyed through the geomorphologic reconstruction and recognition of morpho-climatic erosion surfaces and Ar/Ar radiometric analysis on some lava flows. Among these, one has uncertain origin, another has a radiometric dating and the other ones are dated through the artefacts. The sites are located in abandoned river terraces, in the region Anglona (in northern Sardinia) as shown by the morphological reconstructions in this area where the river network still proceeds on the same Paleolithic system, although much more affected. The southern Sardinia site is located in a low terrace of the wide tectonic plain of Campidano; an important graben which has been affected by a subsidence (more than 100 meters?) during all the Pleistocene.

Two other sites are located in caves, the first, in which the presence of man is uncertain, is located in a moun-

tain area in the inner island; the second one documents the presence of man (archaic Neanderthal man?) by the presence of a bone (phalanx) and evidences of scarification in animal bones.

The geographical and geomorphologic reconstruction has allowed us to recognize, within these areas, the lower and middle Paleolithic surface referable to a period between 300,000 and 500,000 years B.P. These fossil erosion surfaces can be dated with stratigraphic precision thanks to the recent volcanic activities that affected some areas of northern and central eastern Sardinia from the end of Pliocene period (3 M.y.b.p.).

The geographical and geomorphologic method applied to the reconstruction of the background, surfaces and erosion terraces, in an area like Sardinia, allows to "follow" the traces of early human presence in the island's history through the archaeological prospecting targeted still preserved remains of the Paleolithic landscape.

ORAL

**2. CHRONOLOGY OF THE EARLY UPPER PALAEO-  
LITHIC SITE MARKINA GORA (KOSTENKI AREA,  
CENTRAL RUSSIA)**

*Haesaerts, Paul (Royal Belgian Institute of Natural Sciences, Brussels, Belgium) paul.haesaerts@naturalsciences.be*  
*Sinitsyn, Andrei (Institute for the History of the Material Culture, St.-Petersburg, Russia) sinitsyn@AS6238.spb.edu*  
*Douka, Katerina (Oxford Radiocarbon Accelerator Unit, Research Laboratory for Archaeology and the History of Art, University of Oxford) katerina.douka@rlaha.ox.ac.uk*  
*Hublin, Jean-Jacques (Department of Human Evolution, Max-Planck Institute for Evolutionary Anthropology, Leipzig) hublin@eva.mpg.de*  
*Nigst, Philip R (Division of Archaeology, Department of Archaeology and Anthropology, University of Cambridge, Cambridge, & Department of Human Evolution, Max-Planck Institute for Evolutionary Anthropology, Leipzig) prn25@cam.ac.uk*  
*Damblon, Freddy (Royal Belgian Institute of Natural Sciences, Brussels, Belgium) Freddy.Damblon@naturalsciences.be*  
*Higham, Tom (Oxford Radiocarbon Accelerator Unit, Research Laboratory for Archaeology and the History of Art, University of Oxford) thomas.higham@rlaha.ox.ac.uk*  
*Pirson, Stephane (Royal Belgian Institute of Natural Sciences, Brussels, Belgium, & Service Public de Wallonie DG04, Namur, Belgium) stephane.pirson@advalvos.be*  
*van der Plicht, Johannes (Centre for Isotope Research, University of Groningen, the Netherlands, & Faculty of Archaeology, Leiden University, the Netherlands) hjbruins@bgu.ac.il*

Located along the western slope of the Don Valley, south of Voronezh, the Upper Palaeolithic site of Markina Gora (Kostenki 14) provides one of the best documented Middle to Late Pleniglacial pedosedimentary successions in Central Russia. The record encompasses several cultural layers, from Gravettian to early Upper Palaeolithic, as well as two independently dated markers: the Campanian Ignimbrite (Y5) ash, related to an Aurignacian assemblage, and the Laschamp event recorded in between the cultural layers IVa and IVb (Sinitsyn, 1996; Velichko et al, 2009). The chronological background of the Markina Gora sequence is based on a long series of radiocarbon dates on charcoal ranging from 23 to ca 38 ka uncal BP (Haesaerts et al., 2004; Sinitsyn, Hoffecker, 2006) reinforced by paired dates produced in the Oxford laboratory, applying ABA and ABOx-SC pretreatment methods (e.g., Douka et al., 2010). Here we show how the conjunction of this record with that of the adjacent sites of Kostenki 1, Kostenki 12 and Kostenki 17, allowing the establishment of a high-resolution regional sequence. This in turn could be used as a key for long distance correlations between the Russian Plain, the East Carpathian Area, and the Middle Danube Basin, as well as with the Greenland Ice Record. This approach also represents a major contribution to the understanding of the development of a large set of Palaeolithic occurrences (including early Upper Palaeolithic, Spitznian, Gorodsovian, Stretleskian, Early Aurignacian and Gravettian) on a global scale.

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ORAL

### 3. RADIOCARBON DATING THE FINAL MOUSTERIAN OF EURASIA USING ADVANCED RADIOCARBON METHODS

Higham, Tom (Oxford University) [thomas.higham@rlaha.ox.ac.uk](mailto:thomas.higham@rlaha.ox.ac.uk)  
Douka, Katerina (Oxford University) [katerina.douka@rlaha.ox.ac.uk](mailto:katerina.douka@rlaha.ox.ac.uk)  
Wood, Rachel (ANU Canberra) [rachel.wood@anu.edu.au](mailto:rachel.wood@anu.edu.au)

To understand the disappearance of the Neanderthals, a reliable chronology is required. This has largely eluded

science thus far; despite many radiocarbon determinations being obtained from sites dating to the Middle to Upper Palaeolithic transition, our knowledge of the timing of this is opaque. The western European archaeological record constitutes the best evidence there is for the prehistoric replacement of one species of human by another, so deciphering the signals of this transition assumes importance in understanding what happened. For example, exploring the dates of the disappearance of Neanderthals and the arrival of modern humans might help us to understand the possibilities for overlap between the two groups, and therefore whether there was any genetic or genetic exchange between the two populations.

AMS dating material dating older than 30,000 BP is challenging, but work undertaken in Oxford over the last decade has improved the dating of material from this period. We have developed aspects of our pre-treatment chemistry, particularly the purification of bone collagen using ultrafiltration and in the dating of single amino acids from bone, as well quantifying our background limits and corrections.

We have dated over 400 samples of bone, shell and charcoal from more than 50 key Palaeolithic sites in 10 countries. The main focus has been on sites with a succession of contexts containing lithic industries attributed to the Mousterian, Châtelperronian (both seemingly associated with Neanderthals), Uluzzian (now thought to be anatomically modern humans (AMH)).

We used Bayesian age modelling to obtain robust probability distributions allowing us date Mousterian archaeological contexts. The data may be plotted spatio-temporally.

The results reveal patterns in the distribution of final Mousterian sites which may be significant in terms of examining the distribution of near contemporary AMH populations in the period 45-40 ka cal BP in Europe.

ORAL

### 4. PROCESSING TECHNOLOGY OF HARD ANIMAL MATERIALS IN THE UPPER PALEOLITHIC IN EASTERN SIBERIA (BASED ON MALTA-SITE).

Lbova, Liudmila (Institute of Archaeology and Ethnography SD RAS Novosibirsk, Russia) [lbovapnr5@gmail.com](mailto:lbovapnr5@gmail.com)

Malta is a main geo archaeological site of the Upper Paleolithic in Siberia (dated near 19-23 th. BP). Collec-



tion is represented by of more than 500 wide known decorated objects of ivory, horn and bone. A detailed technical-typology study of most part of the collection stored in the State Hermitage Museum (St. Petersburg) has allowed establishing the general steps processing technology ivory, horn and bone by Siberian Gravette.

The study was based on principals of morphological, technical and typological, use-wave analyzes and experiments. The collection include a sculpture of Man, birds, fish, etc. , ornamented plates, rods , personal ornaments. Microscopic analysis allows systematizing the process of shaping techniques, processing, and ornamentation Paleolithic sculptures by Malta. Also we propose defined stable sets of tools and techniques used to work with each of the selected morphological types Paleolithic sculpture.

We identified some manufacturing technologies of Primitive Art pieces, including flaking, drilling, carving, grinding, and polishing. A number of tools were employed for the manufacture of artifacts: hammer stones, retouches, bow-shaped drills, perforators, boring, different kind of burins and knives, reamers, engravers, grinding tablets and scrapers. Basic tools that were involved in forming - planer knives, variants of scrapers. When allocating the use of decorative elements noted burins and knives. Drilling holes and ornamental elements used bow-shaped drills, perforators, boring, different kind of burins. Cases polishing abrasive for solid surface have a single character, mostly marked trail use soft abrasives (eg, skin).

The early decorative complex, along with the evidence of symbolic behavior, with different kind of drilling with boring, reamer or perforated of hole with thinning body of initial form sets the early stage of the culture formation of Siberian Last Gravette period:

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#### ORAL

### 5. COSMOGENIC NUCLIDES: DATING PALEOLITHIC SITES OVER THE QUATERNARY.

*Lebatard, Anne-Elisabeth (CEREGE-CNRS) lebatard@cerege.fr  
Bourlès, Didier L. (CEREGE-AMU) bourles@cerege.fr*

Over the last 40 years, the development and improvements of the Accelerator Mass Spectrometry technique have allowed broadening the applications of the cosmo-

genic nuclides to a growing numbers of geoscience domains such as geomorphology, tectonics or paleoclimate.

Although the application of the most famous cosmogenic nuclide,  $^{14}\text{C}$ , to archaeological purposes is well established, that of the other potentially relevant (due to their half-lives) cosmogenic nuclides such as  $^{10}\text{Be}$  ( $T_{1/2} \sim 1.4$  Ma),  $^{26}\text{Al}$  ( $T_{1/2} \sim 0.7$  Ma) and  $^{36}\text{Cl}$  ( $T_{1/2} \sim 0.3$  Ma) to archaeological and paleoanthropological problematics emerges only in the last decade.

If the use of the dating method based on the atmospherically produced  $^{10}\text{Be}$  in continental environment is still in progress after its successful application in the peculiar desertic setting characterizing the fossiliferous area containing the *Sahelanthropus tchadensis* remains (Chad), the burial dating method based on the in situ-produced  $^{26}\text{Al}/^{10}\text{Be}$  ratio has been successfully applied to major sites in South Africa, Spain, and China. Lately, another dating method based on the in situ-produced  $^{36}\text{Cl}$  has been developed and applied to dating the closure by successive rockfalls of the Chauvet cave (France), evidencing then the Chauvet cave artwork was elaborated more than 21 ka ago and corroborating thus the conclusions drawn from the  $^{14}\text{C}$  dating.

The burial dating method is based on the differential radioactive decay of the  $^{26}\text{Al}$  and  $^{10}\text{Be}$  accumulated with a known production ratio within the quartz ( $\text{SiO}_2$ ) mineral fraction (in situ-production) of rocks exposed at the Earth's surface. Once buried below a thickness of matter large enough (few meters) to efficiently attenuate the cosmic ray flux and thus stop the production due to the cosmic ray derived particles, the accumulated cosmogenic nuclide concentrations start to radioactively decay according to their respective half-lives. Due to its shorter half-life, the  $^{26}\text{Al}$  concentrations decrease roughly twice as fast as the  $^{10}\text{Be}$  concentrations, which implies that the  $^{26}\text{Al}/^{10}\text{Be}$  ratio decreases exponentially with an apparent half-life of  $1.48 \pm 0.01$  Ma. This leads to a period of applicability comprised between 100 ka and  $\sim 5$  Ma.

At CEREGE which hosts the French National AMS Facility ASTER, among other geosciences domains, the applications of the cosmogenic nuclides to archaeometry are developed. The burial dating method was notably used to absolutely date the burial of lithic assemblages or paleoanthropological remains at  $\sim 1.4$  Ma at Dungo (Benguela, Angola), at  $\sim 1.5$  Ma at Attirampakkam (India), at  $\sim 450$  ka at Mansu-Ri and Wondang-Jangnamgyo (South Korea), at  $\sim 1.2$  Ma at Kocaba? (Denizli, Turkey) and studies at la Caune de l'Arago (Tautavel, France) are currently in progress. Altogether, these results provide

absolute chronological framework for the hominid evolution and migration steps.

ORAL

## 6. DATING THE MID UPPER PALAEOOLITHIC OF RUSSIA: PROBLEMS WITH THE RADIOCARBON CHRONOLOGY AND SOME POSSIBLE SOLUTIONS

*Reynolds, Natasha (University of Oxford) natasha.reynolds@arch.ox.ac.uk*

The construction of a reliable and detailed culture history for the Mid Upper Palaeolithic (MUP, ca. 34-24,000 years ago) of European Russia poses significant challenges. Despite the existence of a large number of published radiocarbon dates, the dating of individual assemblages is generally ambiguous. Alleviating this problem by obtaining more precise and accurate dates for each assemblage would make a significant contribution to building a better culture history for this region during the MUP and hence improve our understanding of Upper Palaeolithic cultural dynamics, with ramifications for many important current debates.

This presentation, based on recent research into the chronology and lithic industries of this time period, will demonstrate the current problems with the radiocarbon chronology, and suggest ways of improving the situation.

ORAL

## 7. THE DIACHRONOUS EEMIAN (LAST INTERGLACIAL) IN EUROPE.

*Sier, Mark J. (Utrecht University) marksier@gmail.com*  
*Peeters, Jan (Utrecht University) J.Peeters1@uu.nl*  
*Cohen, Kim (Utrecht University) K.M.Cohen@uu.nl*  
*Dekkers, Mark J. (Utrecht University) M.J.Dekkers@uu.nl*  
*Pares, Josep (Cenieh) josep.pares@cenieh.es*  
*Roebroeks, Wil (Leiden University) j.w.m.roebroeks@arch.leidenuniv.nl*

The Eemian, first defined by Harting in 1874 in the Netherlands, is the term for the terrestrial Last Interglacial in Europe. Extensive research has been devoted to this period from a wide range of disciplines. Archaeologists have an interest in this period as it contains the Last Interglacial presence of *Homo neanderthalensis* in Europe. Understanding the geographic and environmental range of this species, particularly the range limits, gives

important insights in their social and/ or technological abilities. Studying the North western European (including the Eemian typelocality in the Netherlands) Eemian helps to contribute to this understanding.

Here we present the combined results of research done at three Eemian sites, Neumark Nord 2 (Germany), Caours (France) and Rutten (Netherlands). Detailed palaeomagnetic and palaeoenvironmental studies were performed at these sites. In all three sites we identified a palaeomagnetic excursion which is the Blake Event. We used this Blake Event as a chronostratigraphic marker in order to compare our records with the well dated marine core MD952042 (of the Iberian coast). When comparing our results with this core we can conclude that the onset of Eemian was delayed by 5000 years in north western Europe with respect to southern Europe. This means that the onset of the Eemian in north western Europe is placed well after the Marine Isotope Stage 5e sealevel highstand. As a result no "dry path" towards Great Britain was available during this warm period, possibly explaining the absence of *Homo neanderthalensis* during this period.

ORAL

## 8. CONTINUITIES AND DISCONTINUITIES IN THE EAST EUROPEAN UPPER PALAEOOLITHIC: REFLECTIONS BASED ON THE KOSTENKI MODEL.

*Sinitsyn, Andrei (Inst.for the History of Material Culture. RAS) andrei.sinitsyn@gmail.com*

Kostenki group of Upper Palaeolithic sites includes 26 sites: 21 in Kostenki and 5 in Borshchevo. Ten of them are multilayer sites. For the moment we deal with remains of more than 50 settlements in good stratigraphic position divided by sterile sediments.

Two events of high chronological resolution were identified at the sections: level of the volcanic ash and Lashamp palaeomagnetic excursion. According to analytical studies at 80-th last century and at first decade of our century the volcanic ash was connected with eruption CI (Campanian Ignimbrite) of the Phlegrean Fields in South Italy and horizon Y5 of the Adriatic marine cores, the age now is regarded as 39-40 ka. In 2000 the cultural layer of Aurignacian attribution directly connected with volcanic ashes was identified at Markina gora (Kostenki 14). The age of Lashamp excursion is defined at ~ 41 ka. Two cultural layers at Kostenki 14 beneath them have to have a more ancient age: with radiocarbon dates of 36-37 ka nonCal (~ 39-41 kaCal) and IRSL-OSL frame of 42-46

ka. Current model of Kostenki' palaeolithic (Middle Don basin, Central Russia) based on stratigraphic evidences and series of nearly 300 radiocarbon dates is four partial:

- Initial Upper Palaeolithic stratum (42-40 cal ka BP) as an association of the Spitsyean and the cultural tradition of cultural layer IVb at Kostenki 14;

- Early Upper Palaeolithic (40-36 cal ka BP) showing the pan-European bimodal structure with the coexistence of the Aurignacian and "transitional" Streletskian;
- Early Middle Upper Palaeolithic (34-32 cal ka BP) connected with the appearance of the Gravettian, but in association with the Gorodtsovian – a particular East European cultural unity;
- Recent Middle Upper Palaeolithic (27-25 cal ka BP) as an association of a number of Gravettian varieties in coexistence with assemblages of non-Gravettian affiliation.

Sites of LGM are absent at the area according to this model and two chronological gaps are attested: between the EUP and early MUP (~34-35 cal ka BP), and between the early and recent MUP (31-28 cal ka BP).

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POSTER

POSTER

## 9. PALEOMAGNETIC ANALYSES OF THE NORTHERN MARGIN OF AÏN BÉNI MATHAR - GUÉFAIT BASIN (EASTERN MOROCCO)

*Álvarez Posada, Claudia (CENIEH, Burgos) claudia.alvarez@cenieh.es*

*Parés, Josep María (CENIEH, Burgos) josep.pares@cenieh.es*  
*Carrancho, Ángel (Universidad de Burgos, Burgos) acarrancho@ubu.es*

*Villalain, Juan José (Universidad de Burgos, Burgos) villa@ubu.es*  
*Aouraghe, Hassan (FSO, Univ. Mohamed 1er (Oujda, Morocco) aouraghe1@yahoo.fr*

*Haddoumi, Hamid (Laboratoires des Géosciences appliquées, Faculté des Sciences Université Mohamed premier, 60 000 Oujda) haddoumihamid@yahoo.fr*

*Hammouti, Kamal (UMR7194, MNHN (France) elhamkam@yahoo.fr*

*El Harradji, Abderrahman (FLSH, Univ. Mohamed 1er (Oujda, Morocco) elharradji@yahoo.fr*

*Sala, Robert (IPHES, URV (Tarragona, Spain) robert.sala@urv.cat*  
*Chacón, María Gema (UMR7194, MNHN (France) IPHES, URV (Tarragona, Spain) gchacon@iphes.cat*

Dating Pleistocene occupations in the Circum-Mediterranean region plays a key role in the study of human evolution, as it is critical to establish an accurate time framework for better understanding how, when and why the first human expansions occurred outside the African continent. In Eurasia this out of Africa expansion and colonization probably occurred through the Middle East and along several pulses (Aguirre and Carbonell, 2001; Allué et al., 2013; Bermúdez de Castro and Martínón-Torres, 2012; Carbonell et al., 2008; Toro-Moyano et al., 2013) as documented by sites such as Dmanisi, with an age of 1.7 to 1.8 Ma (Ferring et al., 2011; Lordkipanidze et al., 2007) or archaeological sites presents in the Circum-Mediterranean basin such as Atapuerca, Pirro Nord, Ubeidiya, among others (Parés et al., 2011) with ages between 0.8 and 1.4 Ma.

However, the chronology of deposits in North Africa such as Ain Hanech and E-Kerbha, shows that, the dispersal from Africa of genus Homo, began earlier than previously thought, possibly since the beginning of the lower Pleistocene (Sahnouni et al., 2010; Parés et al., 2014). In this sense, the chronology of Paleolithic archaeological sites in Morocco, such as in the basin of Aïn Béni Mathar (eastern Morocco), can be crucial to contextualize old human dispersal in Northern Africa. Sediments and terraces in the Aïn Béni Mathar area, in the basin of the same name, contain remains of both Acheulean (Mode II) and Oldowan (Mode I) stone tools that have been discovered in successive campaigns since 2006.

In attempt to provide a first chronological context for these archaeological sites in Eastern Morocco, we have collected samples from two different yet related areas within the basin for paleomagnetic dating. The first succession is found near to the town of Aïn Béni Mathar, where 50 samples were obtained along a sequence of about 80 meters and the second one, near to the town of Guéfait, with a sequence of approximately 120 meters with 110 specimens. Paleomagnetic analysis was carried out at both University of Burgos, and CENIEH, and all samples were demagnetized by stepwise progressive alternating field of thermal demagnetization to determine the characteristic remanent magnetization (ChRM) directions.

The paleomagnetic analysis of both sequences have resulted in a two local magnetic magnetostratigraphies, where both normal and reverse polarities are observed. Due to the lack of biostratigraphic data, a conclusive correlation of the local magnetostratigraphy to the Geomagnetic Polarity Time Scale (GPTS) is not possible, although we will discuss possible options, which are constrained by the presence of stone tools remains.

# B39 Paleanthropological debates on Human Evolution

Organiser: Ignacio Martínez, Rolf Quam & Carlos Lorenzo

Thursday 4th, (9:00-13:30)

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ORAL CONTRIBUTIONS

ORAL

## 1. ONE MILLION YEARS OF CULTURAL DENTAL WEAR AT ATAPUERCA SITES

Lozano Ruiz, Marina (IPHES-Tarragona, Spain) [mlozano@iphes.cat](mailto:mlozano@iphes.cat)

Bermúdez de Castro Risueño, José M<sup>a</sup> (CENIEH-Burgos, Spain) [jm.ber@cenieh.es](mailto:jm.ber@cenieh.es)

Arsuaga Ferreras, Juan Luis (Centro Mixto UCM-ISCIII de Evolución y Comportamiento Humanos-Madrid, Spain) [jlarsuaga@isciii.es](mailto:jlarsuaga@isciii.es)

Carbonell Roura, Eudald (IPHES-Tarragona, Spain) [ecarbonell@iphes.cat](mailto:ecarbonell@iphes.cat)

Cultural dental wear provides useful information about the use of teeth for non-alimentary purposes. Non-alimentary tasks are usually related to economical and cultural activities. The presence of cultural dental wear has been identified in three different *Homo* species from Sierra de Atapuerca sites.

The human remains analyzed in this study were recovered in four sites from Sierra de Atapuerca: Sima del Elefante, Gran Dolina-TD6, Sima de los Huesos and El Mirador. The chronology of these sites ranges from more than one million to 4,000 years ago. More than 500 teeth from 56 individuals belonging to three different species (*Homo antecessor*, *Homo heidelbergensis* and *Homo sapiens*) have been analyzed by means of electron scanning microscopy (SEM and ESEM). Dental wear features have been identified, measured and described to determine patterns of dental wear. These patterns can be related to specific activities.

Evidence of cultural dental wear has been documented in the three *Homo* species analyzed showing the use of teeth as a tool as far as one million years ago. However, each species shows specific typology and frequency of dental wear features. Also, the dental features are located in different dental surfaces and teeth indicating a diversity of activities carried out using teeth as a tool.

The use of teeth as a tool was a widespread habit in the genus *Homo*. However, each species carried out specific types of tasks involving the use of different dental surfaces and teeth. The diversity of dental wear patterns can be related to cultural and economical activities widening our knowledge of the behaviour of these hominins.

ORAL

## 2. THE MORPHOLOGY OF THE FOOT IN THE MIDDLE PLEISTOCENE POPULATION OF SIMA DE LOS HUESOS

Pablos, Adrián (Laboratorio de Evolución Humana, Universidad de Burgos. Centro mixto UCM-ISCIII de Investigación sobre Evolución y Comportamiento Humanos, Madrid. Centro Nacional de Investigación sobre Evolución Humana (CENIEH), Burgos) [adrizaino@yahoo.es](mailto:adrizaino@yahoo.es)

Martínez, Ignacio (Centro mixto UCM-ISCIII de Investigación sobre Evolución y Comportamiento Humanos, Madrid. Área de Paleontología, Departamento de Geografía y Medio Ambiente, Universidad de Alcalá.) [ignacio.martinezm@uah.es](mailto:ignacio.martinezm@uah.es)

Lorenzo, Carlos (Area de Prehistoria; Universitat Rovira i Virgili, Tarragona. IPHES, Institut Català de Paleoecologia Humana i Evolució Social, Tarragona. Centro mixto UCM-ISCIII de Investigación sobre Evolución y Comportamiento Humanos, Madrid.) [carlos.lorenzo@urv.cat](mailto:carlos.lorenzo@urv.cat)

Gracia-Téllez, Ana (Centro mixto UCM-ISCIII de Investigación sobre Evolución y Comportamiento Humanos, Madrid. Área de Paleontología, Departamento de Geografía y Medio Ambiente, Universidad de Alcalá.) [agracia@isciii.es](mailto:agracia@isciii.es)

Carretero, José Miguel (Laboratorio de Evolución Humana, Universidad de Burgos. Centro mixto UCM-ISCIII de Investigación sobre Evolución y Comportamiento Humanos, Madrid.) [jmcarre@ubu.es](mailto:jmcarre@ubu.es)

Arsuaga, Juan Luis (Centro mixto UCM-ISCIII de Investigación sobre Evolución y Comportamiento Humanos, Madrid. Departamento de Paleontología, Universidad Complutense de Madrid) [jlarsuaga@isciii.es](mailto:jlarsuaga@isciii.es)

The morphology of the human foot is closely related with locomotion and weight transmission. The preservation of *Homo* fossil foot remains previous to modern humans and Neandertals is very scarce throughout the fossil record. Previous studies have demonstrated that modern humans and Neandertal feet are similar in overall size and proportions and are indistinguishable in the implied locomotor capabilities. However, the robusticity and some metrical and morphological traits that characterize the Neandertal foot are different from that of modern humans. Due to the evolutionary and morphological relationship between Neandertals and the Sima de los Huesos (SH) sample, important information can be extracted from SH foot remains that is relevant to the understanding of the Neandertal foot evolution.

Among more than 6500 human fossils recovered so far in SH, around 500 belong to the foot. They represent approximately the 60% of the foot remains of the *Homo* fossil record prior to Neandertals and Early *Homo*

*sapiens*. This large collection offers an unprecedented opportunity to study the morphology of the foot in a population from the Middle Pleistocene, something that was not possible until the discovery and thorough excavation of the SH site. Here, we present a detailed metrical and morphological study of the foot remains from SH. The entire collection of foot remains from SH represents a minimum number of 16 individuals.

As a whole, the morphology of the foot from SH is similar to that of Neandertals and modern humans except for the robusticity of the fossils. However, this study provides further features that allow to distinguish SH hominins from modern humans. Both the SH hominins and the Neandertals display tali with short necks and broad lateral malleolar facets, broad calcanei with long bodies and projected sustentaculum tali, stout naviculars, short intermediate cuneiforms and robust metatarsals and phalanges. In addition, the SH tali show small heads that are different from the large ones typical of the Neandertal tali.

The morphological study of the foot bones from SH confirms the evolutionary relationship between this Middle Pleistocene population and the Neandertals. Nevertheless, some traits differentiate the SH hominins and Neandertal feet. These results are also in accordance with the proposed large corporal size for the SH population and its primitive biotype.

**Acknowledgments:** We are deeply grateful to SH excavation team and our colleagues from LEH-ISCIII. We are indebted to many people who have allowed access to some important skeletal collections. This research is funded by Junta de Castilla y León, Fundación Atapuerca, *Ministerio de Economía y Competitividad* of Spain (Project CGL2012-38434-C03-01 & 03), 2009-SGR-2009-324 project, and European Social Fund (*Fondo Social Europeo*). A.G.-T. has a Contract-Grant from the Ramón y Cajal Program, RYC-2010-06152. María Martín-Torres kindly helped with the preparation of the English manuscript

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ORAL

### 3. INVENTORY AND DESCRIPTION OF THE SACRAL REMAINS FROM THE MIDDLE PLEISTOCENE SIMA DE LOS HUESOS SITE (ATAPUERCA, SPAIN)

*Bonmati-Lasso, Alejandro (Centro UCM-ISCIII de Evolución y Comportamiento Humanos. Madrid, Spain / Dpto. de Paleontología. Facultad de Ciencias Geológicas. Universidad Complutense de Madrid, Spain) alejandrobmati@gmail.com*

*Arsuaga, Juan Luis (Centro UCM-ISCIII de Evolución y Comportamiento Humanos. Madrid, Spain / Dpto. de Paleontología. Facultad de Ciencias Geológicas. Universidad Complutense de Madrid, Spain) jlsuaga@isciii.es*

*Carretero, José Miguel (Laboratorio de Evolución Humana, Dpto. de Ciencias Históricas y Geografía, Universidad de Burgos, Spain) jmcarre@ubu.es*

*Martínez, Ignacio (Área de Paleontología. Dpto. de Geología, Geografía y Medio Ambiente. Universidad de Alcalá, Spain / Centro UCM-ISCIII de Evolución y Comportamiento Humanos. Madrid, Spain) ignacio.martinez@uah.es*

*Gracia, Ana (Área de Paleontología. Dpto. de Geología, Geografía y Medio Ambiente. Universidad de Alcalá, Spain / Centro UCM-ISCIII de Evolución y Comportamiento Humanos. Madrid, Spain) agraciatellez@gmail.com*

The sacrum is situated in the lower part of the vertebral column and transfers the body weight from the trunk to the pelvic girdle and as such plays a key role in the sagittal balance of the body. On the other hand, the sacrum forms the back part of the pelvic cavity and its study is important to understand the birth mechanism. This skeletal element is poorly represented in the human fossil record. Most of the fossil remains are fragmentary and only few specimens preserve significant portions to investigate the sacrum as a whole. In particular, a number of studies have concluded that Neandertal sacrum is essentially similar to that of modern humans.

The Sima de los Huesos site (SH) is located within a small chamber inside the Cueva Mayor karst system in the Sierra de Atapuerca (Spain). This cavity is partially filled with a fossil-bearing clay deposit that contains more than 6500 human remains from at least 28 individuals. This collection is presently dated to an age around 430 ka. These hominins have been considered phylogenetically related to Neandertals. Here, we present a complete inventory and a preliminary morphometric description of the sacral collection coming from the SH site. This is the most extensive assemblage of non-anatomically modern human fossil sacra coming from a single site.

Original fossils from SH have been studied. In addition to this collection, comparative fossil and modern human samples have been included. Data from the literature has also been taken into account. A set of metrical measurements were taken using standard callipers.

The fossil sacral collection from SH is composed of 39 specimens. All these specimens represent a minimum number of 10 individuals (MNI=10) with immature and adult individuals equally represented. There are complete

or fragmentary portions of five sacral elements (S1-S5) within this collection.

SH adult sacra are not significantly different from modern humans regarding the straight length of the complete sacrum and the sagittal diameter of the sacro-lumbar plate. In contrast, the sacral breadth and the transverse diameter of the sacro-lumbar plate of SH are significantly greater than those of modern human sacra. On the other hand, SH and Neandertal sacrum shows partial fusion and a similar morphology ("second promontory") of the S1-S2 suture whereas SH sacra are significantly broader than those of Neandertals.

Sacrum is badly preserved in the fossil human record. SH site provides valuable material to investigate the evolution of this skeletal region. Metrical and morphological analyses reveal differences between SH collection and modern human and Neandertal samples.

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#### ORAL

#### 4. SUBADULT HUMERII FROM SIMA DE LOS HUESOS SITE (SIERRA DE ATAPUERCA, SPAIN): PHYLOGENETIC AND ONTOGENETIC IMPLICATIONS IN GENUS HOMO.

*García-González, Rebeca (Laboratorio de Evolución Humana. Area de Paleontología. Universidad de Burgos) mr-garcia@ubu.es*

*Carretero, José Miguel (Laboratorio de Evolución Humana. Area de Paleontología. Universidad de Burgos. UCM-ISCIII Centro Mixto para el estudio de la Evolución y Comportamiento Humano), jmcarre@ubu.es*

*Rodríguez, Laura (Laboratorio de Evolución Humana. Area de Paleontología. Universidad de Burgos) lrodriguez@beca.ubu.es*

*Gracia-Téllez, Ana (Departamento de Paleontología de la Universidad de Alcalá. UCM-ISCIII Centro Mixto para el estudio de la Evolución y Comportamiento Humano.) agracia@isciii.es*

*Martínez, Ignacio (Departamento de Paleontología de la Universidad de Alcalá. UCM-ISCIII Centro Mixto para el estudio de la Evolución y Comportamiento Humano) ignacio.martinez@uah.es*

*Arsuaga, Juan Luis (UCM-ISCIII Centro Mixto para el estudio de la Evolución y Comportamiento Humano. Departamento de Paleontología. Universidad Complutense de Madrid.) jlarsuaga@isciii.es*

Humeral morphology has the potential to provide insights in terms of both, phylogenetic relationships and functional morphology. However, some traits used

for these purposes seem to be variable within the genus *Homo*, and thus it is difficult to understand their significance, either in phylogenetic or functional terms. In this sense, an ontogenetic approach can help to solve these questions. Unfortunately, there are not studies, as far as we know, about this specific topic, probably due to the scarcity of subadult humeral remains. Thereby, in Pre-Neandertal record there are three subadult humeri: Dmanisi D2715/ D26280, KNM-WT-15000 y ATD6-121; and even among the Neandertal there are five individuals.

Since 1976 more than 6000 human fossils have been recovered from Sima de los Huesos site (SH). Among these, over 72 represent juvenile humeri, belonging to a minimum number of seven individuals. Thus, this sample can be considered the most promising source of evidence for exploring the relationship between phylogeny and ontogeny. In order to carry out this goal, we analyzed the development of robusticity, mid-shaft shape and morphology of distal end in SH sample.

Development of robusticity was established through the relative growth trajectory of mid-shaft circumference and maximum length. In the case of mid-shaft shape, we considered the relative growth of medio-lateral and antero-posterior diameters at mid-shaft. To assess the changes of morphology of humeral distal end through the ontogeny, we established three different relative growth trajectories: (1) medial pillar thickness and olecranon fossa breadth, (2) medial pillar thickness and lateral pillar thickness, and (3) olecranon fossa breadth and distal metaphyseal breadth. For comparative purposes, these traits are, also, studied in two actual human samples, fossil anatomical modern humans, Neandertals, TD6 humeri and KNM-WT-15000.

Neandertals and SH hominins differ from those of modern humans in their growth of midshaft circumference relative to their maximum length. However, there are not differences among these human groups in the relative growth of both diameters at midshaft. The wide olecranon fossa and narrow pillars characteristic of both, Neandertals and SH hominins, are due to the slower growth of the medial pillar relative to both, olecranon fossa and lateral pillar.

Therefore, some distinctiveness humeral traits appear early in the ontogeny, while others are developing through the whole growth process.

Our findings are showing how the study of the ontogeny of humeral traits can be a clue for the correct

understanding and interpretation of the morphological variation that exists in the adult specimens of different species. Moreover, analogies and differences in the ontogeny can help to explore the most plausible developmental scenario for *Homo heidelbergensis* and its phylogenetic relationship to *H. neanderthalensis* and *H. sapiens*.

ORAL

## 5. PALEONEUROLOGY OF HOMO ERECTUS: ENDOCRANIAL VARIATION AND PROPORTIONS IN AFRICAN AND ASIAN SAMPLES

Bruner, Emiliano (Centro Nacional de Investigación sobre la Evolución Humana, Burgos (Spain) [emiliano.bruner@cenieh.es](mailto:emiliano.bruner@cenieh.es)

Grimaud-Hervé, Dominique (Muséum National d'Histoire Naturelle, Paris (France) [dgherve@mnhn.fr](mailto:dgherve@mnhn.fr)

Wu, Xiuji (Chinese Academy of Sciences, Beijing (China) [wuxiuji@ivpp.ac.cn](mailto:wuxiuji@ivpp.ac.cn)

Holloway, Ralph (Columbia University, New York (USA) [rlh2@columbia.edu](mailto:rlh2@columbia.edu)

There is still no agreement on the taxonomic and phylogenetic affinity between African, Chinese, and Indonesian specimens generally referred to as *Homo erectus sensu lato*. Apart from minor differences in brain size, no endocranial differences have consistently been described among these three groups. This study is aimed at evaluating differences in the endocranial proportions among these three geographical samples.

We compute a multivariate survey on a set of traditional metric variables commonly used in paleoneurology, to evaluate the degree and pattern of endocranial variation in the whole group. Principal component analysis and cluster analysis have been computed on arcs and diameters, to quantify possible differences and shared patterns of variability.

The three groups largely overlap in terms of morphological variation. The Indonesian sample displays a larger variation in terms of size, but more homogeneous proportions in terms of overall shape. However, group-specific differences cannot be tested statistically because of the small sample size. General morphometric affinity between specimens seems not influenced by geography.

Independently upon the taxonomic and phylogenetic status of these three groups, the endocranial proportions

cannot reveal patent differences in the overall brain form, at least taking into account the current available sample and the traditional endocranial diameters and curves. It remains to be evaluated whether or not discrete characters or shape analysis can reveal more localized or subtle differences between these three geographic groups.

ORAL

## 6. THE BRAIN OF HOMO HEIDELBERGENSIS AND HOMO NEANDERTHALENSIS

Grimaud-Hervé, Dominique (UMR 7194 - MNHN - Paris ) [dgherve@mnhn.fr](mailto:dgherve@mnhn.fr)

Balzeau, Antoine (UMR 7194 - MNHN - Paris) [abalzeau@mnhn.fr](mailto:abalzeau@mnhn.fr)

Détroit, Florent (UMR 7194 - MNHN - Paris) [fdetroit@mnhn.fr](mailto:fdetroit@mnhn.fr)

Paleoneurology is an important field in the study of hominin evolution and diversity and particularities such as variations in size and shape of the endocast help differentiate between hominin species. The aim of this study is to compare *Homo heidelbergensis* and *Homo neanderthalensis* based on endocranial form (i.e. size and shape) and morphology including middle meningeal vascular impressions in the context of evolutionary trends observed from the earliest *Homo heidelbergensis* to the latest *Homo neanderthalensis*.

To do so, a large sample is composed of hominin including european *Homo heidelbergensis* (Arago, Swanscombe, Reilingen, Biache-Saint-Vaast 1, Ehringsdorf H), western Europe *Homo neanderthalensis* (Saccopastore 1 and 2, Steinheim, Neandertal, Le Moustier 1, La Chapelle aux Saints 1, La Ferrassie 1, La Quina H5, Spy 1 and 10, Gibraltar 1) and extant modern humans.

The estimation of cranial capacity by direct method and the morphological description of encephalic structures and vascular imprints were performed. Also recorded were traditional linear measurements for 2D metric analysis and landmarks registered with a microscribe for 3D geometric morphometric analysis.

The morphological features joined to the 2D and 3D metrical results allow to highlight differences between these two hominin species.

Although the origin and evolution of european *Homo heidelbergensis* is still debated, the main features of the earliest one, which is Arago endocast, clearly align



it with specimens frequently assigned to this extinct species of genus *Homo*. The results clearly show the differences of the morphological features between *Homo heidelbergensis* and *Homo neanderthalensis*.

ORAL

### 7. THE KOCABA? FRAGMENTARY SKULL: A HOMINID IN TURKEY IN THE MIDDLE OF EURASIA BETWEEN 1,6 AND 1,2 MY. EVOLUTIONARY INFERENCES.

Vialet, Amélie (MNHN UMR7194) [vialet@mnhn.fr](mailto:vialet@mnhn.fr)  
Alcicek, Mehmet Cihat

In 2002, a fragmentary fossil hominid was discovered by Mehmet Cihat Alcicek in the Denizli Basin (locality of Kocaba?) in the south-west of Turkey. Recently, a multidisciplinary study combining cosmogenic nuclide concentration ( $^{26}\text{Al}/^{10}\text{Be}$ ) and paleomagnetic measurements with sedimentological observations provided an absolute chronological framework, bracketed between 1,2 and 1,6 My, for the Upper fossiliferous Travertine unit where the Kocaba? hominid was discovered. This date is confirmed by the large mammal assemblage, typical of the late Villafranchian, found in the same deposit.

The Kocaba? skull comprised three fragments belonging to the same individual (a young adult): a fragment of the right part of the frontal bone, the anterior half of the right parietal bone and two left frontal and parietal fragments still connected. A 3D reconstruction re-established the anatomical connection between the three cranial remains. A morphological and metrical study was carried out comparing the Kocaba? skull with the other Pleistocene specimens from Africa, Asia and Europe, focusing on the frontal bone which is almost complete on the reconstructed Turkish fossil.

Results show that the Kocaba? hominid belongs to the *Homo erectus* s.l. group that includes Chinese and African fossils, and is different from Middle and Upper Pleistocene specimens. However, the proportions (shared with the African *Homo erectus*) of the short and large Kocaba? frontal bone (without the supraorbital torus) differentiate it from Asian *Homo erectus*, which present a longer frontal squama.

Settled outside Africa, at the crossroad of Eurasia, this Turkish fossil contributes to bridging a palaeoanthropological gap around 1,2 - 1,6 My contributing to the dis-

cussion about the origins of *Homo antecessor* to the west and *Homo erectus* s.s. to the east.

ORAL

### 8. A CLADISTIC METHODOLOGICAL PROTOCOL TO TEST EVOLUTIONARY SCENARIOS WITH APPLICATION TO HOMO HEIDELBERGENSIS

Caparros, Miguel (Muséum National d'Histoire Naturelle, Département de Préhistoire, Paris.) [capmig@aol.com](mailto:capmig@aol.com)  
Mounier, Aurélien (The Leverhulme Centre for human Evolutionary Studies, Department of Archaeology and Anthropology, University of Cambridge.) [aurelien.mounier@gmail.com](mailto:aurelien.mounier@gmail.com)

Most of the proposed evolutionary diagnostic scenarios in human evolution are based on comparative morphology analyses or phenetics.

Because of individual variation among fossils and often times confusion concerning the recognition of morphological character diagnosis, many authors who advocate taking into account overall similarity tend to disagree among themselves when it comes to defining paleospecies of the genus *Homo*.

Phenetic methods do not allow the recognition of homologies to identify taxa and are based on general numerical similarity between specimens. Although they are classification tools, they cannot handle character based phylogenetic hypotheses and thus should not be considered as phylogenetic reconstruction methods. The results of phenetic analyses summarized in a clustering dendrogram do not provide the supporting evidence related to character states at the nodes which define the morphotypes of common hypothetical ancestors of terminal taxa.

The only method for species / taxa recognition is to identify well-defined morphological assemblages on the basis of several apomorphies in a pragmatic Hennigian cladistics framework. The aims of cladistics is to find the sequential order in which morphological novelties (homologies) appear in populations and to ascertain what the hypothetical ancestors of these populations at the nodes look like. This approach is rarely used in palaeoanthropology.

Wiley (1981) recommended that the identification of homologies must be organised in two stages. The first one, primary homology based on conjecture of

similarity, deals with the identification of homologous characters by using morphological criteria (de Pinna, 1991). In a second stage these homologies are tested phylogenetically by the principle of parsimony, and discovered *a posteriori* as secondary homologues, i.e. synapomorphies (homologies *sensu stricto*) or homoplasies (non-homologies *sensu stricto*).

We present here a cladistic methodological protocol that draws on prior research (Caparros, 1997) and essentially expands the second stage by parsimony analysis conducted in three conceptual steps. The first step is a low-level analysis (discovery of the information content of characters), the second step is a high-level analysis (cladistic analysis after reweighting of characters) and the final step is the character state optimization for identification of the morphology of the hypothetical ancestors at the nodes of the cladogram. The second step, the high-level analysis (cladistic analysis after reweighting of characters), and the final step, character state optimization, are simultaneous. We illustrate this protocol by testing two different scenarios that have been proposed to explain the Middle Pleistocene fossil record (Mounier, 2009): *Homo heidelbergensis sensu stricto* and *Homo heidelbergensis sensu lato*. We show that none of these two scenarios is validated by our cladistic protocol analysis.

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ORAL

## 9. ELLIPTIC FOURIER ANALYSIS OF MANDIBULAR SYMPHYSEAL OUTLINE: DIFFERENCES BETWEEN MODERN HUMANS, NEANDERTHALS AND MIDDLE PLEISTOCENE HOMININS

Arnaud, Julie (Università degli Studi di Ferrara) [julie.arnaud@unife.it](mailto:julie.arnaud@unife.it)

Détroit, Florent (MNHN) [fdetroit@mnhn.fr](mailto:fdetroit@mnhn.fr)

Grimaud-Hervé, Dominique (MNHN) [dgherve@mnhn.fr](mailto:dgherve@mnhn.fr)

Peretto, Carlo (Università degli Studi di Ferrara) [carlo.peretto@unife.it](mailto:carlo.peretto@unife.it)

Morphological and morphometric study on human mandibular remains have highlighted significant inter and intra individual variability in modern humans but also in Neanderthals and Middle Pleistocene hominins. It appears necessary to develop new methodological approaches to quantify and analyse specific mandibular area in order to find accurate discriminative traits in these human groups.

In this work, we propose a study based on Elliptic Fourier

Analysis (EFA) to analyse shape variations of mandibular symphysis outlines and to distinguish specific morphotypes in the European human groups.

This general analytical framework involves 144 mandibles of adult and juvenile individuals belonging to three different taxonomic groups of the genus *Homo*.

For this particular study we focused on adult specimens only, with balanced sub-samples of 19 *Homo sapiens* and 19 *Homo neanderthalensis*, as well as the best preserved Middle Pleistocene hominin mandibles (n=6).

Symphysis outlines were digitized on 3D models of the specimens realized with a NextEngine laser scanner. Each outline includes three anatomical landmarks (*Infradentale*, intersection of the digastric fossae and *Infradentale posterior*) and 41 semi-landmarks. Raw coordinates in 3D were transformed in 2D data (through a dimensionality reduction procedure) before applying EFA. Fourier descriptors (harmonics) derived from EFA were used in multivariate analyses: Principal Component Analysis and Linear Discriminant Analysis (PCA and LDA). The efficiency of this methodological approach to discriminate the different taxonomic groups was tested with a leave-one-out cross-validation procedure for calculating the percentage of misclassified specimens in each group by the discriminant functions.

The results show a high reliability of this method, with 93% of correct classifications after cross validation. Multivariate analyses (PCA and LDA) applied on the Fourier descriptors of the mandibular symphysis outlines allowed to discriminate correctly the three taxonomic groups taking into consideration. The major shape variation corresponds to the shape and magnitude of the mental projection, which discriminates clearly modern humans from Neanderthals/Middle Pleistocene hominins. Secondary variations are although highlighted on the internal face of the symphysis, especially on the expression of structures (presence/absence of the transverse torus). Shape differences are also found between Neanderthals and Middle Pleistocene hominins, with a slightly more receding symphyseal profile in the latter group.

ORAL

**10. SIZE AND MECHANICAL CORRELATION AMONG BONES: AN ATTEMPT TO ASSOCIATE ISOLATED BONES**

Rodriguez, Laura (*Laboratorio de Evolución Humana. Area de Paleontología. Universidad de Burgos*) lrodriguez@beca.ubu.es

Carretero, Jose Miguel (*Laboratorio de Evolución Humana. Area de Paleontología. Universidad de Burgos, y UCM-ISCIII Centro Mixto para el estudio de la Evolución y Comportamiento Humanos*) jmcarre@ubu.es

García-Gonzalez, Rebeca (*Laboratorio de Evolución Humana. Area de Paleontología. Universidad de Burgos*) mr-garcia@ubu.es

Martinez, Ignacio (*Departamento de Paleontología de la Universidad de Alcalá, y UCM-ISCIII Centro Mixto para el estudio de la Evolución y Comportamiento Humanos*) ignacio.martinez@uah.es

Gracia, Ana (*Departamento de Paleontología de la Universidad de Alcalá, y UCM-ISCIII Centro Mixto para el estudio de la Evolución y Comportamiento Humanos*) agracia@isciii.es

Arsuaga, Juan Luis (*Departamento de Paleontología. Universidad Complutense de Madrid y UCM-ISCIII Centro Mixto para el estudio de la Evolución y Comportamiento Humano*) jlarsuaga@isciii.es

When a mass grave is discovered there should be a big quantity of bones from different individuals which are mixed or/and without any clear anatomical position. Because the main goal in every Physical and Forensic Anthropology and Archaeological studies is to characterize the population biological profile, one of the first steps in all the cases is to try to establish a minimum number of individual (MNI) which of them are males and which females, the age at dead, and of course, and to try associate bones belonging to the same individual to be able to determine body proportions. So, the founding of mixed and isolated bones of different individuals is one of the biggest problems to be solved.

Until now, systematic search by symmetry and articular congruence was the main way to try to define an individual, but in here we will try to add a new tool for this, the diaphyseal cross-section geometric properties of the bones.

We use several modern human samples (N=150) and a Neandertal sample (N=9) to check the use of the new proposed technic to other potential populations and/or species. Correlation in joint size measurements in contiguous bones and bone length in parallel ones are

used for eliminate the most unprovable association of couple of bones, and then the correlation of geometric properties at 50% level for all bones (except in the humerus in which we use the 35% level) is used only in those most probable pairs.

Sliding caliper and osteometric board for articular and length measurements as well as computer tomography, Mimics software and Autocad are used to extract and calculate the mechanical parameters.

It can be said, that correlation coefficients between joints in the same individual are high enough to, at least, eliminate some bone couples which are unable to belong to the same individual. Geometric properties are indeed the best approach to associate bones with r values around 0.9 in most cases. In this work we are showing that Neandertals look to follow the same trend than modern humans.

This methodical combination is a powerful tool in order to associate isolated bones, and as in Neandertals is also valid, we are opening here a new way for associating bones in other hominin samples.

ORAL

**11. CONSERVATION OF A NEANDERTAL MAXILLA FROM COVA FORADÀ (OLIVA, VALÈNCIA, SPAIN)**

Gómez-Merino, Gala ( *IPHES, Institut Català de Paleoecologia Humana i Evolució Social (IPHES), 43007, Tarragona, Spain. /Àrea de Prehistoria, Universitat Rovira i Virgili (URV), 43002, Tarragona, Spain.*) ggomez.merino@iphes.cat

Aparicio, José (*Real Acadèmia de Cultura Valenciana. c/ Avellanes 26. 46003, Valencia, Spain.*) joapa2005@hotmail.com

Subirà, Eulàlia (*GRAPAC Unitat d'Antropologia Biològica, Facultat de Biociències, Universitat Autònoma de Barcelona. 08193 Bellaterra, Barcelona, Spain. / MINOA Arqueologia i Serveis S.L. I+D. Camí Antic de Sant Cugat 145. 08193, Bellaterra, Barcelona, Spain.*) eulalia.subira@uab.cat

Lozano, Marina ( *IPHES, Institut Català de Paleoecologia Humana i Evolució Social (IPHES), 43007, Tarragona, Spain. /Àrea de Prehistoria, Universitat Rovira i Virgili (URV), 43002, Tarragona, Spain.*) mlozano@iphes.cat

Lorenzo, Carlos (*Àrea de Prehistoria, Universitat Rovira i Virgili (URV), 43002, Tarragona, Spain. / IPHES, Institut Català de Paleoecologia Humana i Evolució Social (IPHES), 43007, Tarragona, Spain.*) carlos.lorenzo@urv.cat

Cova Foradà is a cave located near Oliva village (Valencia, Spain) in south-eastern of Iberian Peninsula and close

to Mediterranean coast. Inside the cave there is a site with archaeological levels from Upper Pleistocene to Holocene (including Mesolithic and Bronze Age levels). In 2000 a Neandertal maxilla and other human remains were discovered in the Mousterian levels associated to abundant lithic tools and fauna remains. The maxilla was a Neandertal maxilla covered with a hard layer of sediment which difficult to study the morphology and anatomy of the fossil, its surface and to take measures on it. In 2010 the maxilla and the other human fossils were transported to the Conservation Laboratory at Institut Català de Paleoecologia Humana i Evolució Social to clean the remains and to perform a new paleoanthropological study. In this report we describe the preservation works on the maxilla and the conservation processes carried out.

We have applied different non-destructive techniques to analyze the composition of the bone and concretions before and after the cleaning treatment to conduct a better preservation of the fossil. We have avoided the use of chemical products to prevent the contamination of the fossil. With the same objective of preserving all information of the fossil without the introduction of chemical products on the bone, we have used three dimensional technologies to record the morphology of the maxilla. First of all the maxilla was 3D scanned (with CT and with a surface scanner), we perform a reconstructed version of the maxilla by symmetry, we reproduce these virtual reconstructions with a 3D printer and finally it was casted. At last, we have designed a method to preserve the fossil in the best conditions.

POSTER

POSTER

## 12. ENDOCRANIAL VASCULAR TRACES AND PALEOANTHROPOLOGY

*Písová, Hana (Charles University in Prague, National Museum in Prague) hana.pisova@natur.cuni.cz*

*de la Cuetara, José Manuel (Universidad Autónoma de Madrid) jm.delacuetara@gmail.com*

*Velemínský, Petr (National Museum in Prague) petr\_veleminsky@nm.cz*

*Bruner, Emiliano (Centro Nacional de Investigación sobre la Evolución Humana) emiliano.bruner@cenieh.es*

The traces left on the endocranial surface by arteries and veins can supply evidence on physiological processes associated with brain biology in fossil hominids. Morphological differences in these networks and

consequent thermoregulation patterns can support inferences on brain evolution and metabolism. Despite the relevance of these topics, issues associated with selective brain cooling in humans remain largely elusive. Digital anatomy currently provides tools and methods to investigate these traits in modern and fossil samples, and computed modeling allows reliable methods to evaluate anatomical changes and differences according to the principles of functional craniology and integration. These same characters and methods have also relevance in forensic anthropology, archaeology, and medicine.

In this study, we used cranial samples of anatomically modern humans from different historical periods (early medieval, late medieval and modern age) to evaluate bias and limits associated with the anatomical reconstruction and evaluation of vascular traits from bone remains. In particular, we focused on those traits generally considered in paleoanthropology, like middle meningeal vessel imprints, foramina/tunnels of emissary veins, traces of venous sinuses and other structures which can be scored and measured from bone and computed tomography. Vascular features were visually assessed from the semiautomatic backface projected CT reconstructions, and then compared with physical specimens when available. The endocranial area of physical specimens was also approached with digital endoscope.

The digital analyses were able to show intrasosseous connections of various venous channels that cannot be inferred by exclusive inspection of the ecto- and endocranial surfaces. Besides reconstructions of multiple mastoid emissary foramina, the mastoid tunnel transferring occipital artery and vein in the close proximity of mastoid emissary foramen was frequently present. This passage for occipital artery was easily confused with mastoid foramen and in several cases the tunnel was reconnected with mastoid emissary foramen and/or sigmoid sinus groove. Other traits such as imprints of middle meningeal vessels showed frequent presence of tunnels above lesser sphenoid wing hardly traceable with endoscopic examination. Moreover, middle meningeal vessels in the area of sphenoparietal sinus produced numerous reconstructions with diploic system.

This preliminary survey showed a complex intrinsic vascular network, especially in the area above mastoids, where digital anatomy proved to be necessary to make any further interpretation of the external vascular

characters. The analysis of the inner vascular network is then mandatory when dealing with paleoanthropological hypothesis, for which the study of the ectocranial traits alone is not sufficient and can be even misleading.

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POSTER

**13. COMPUTED TOMOGRAPHY, DIPLOIC VESSELS, AND HUMAN EVOLUTION: A PRELIMINARY COMPARISON IN PHYSICAL AND DIGITAL SPECIMENS.**

*Rangel de Lázaro, Gizéh (Universitat Rovira i Virgili) gizrandel@gmail.com*

*de la Cuétara, José Manuel (Universidad Autónoma de Madrid) jm.delacuetara@gmail.com*

*Lorenzo Merino, Carlos (Universitat Rovira i Virgili. Institut Català de Paleoecologia Humana i Evolució Social.) carlos.lorenzo@urv.cat*

*Bruner, Emiliano (Centro Nacional de Investigación sobre la Evolución Humana) emiliano.bruner@cenieh.es*

The diploic channels were identified in mammals over 200 years ago, and subsequently described in humans by Gilbert Breschet in 1829. However, diploic veins are scarcely considered in current anatomical studies. This vascular network appears to be more developed in humans than in non-human primates, which suggests this topic may be relevant in evolutionary biology. Diploic vessels grow in the spongy tissue between the cranial tables (internal and external), mostly within frontal and parietal bones, with large veins connected through a complex network of microscopic channels. The vessels are valvesless. Quantitative studies on diploic channels in extinct human species can supply information on vascular evolution and endocranial thermoregulation, specifically brain cooling. The aim of this study is to determine the application of computed tomography (CT) in digital analysis of diploic vascular system in human anatomy and paleoanthropology.

We analyze potentiality and limits of CT to evidence and reconstruct diploic channels in modern and fossil specimens. A first modern sample included 10 physical skulls CT scanned at high resolution (pixel size and slice thickness 0.25 mm). Physical specimens were checked by transillumination and their digital replica by computed imaging. Transillumination equipment was performed with two Cool-White LEDs, of 1500 lumens each. Predominant wavelengths were 450 nm and 600 nm, with a minimum peak at 490 nm and correlated color temperature was in the range of 5000-8300 K. A second modern sample included 10 digital skulls

scanned at medium resolution (pixel size and slice thickness between 0.30 and 0.40 mm). We considered CT scans from three Neanderthal skulls: Saccopastore 1, Spy 1, and Spy 2. Digital imaging was computed by using Mimics 10.01 and Image JA 1.45b. One skulls of each sample was analyzed in high, medium and low resolution, to evaluate the effect of different degree of resolution on diploic channels visualization.

In the current physical sample (mean vault thickness =  $5.2 \pm 1.1$  mm) transillumination is not able to reveal the presence or patterns of diploic network, giving only minor information on the imprints of middle meningeal vessels.

To achieve 3D reconstruction of diploic veins without the diploe noise interference we created a specific protocol to filter the original CT images. Most channels are observed with pixel size and slice thickness at 0.25 mm, at this resolution 3D reconstruction is partially confused because of the noise introduced by spongy tissue. At lower resolution only the largest channels can be recognized.

Transillumination is not an informative method to investigate diploic channels in physical samples. The protocol used for treating CT images with digital software was successful for perform anatomical surveys in modern and fossil human remains, providing an important tool to investigate the evolution of cranial vascular networks in extinct human species.

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POSTER

**14. AN ONTOGENETIC PERSPECTIVE ON CRANIAL BASE VARIATIONS IN EXTANT HOMINOIDEA AND FOSSIL HOMININS**

*Profico, Antonio (Dipartimento di Biologia Ambientale, Sapienza University of Rome, Italy) antonio.profico@uniroma1.it*

*Di Vincenzo, Fabio (Dipartimento di Biologia Ambientale, Sapienza University of Rome, Italy) fabio.divincenzo@uniroma1.it*

*Piras, Paolo (Center for Evolutionary Ecology, Rome, Italy) paolo.piras@uniroma3.it*

*Manzi, Giorgio (Dipartimento di Biologia Ambientale, Sapienza University of Rome, Italy) giorgio.manzi@uniroma1.it*

Several studies on cranial base morphology deal with basicranial flexion, mainly in relationship with cranio/facial size and shape (Bastir et al., 2010; Bastir et al., 2011). On the opposite, our aim is to test to what extent basicranial morphology is related to functional and/or

ontogenetic patterns. In particular, we are interested in the evaluation of factors that may have influenced the cranial base morphology in Plio-Pleistocene Hominins.

We used a configuration of 17 landmarks distributed on cranial base; the sample includes 131 specimens belonging to *Homo*, *Australopithecus*, *Paranthropus*, *Pan*, *Gorilla*, and *Pongo*; the age at death was assessed by patterns of teeth eruption.

The landmark set has been transformed into shape coordinates by Generalized Procrustes Analysis (GPA) and the variance-covariance matrix was explored through Principal Component Analysis (PCA). Shape predictions for extant species were performed via separate regressions of the PC scores on centroid size (CS) in order to display the respective pattern of growth within the different OTUs. A quantification of phylogenetic signal (Adams & Otárola-Castillo, 2013) has been carried out on GPA-aligned coordinates on an adult sample.

When the first two principal components (49,41 % of total variance) are considered together, two clusters are clearly recognizable: *Pongo*, *Gorilla*, and *Pan*, share a common growth pattern of cranial base variation, while modern humans and fossil Hominins show a distinct pattern of change with analogous ontogenetic polarity. In the morpho-space Australopithecids and early-*Homo* specimens seem to be closer to *Homo* spp. than to great Apes cluster.

Shape variations accounts for relative changes in basioccipital and foramen magnum dimensions along the PC1 and for variation in the basioccipital flexion along the PC2. This different pattern appears more related to functional demand (posture/locomotion) than to phylogeny, the phylogenetic signal explaining the 21% of total shape variability (p-value = 0.00398; iterations = 1000).

The regression on CS performed on extant species shows that all trajectories are in ontogeny. The allometric trajectories of *Gorilla* and *Pan* diverge from *Homo* while are parallel each other.

For what concerns our evolutionary lineage and great Apes, these results indicate that main factors driving differences in cranial base morphology are primarily in relation to function and ontogeny. Further research will focus on other anatomical features that may have influenced morphological variation of the skull base present in the Hominoidea.

# B40

## Cleaning up a messy Moustertian: how to describe and interpret Late Middle Palaeolithic chrono-cultural variability in Atlantic Europe

Organiser: J.Ph. Faivre, M. Frouin, A. Turq and E. Discamps

Tuesday 2nd, (14:30-19:30)  
Meeting Room B27



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ORAL CONTRIBUTION

ORAL

**1. REFLECTIONS ON THE CHRONOCULTURAL VARIABILITY OF THE LATE MIDDLE PALAEOLOGIC OF WESTERN EUROPE TURQ, ALAIN (MNP) ALAIN. TURQ@CULTURE.GOUV;FR**

*Ashton, Nick (British museum) nashton@thebritishmuseum.ac.uk*  
*Soressi, Marie (Leiden University) m.a.soressi@arch.leidenuniv.nl*  
*Roebroeks, Wil (Leiden University)*  
*j.w.m.roebroeks@arch.leidenuniv.nl*

The western part of Europe is a key area for the study of late Middle Palaeolithic (MIS 5-3) adaptations, as a result of a variety of factors, including its latitudinal extension (from Portugal to Wales), its diversity of ecosystems and its long research history, which has made it into a densely sampled region. Over the last three decades, our knowledge of the Late Pleistocene geomorphology of the area has increased significantly, with solid data regarding changes in land-sea distribution, the chronological and spatial distribution of permafrost phenomena and of the deposition of a wide range of aeolian sediments. Detailed archaeological studies of the chronology, technology and typology and of lithic assemblages retrieved from Pleistocene sediments have afforded us with a detailed picture of the presence and absence of Neandertals here, with a degree of resolution enabling us to reflect on the chrono-cultural variability of the last Neandertals on the basis of a large data set.

From a historical perspective, this diversity was mainly demonstrated using methods developed by Francois Bordes. As a result of its heavy typological focus, this approach was applied foremost in regions with caves and rockshelters, i.e. in karstic areas, where the numbers and percentages of retouched tools are as a rule much higher than in the open air sites of the north. There, the dominance of rescue excavations of large – and often : well-preserved - open air sites has favoured the development of studies with a strong emphasis on technological aspects of Middle Palaeolithic assemblages.

A first phase of critical reflection on the Bordes method has led to the identification of a few technocomplexes (TCL) which seem to follow each other in chronological order in the archaeological sequences of the Perigord area: TCL Levallois, TCL Quina and a TCL with denticulates. We consider it important to continue this critical revision by discussing criteria for various TCL's with colleagues working in western Europe at large. This will en-

able us to reflect on the key questions at stake in studies of the late Middle Palaeolithic such as the significance of both the autonomy and the co-existence of various ways of producing blanks in the TCLs ? What is the role of faconnage in TCLs ? Which TCL's are present in this geographical area, how are they distributed in time and space, and how to interpret the chronological relationships between the TCLs of the northwest and the southwest of Europe ? And in more general terms, is it possible to obtain data on the (cultural, environmental ?) factors which may be steering these techno-economic systems ? We will present a few case studies, taken from the area at stake here, to illustrate the relevance of these issues for studies of the late Middle Palaeolithic.

ORAL

**2. LA FIN DU PALÉOLITHIQUE MOYEN EN EUROPE DU NORD-OUEST - END OF MIDDLE PALAEOLOGIC IN NW EUROPE DEPAEPE, PASCAL (INRAP) PASCAL. DEPAEPE@INRAP.FR**

*Di Modica, Kevin (Centre archéologique de la grotte Scladina) kevin\_dimodica@yahoo.fr*  
*Richter, Jürgen (Universität zu Köln ) al002@uni-koeln.de*

Ces dernières années ont vu un renouveau important dans les études sur le Paléolithique moyen dans le Nord-Ouest de l'Europe. D'une part, de nombreuses fouilles, pour une grande partie préventives, ont enrichi le corpus. D'autre part, des collections issues de fouilles anciennes ont fait l'objet de réexamens critiques fournissant de nouvelles informations. Enfin, les approches chronostratigraphiques ont été précisées et les datations radiométriques se sont multipliées, autorisant ainsi un positionnement affiné des sites dans la chronologie absolue. Ces éléments permettent un nouveau regard sur la fin du Paléolithique moyen (MIS 4-3) dans une région aux biotopes variés et très sensibles aux variations climatiques. Seront particulièrement abordés les problèmes de mouvements des populations (nord-sud, est-ouest) au travers des influences culturelles, ainsi que le statut de cette région : carrefour ou cul-de-sac.

ORAL



### 3. TIME SCALE AND CULTURAL COMPONENT IN RECENT MIDDLE PALAEO-LITHIC IN NORTHERN FRANCE GOVAL, EMILIE (UMR7194, INRAP) EMILIE.GOVAL@INRAP.FR

*Locht, JeanLuc (UMR8591, Inrap) jean-luc.locht@inrap.fr*  
*Hérisson, David (UMR7194, Inrap) davidherisson@yahoo.fr*  
*Antoine, Pierre (UMR8591) pierre.antoine@cnrs-bellevue.fr*  
*Coutard, Sylvie (UMR8591, Inrap) sylvie.coutard@inrap.fr*  
*Auguste, Patrick (UMR8217) Patrick.Auguste(at)univ-lille1.fr.*  
*Paris, Clément (Inrap) clement.paris@inrap.fr*

In northern France, the Upper Pleistocene is characterized by discontinuous human presence, closely linked to climatic variations. Human groups were mainly present during the Eemian interglacial and the beginning of the Weichselian (Early-glacial), as well as during the Late glacial, in close correlation with variations in large mammal populations. In addition, during the Upper Pleistocene, climatic erosion phases linked to rapid climatic events modified raw material access, which partly impacted lithic production modalities. However, the influence of cultural traditions remains important, for both lithic production and subsistence strategies.

The excavation of numerous Late Middle Palaeolithic sites over the last twenty years has provided invaluable chronological and environmental information on Upper Pleistocene human occupation contexts in northern France, mainly in loessic context. This study is based on data from 45 excavated archaeological levels, representing a total surface of about 54 000 m<sup>2</sup>, combined with a unique pedostratigraphic reference frame for European Upper Pleistocene. A total of ~ 62 000 artefacts have been unearthed in these levels.

From a chronological viewpoint, five of these levels are contemporary with the Eemian interglacial (MIS 5e), seven are attributed to MIS 5c, 10 to MIS 5a (temperate continental forest / grey forested soils) and 8 others, to the end of MIS 5a (steppe soils). Lastly, 13 others are contemporary with the end of the Lower Pleniglacial (MIS 4) or Middle Pleniglacial (~ MIS 3).

This significant database has enabled us to analyze interactions between climatic fluctuations, responsible for palaeoenvironmental modifications, and prehistoric occupations, focusing on four main themes: occupation density, raw materials, lithic industries and faunal remains.

ORAL

### 3 BIS. THE MIDDLE PALAEO-LITHIC SITES OF KESSELT-OP DE SCHANS (BELGIUM), MAASTRICHT-BELVÉDÈRE (THE NETHERLANDS) AND VELDWEZELT-HEZERWATER (BELGIUM) PROVIDE AN EXCEPTIONAL RECORD OF NEANDERTHAL OCCUPATION DURING THE LATE-MIDDLE AND THE LATE PLEISTOCENE OF NORTHWESTERN EUROPE.

*Bringmans, Patrick M.M.A. (The 'Veldwezelt-Hezerwater' Neanderthal Research Centre - Belgium) Patrick.Bringmans@hotmail.com*  
*de Warrimont, Jean-Pierre (Archeologische Vereniging Limburg - The Netherlands) warrimont@archeogeolab.nl*  
*Meijs, Erik P.M. (ArcheoGeoLab Maastricht - The Netherlands) Meijs@archeogeolab.nl*

The interstratified loess–soil sequences in the Provinces of Belgian and Dutch Limburg reveal a continuous record of palaeo-climatic variations during the late-Middle and Late Pleistocene. The most detailed stratigraphic information comes from remarkable exposures on the left side of the Meuse Valley. These impressive loess–soil sequences represent the last five glacial–interglacial cycles. The study of these loess-soil sequences yielded at least 17 different archaeological levels.

The investigation of these very detailed loess-soil sequences opens unseen possibilities to extend temporal and spatial correlations regionally and across the European loess belt.

At Kesselt-Op de Schans five archaeological levels were found (2007–2008). Level 1 could be dated to around 85 ky BP (in situ). Level 2 is reworked and probably 200 ky old. Level 3 could be dated to 280 ky BP. Level 4, which can be dated around 390 ky BP, is reworked, just as Level 5, which could be dated to around 480 ky BP. Level 5 and 4 comprised only a few non-Levallois artefacts, a retouched blade, sidescrapers with bifacial retouch and bifacial points. At Level 3, four small Levallois knapping spots (ODS 1, 2, 3 & 4) were excavated. A few centripetal Levallois cores, small flakes, larger Levallois flakes and a few side-scrapers were also excavated. At Level 1 and 2 there were also Levallois products present.

The Maastricht-Belvédère pit has been the object of archaeological investigation between 1980 and 1990. Two separate interglacial periods within MIS 7 (ca. 250 ky BP) were present. The oldest archaeological find horizon IV-B (Sites: B, C & G) is part of the interglacial MIS 7.5, while the archaeological find horizon IV-C (Sites: A, D, F, H, K, & N) is

part of the younger interglacial MIS 7.3. Most of the excavated Middle Palaeolithic artefacts belong to Levallois core reduction sequences. A large 'Micoquian' handaxe was found in a small channel, which could be dated to MIS 6.

The Veldwezelt-Hezerwater site is the most important of these three localities. There, the successive archaeological excavation campaigns (1998-2003) provided important new data of at least seven separate Middle Palaeolithic settlements. At Veldwezelt-Hezerwater, Levallois products have been found at the VLB Site (MIS 6.01), the VBLB Site (MIS 5a), the TL Site (MIS 3) and the WFL Site (MIS 3). At the VLL Site and the VLB Site (both MIS 6.01), blades and small tools were produced. Oversized tools, which are tools that are exceptionally big relative to the rest of the lithic toolkit, have been found at the TL Site (MIS 3) and the WFL Site (MIS 3). Quina tools have been excavated at the TL Site and the WFL Site at Veldwezelt-Hezerwater.

The simultaneous presence of several 'discrete' core reduction strategies (e.g., Levallois, blade, prismatic & opportunistic) and tool reduction strategies (e.g., Mousterian, Quina) shows that the Neanderthals did make use of more than one core or tool reduction strategy at a time. At Veldwezelt-Hezerwater, this phenomenon is probably a direct consequence of the flint knappers working with different sizes and qualities of lithic raw materials.

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ORAL

#### **4. LES TECHNO-COMPLEXES DU PALÉOLITHIQUE MOYEN RÉCENT EN FRANCE MÉDITERRANÉENNE : UN PREMIER BILAN PLUS DE QUARANTE ANS APRÈS LES DERNIÈRES SYNTHÈSES RÉGIONALES**

*Lebègue, Frédéric (UMR 7194 M.N.H.N / U.P.V.D) fred.leb-  
egue@gmail.com*

*Wengler, Luc (UMR 7194 M.N.H.N / U.P.V.D) wengler@univ-perp.fr*

Dans son ouvrage de 1971, intitulé le Paléolithique inférieur et moyen du Midi Méditerranéen dans son cadre géologique, H. de Lumley suggère l'existence d'une multiplicité de faciès typologique du Moustérien, tout en pointant certaines variantes et particularités régionales. Mais quoi de neuf depuis ?

L'apport documentaire des fouilles menées dans les années 80-90, mais aussi, et surtout, le renouvellement méthodologique dans l'étude des ensembles lithiques (archéo-pétrographie, technologie, techno-économie) rendent aujourd'hui possible une autre perception du

Paléolithique moyen dans le Sud-est de la France. Le ré-examen en cours des principales collections régionales, basé sur l'analyse des systèmes techniques et économiques ainsi que sur leur interprétation en termes de mobilité et d'entité techno-culturelles, conduit à revoir la classification chrono-culturelle proposée voici plus de 40 ans.

Les résultats obtenus ces dix dernières années en domaine méditerranéen mettent ainsi en évidence une certaine « originalité », tant dans la diversité que dans l'organisation archéo-stratigraphique des systèmes techniques, qui contraste avec les observations faites dans d'autres régions, en particulier le Sud-ouest de la France. L'importante diversification des systèmes de production et des techno-complexes (Quina, Discoïde à denticulé, MTA, Levallois), qui caractérise la phase récente du Paléolithique moyen d'Aquitaine, ne se retrouve pas en Méditerranée. Au contraire, une certaine homogénéité se dégage au niveau des « traditions techniques », avec l'emploi massif du débitage Levallois récurrent centripète au sein des ensembles lithiques des stades isotopiques 4 à 3, peu importe le contexte lithologique ou le type d'occupation. Les systèmes Discoïde et Quina, très fréquents à la même époque dans le Sud-Ouest, sont ici peu voire pas représentés. Le Moustérien de tradition acheuléenne, et plus largement le système bifacial, sont également absents.

Ces traits techniques du Midi-Méditerranéen, qui se conjuguent avec une permanence dans l'organisation du territoire (gîtes exploités, formes de circulation des matériaux, etc.), traduisent non seulement un cadre, mais aussi une dynamique culturelle propre à la zone méditerranéenne.

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ORAL

#### **5. CHRONOLOGIE DES OCCUPATIONS DU PALÉOLITHIQUE MOYEN DU BASSIN AQUITAIN: VERS UN NOUVEAU BILAN**

*Lahaye, Christelle (IRAMAT-CRP2A UMR5060) christelle.lahaye@u-bordeaux-montaigne.fr*

*Frouin, Marine (IRAMAT-CRP2A UMR506) marine.frouin@u-bordeaux-montaigne.fr*

*Guérin, Guillaume (IRAMAT-CRP2A UMR5060) gguerin@u-bordeaux-montaigne.fr*

*Faivre, Jean-Philippe (PACEA UMR5199) jp.faivre@pacea.u-bordeaux1.fr*

*Turq, Alain (Musée National de Préhistoire) alain.turq@culture.gouv.fr*

*Lebrun, Brice (IRAMAT-CRP2A UMR5060) brice.lebrun01@gmail.com*

*Gravina, Brad (PACEA UMR5199) gravina.brad@gmail.com*

*Bourguignon, Laurence (INRAP) laurence.bourguignon@inrap.fr*

*Discamps, Emmanuel (Université de Bergen et PACEA UMR5199) ediscamps@gmail.com*

*Mercier, Norbert (IRAMAT-CRP2A UMR5060) norbert.mercier@u-bordeaux-montaigne.fr*

*Maureille, Bruno (PACEA UMR5199) b.maureille@pacea.u-bordeaux1.fr*

*Jaubert, Jacques (PACEA UMR5199) j.jaubert@pacea.u-bordeaux1.fr*

*Guibert, Pierre (IRAMAT-CRP2A UMR5060) pierre.guibert@u-bordeaux-montaigne.fr*

Dès le début du XIX<sup>ème</sup> siècle et les prémices de la Préhistoire, le Bassin aquitain a constitué un territoire privilégié pour l'étude du Paléolithique moyen, notamment en raison de la richesse et de l'abondance des gisements qui s'y rapportent. L'un des enjeux récurrents au cours du temps fut la compréhension de la variabilité des traditions techno-culturelles qui composent l'entité moustérienne, qu'il s'agisse de réelles différences profondes ou de nuances plus ténues.

Depuis plusieurs décennies, de nombreuses études ont été conduites au gré de la disponibilité des matériaux datables et des évolutions méthodologiques en géochronologie. Une première synthèse, fortement ancrée dans l'interdisciplinarité, fut établie à partir de l'examen critique des données chronologiques acquises plus ou moins anciennement et en tenant compte de la représentativité des datations effectuées par rapport aux faits archéologiques étudiés (Guibert et al. 2008). Depuis ces travaux de nombreux sites, inédits ou connus, ont été étudiés ou ré-étudiés, bénéficiant ainsi des progrès méthodologiques importants qui ont été réalisés dans le domaine des datations paléodosimétriques (Guérin et al. 2012, par exemple).

Nous proposons ici un nouveau bilan critique des données chronologiques du Paléolithique moyen aquitain, pour tenter de dépasser la vision binaire interrogeant la possibilité de « contemporanéités ou successions » des Techno-complexes moustériens, tout en questionnant la réalité des ensembles anciennement définis. Il s'agit donc avant tout d'établir une synthèse des connaissances actuelles afin de proposer une chronologie objective des grands systèmes de production lithique (Levallois, Quina, Discoïde, ...), intégrant des considérations techno-économiques plus avancées pour tendre vers une vision plus fine. Le but de cette révision est de renouveler le registre de données chronologiques rela-

tives à l'émergence, au développement et au remplacement des différentes traditions techno-culturelles moustériennes.

## POSTERS

### POSTER

#### **5 BIS. FURTHER ELEMENTS ON THE CHRONOLOGY OF THE ROC DE MARSAL (SW FRANCE) MIDDLE PALAEOOLITHIC SEQUENCE: INSIGHTS FROM QUARTZ SINGLE GRAIN OSL AND VARIOUS K-FELDSPAR IRSL SIGNALS**

*Guérin, Guillaume (CNRS - Université Bordeaux Montaigne, UMR 5060, IRAMAT-CRP2A, Maison de l'archéologie, Esplanade des Antilles, 33607 Pessac cedex, France) guillaume.guerin@u-bordeaux-montaigne.fr*

*Frouin, Marine (CNRS - Université Bordeaux Montaigne, UMR 5060, IRAMAT-CRP2A, Maison de l'archéologie, Esplanade des Antilles, 33607 Pessac cedex, France) marine.frouin@u-bordeaux-montaigne.fr*

*Lahaye, Christelle (CNRS - Université Bordeaux Montaigne, UMR 5060, IRAMAT-CRP2A, Maison de l'archéologie, Esplanade des Antilles, 33607 Pessac cedex, France) christelle.lahaye@u-bordeaux-montaigne.fr*

*Norbert Mercier (CNRS - Université Bordeaux Montaigne, UMR 5060, IRAMAT-CRP2A, Maison de l'archéologie, Esplanade des Antilles, 33607 Pessac cedex, France) mercier.norbert@u-bordeaux-montaigne.fr*

*Goldberg, Paul (Department of Archaeology, Boston University, Boston, USA) paulberg@bu.edu.*

*Aldeias, Vera (Department of Human Evolution, Max Planck Institute for Evolutionary Anthropology, Leipzig, Germany.) vera\_aldeias@eva.mpg.de*

*Turq, Alain (CNRS, Univ. Bordeaux, MCC, PACEA, UMR 5199, F-33400 Talence, France) alain.turq@culture.gouv.fr*

*Dibble, Harold (Department of Anthropology, University of Pennsylvania, Philadelphia, USA.) hdibble@sas.upenn.edu*

*Shannon McPherron (Department of Human Evolution, Max Planck Institute for Evolutionary Anthropology, Leipzig, Germany.) mcpherro@eva.mpg.de*

*Sandgathe, Dennis (Human Evolution Studies Program and Department of Archaeology, Simon Fraser University, Burnaby, Canada.) agc6@sfu.ca*

The Roc de Marsal is a small cave located on a cliff close to the Vézères River, in the Dordogne region of France. It is famous for the discovery of the well preserved skeleton of a Neanderthal child [1]. Recent excavations focused on the Middle Paleolithic occupation layers, and revealed very rich deposits in terms of both lithics and

fauna. Geoarchaeology shed new light on the processes of sediment deposition and allowed discussing the intentionality of the 'burial' of the Neanderthal child [2]. Combustion features were also uncovered in a very good state at the base of the sequence [3].

In a previous attempt to date the Mousterian occupations of Roc de Marsal [4], TL on heated flints and sedimentary quartz, as well as multi-grain OSL on fine grained quartz extracts from both heated and unheated sediment samples were studied. This original study revealed a systematic discrepancy between OSL and TL ages, and the authors concluded that multi-grain OSL results from fine grain quartz could not be trusted because of small scale dose rate heterogeneities and/or incomplete OSL signal resetting of fine grain quartz, possibly due to roof spall contamination.

To resolve this discrepancy and further constrain the chronology of the sequence (in particular, Quina layers at the top of the sequence remained poorly dated because of the scarcity of heated flint samples), coarse grain quartz and potassium-rich feldspar extracts have been studied using, respectively, single grain OSL and various IRSL signals.

These luminescence signals, because they provide complementary information, are expected to shed more light on the chrono-stratigraphy of Roc de Marsal. In particular, OSL and IRSL signals have different sensitivities to sunlight exposure: thus, their comparison allows identifying luminescence signals resetting problems at the time of sediment deposition, and help constrain single grain OSL analysis. The OSL from eight samples has been measured; in all cases, the OSL signal is dominated by the fast component. However, the proportion of grains emitting detectable OSL greatly varies between samples: whereas ~30-40 % of the grains sampled from combustion features (n=3) are usable for OSL dating, only ~5-10 % of the grains from unheated sediment samples (n=5) show an uncertainty on the test dose (~25 Gy) response of less than 20 %. Multi-grain post-IR IRSL signals at elevated temperature (225 °C) and IRSL signals at 50 °C have been measured and corrected for fading; they indicate that the OSL signals from all samples were fully reset before subsequent sediment deposition.

Statistical analysis of measured OSL data is performed using a newly developed Bayesian central age model [5].

New ages, both from IRSL and single grain OSL signals, will be presented and discussed, and an overall chronological scenario will be proposed.

ORAL

## 6. AN INTEGRATED APPROACH TO THE PALEOENVIRONMENTAL SETTINGS OF MOUSTERIAN HUNTERS IN SOUTHWESTERN FRANCE: COMBINING DATA FROM LARGE AND SMALL FAUNA COMMUNITIES

*Discamps, Emmanuel (University of Bergen, AHKR & Université de Bordeaux, PACEA) ediscamps@gmail.com*

*Royer, Aurélien (Université de Bordeaux, PACEA) aurelien\_royer@hotmail.com*

From MIS 5 to 3, Western Europe was subject to important climatic changes that affected the environments inhabited by past human societies. As a result, environmental changes have often been considered as a key factor in explaining the cultural and biological histories of Middle Paleolithic hunter-gatherers, as well as potentially underlying the technological variability of Mousterian lithic industries.

For the southwestern part of France, pollen analyses from deep-sea cores have well documented the evolution of floral communities and suggested that global climatic fluctuations influenced the evolution of terrestrial ecosystems. However, the exact impact of climatic changes on terrestrial ecosystems at local and regional scales is still poorly documented. Such changes certainly shaped the environments used by Neandertals, by constantly redefining the floral and faunal resources available to them.

Here, we present the first results of ongoing interdisciplinary research aimed at reconstructing the paleoenvironmental settings of Neandertal societies in southwestern France, through the exploitation of a regional GIS. This technique allows us to combine contextual information (site locations, stratigraphic sequences, cultural attributions, absolute dates), with climate and environmental data from different continental sources (archaeological and paleontological sites) and proxies (herbivore populations, small vertebrates communities and isotopic compositions). The patterns identified are then compared with pollen analyses of deep-sea cores. Chronological correlations of the different records are achieved by Bayesian modeling, a type of statistical analyses that integrates both absolute dates and stratigraphic constraints. A critical assessment of this dataset highlights the pros and cons of the different proxies.

In the end, it can be shown that global climate changes did not have the same impact on terrestrial ecosystems depending on geographical regions, even at such a small

scale. The results obtained emphasize the need of detailed, regional-scale, paleoenvironmental analyses of faunal communities in order to discuss human - environment interactions. Moreover, our integrated approach of large and small fauna communities allows estimating to what degree changes in subsistence strategies were influenced by changes in prey availability. We then discuss how much the diversity of Mousterian techno-complexes could be explained by Neandertal technological and behavioral adaptation to different types of environments.

ORAL

## 7. RÉVISION DES MODÈLES D'ORGANISATION TECHNO-ÉCONOMIQUES DES SOCIÉTÉS DU PALÉOLITHIQUE MOYEN RÉCENT DANS LE NORD-EST AQUITAIN

*Faivre, Jean-Philippe (UMR 5199 PACEA) jp.faivre@pacea.u-bordeaux1.fr*

*Bourguignon, Laurence (INRAP) laurence.bourguignon@inrap.fr*

*Turq, Alain (MNP) alain.turq@culture.gouv.fr*

*Jaubert, Jacques (UMR 5199 PACEA) jjaubert@pacea.u-bordeaux1.fr*

Le renouvellement des études sur le Paléolithique moyen récent permet, aujourd'hui, de percevoir différemment la variabilité des techno-complexes lithiques moustériens dans le nord-est du Bassin aquitain. Cette situation s'illustre notamment au travers de l'étude conjointe des savoir-faire techniques et des activités de subsistance s.l (e.g. modalités d'acquisition et / ou de gestion des ressources animales et minérales), démarche décisive dans l'appréhension des espaces parcourus et occupés par les groupes moustériens (e.g. Binford 1979 ; Kelly 1983 et 1988 ; Bamforth 1986 ; Kuhn 1992, 1995 ; Andrefsky 2009 ; Delagnes et Rendu 2011). Parallèlement aux travaux portant sur la géographie et la chronologie des systèmes de production (Levallois, Quina, Discoïde, ...), cadres majeurs et structurants des techno-complexes lithiques, il convient aujourd'hui de préciser les modèles d'organisation techno-économiques développés à partir de ses savoir-faire techniques afin, in fine, de réviser les stratégies de mobilité qu'ils sous-tendent.

ORAL

## 8. LES TECHNO-COMPLEXES LITHIQUES DU PALÉOLITHIQUE MOYEN RÉCENT (MISS5-3) DU NORD-EST AQUITAIN : ÉTAT DE LA QUESTION

*Turq, Alain (MNP) alain.turq@culture.gouv.fr*

*Bourguignon, Laurence (INRAP) laurence.bourguignon@inrap.fr*

*Faivre, Jean-Philippe (UMR 5199 PACEA) jp.faivre@pacea.u-bordeaux1.fr*

*Gravina, Brad (UMR 5199 PACEA) gravina.brad@gmail.com*

*Discamps, Emmanuel (AHKR Institute, University of Bergen) ediscamps@gmail.com*

*Soressi, Marie (Leiden University) m.a.soressi@arch.leidenuniv.nl*

*Jaubert, Jacques (UMR 5199 PACEA) jjaubert@pacea.u-bordeaux1.fr*

Le nord-est du Bassin aquitain est riche de plusieurs espaces géographiques (Charentes, Périgord, Bergeracois, Agenais, Quercy) constituant des territoires singuliers de par la densité des enregistrements archéologiques et les données lithologiques qui leurs sont propres. Pour chaque techno-complexe lithique (TCL) moustérien, ces données lithologiques mettent en relation certains territoires.

Ainsi, un ensemble cohérent s'organise autour du Périgord noir et de ses archéo-séquences, à partir desquelles ont été largement définis les faciès "bordiers" et, plus récemment, les TCL paléolithiques moyen (ACRs Aquitain et Quercy).

Dans le cadre de cette communication, nous proposons une révision des critères de définition des TCL excluant largement ceux retenus par F. Bordes dans la définition de ses faciès, et privilégiant, comme cadre structurant, les systèmes de production lithique (Levallois, Discoïde, Quina, ...). À partir de ce cadre, les données techno-économiques révéleront la dynamique relative à la mobilité des populations porteuses de ces savoir-faire. Une nouvelle grille de lecture, systémique, structurera l'ensemble de ces données.

Une approche renouvelée des archéo-séquences ainsi sélectionnées (selon un enregistrement diachronique et selon un degré d'intégrité fiable) au sein de ce territoire sera proposée à partir de cette grille de lecture.

ORAL

## 9. SOURCES OF VARIABILITY IN LATE MIDDLE PALEOLITHIC LITHIC TECHNOLOGY IN EASTERN CANTABRIAN REGION

*Rios-Garaizar, Joseba (CENIEH) joseba.rios@cenieh.es*

In the last decades the Late Middle Paleolithic (LMP) of Cantabrian Region has been thoroughly investigated from a technological perspective, resulting in a significant increase of the information available for synthetic approaches (among others: Carrión et al 2008, Maillo 2005, Sánchez-Fernández and Bernaldo de Quirós 2008, Rios-Garaizar 2008). One of the major features of this period in this region is the high degree of variability than can be observed in settlement strategies, raw material provisioning, lithic tool production and use. Precisely, in Eastern Cantabrian Region, the information available from sites like Axló, Amalda, Arrillor or Lezetxiki evidences this variability. Different technological strategies can be observed through time, for example in Axló Levallois based technologies are substituted by Quina, but also the use of different technological strategies can be observed inside the same assemblage, as happens in Amalda level VII (Rios-Garaizar 2010). We can see also subtle differences in the way the same technological strategy is applied, as has been observed between Quina technology levels in Axló (Rios-Garaizar 2005).

In this scenario the environmental transformations played an important role creating the conditions which Neanderthal populations adapted to, but the process of choosing and applying different technological solutions seems to rely more on cultural traditions and socio-economic organization. For example the process of ramified Levallois production is not a simple response to raw material scarcity, but a solution for new productive necessities (Rios-Garaizar et al. submitted). We are going to explore the possibilities of inferring changes in social organization as the source of this variability between Lithic Techno-Complexes from LMP in the Eastern Cantabrian Region.

ORAL

## 9 BIS. MESS AT THE END. THE LATE MOUSTERIAN IN NORTH AND NORTH-EAST IBERIA: CUEVA DEL ESQUILLEU (CANTABRIA, SPAIN) AND TEIXONERES CAVE (BARCELONA, SPAIN)

*Chacón, María Gema (IPHES, URV (Tarragona, Spain) gchacon@iphes.cat*

*Baena, Javier (UAM, Department of Prehistory (Madrid, Spain) javier.baena@uam.es*

*Carrión, Elena (Ministerio de Cultura (Madrid, Spain) elena.carrion@mecd.es*

*Torres, Concepción (UAM, Department of Prehistory (Madrid, Spain) conxi\_@hotmail.com*

*Rosell, Jordi (IPHES, URV (Tarragona, Spain) jordi.rosell@urv.cat*

*Blasco, Ruth (Gibraltar Museum (Gibraltar) rblascolopez@gmail.com*

*Rivals, Florent (ICREA (Barcelona, Spain) frivals@iphes.cat*

The Iberian Peninsula is an important region for the study of the final evolution of Mousterian communities on European scale. This region presents very important sites that provide a great quantity of information to address the socio-economic variability of last Neanderthal groups. Heterogeneity and complexity of Mousterian groups seems to show a variety of responses that include both adaptive processes, like other characterized for changes in the patterns of exploitation of the environment and ecological alternative occupation.

In this paper we present the data about the lithic techno-complexes from Esquilleu Cave (Santander, Spain) and Teixoneres Cave (Barcelona, Spain). These sites are located in two different geographical areas where the traditional interpretation of the Late Mousterian propose different technical behaviors between the Cantabrian and Mediterranean Neanderthals groups, and in this way different subsistence adaptive answers.

The cultural attribution of some lithic assemblages, especially when they show knapping strategies with little specializations as is the case of discoid production schemes, could be ambiguous and confusing. This is further complicated if we add the temporal coexistence with non expedite knapping methods as Levallois or Quina. The Esquilleu cave has a very well-known archaeological sequence that provides essential data to understand the Late Mousterian at the Iberian Peninsula. More than 41 stratigraphical levels with 34 with late Mousterian occupation provide a recent regional chrono-cultural sequence with particular changes. From periods with wide presence of Quina and Levallois knapping schemas to

the late and speed changes of the controverted discoid unit (levels VI-III), the whole sequence demonstrates during the MIS3 the existence of particular adaptations to the mountainous Picos de Europa context.

Teixoneres Cave (Barcelona, Spain) excavated since 2007 has also provided a significant archaeological record belonging to the Late Pleistocene (MIS 3). Level III (that focus this paper) corresponds to a palimpsest alternating human and carnivorous activities. The recent results of the techno-complexe studies show technological patterns similar to these from late Middle Paleolithic Levels from Esquilieu with a mix use of Levallois and discoidal methods, the last one essentially on quartz with production orientated to obtain pseudolevallois points.

This paper provide new information about the singular or coexisting production systems in very different geographical and ecological areas to show diachronic and synchronic trends at the south-west Europe, and at the same time scope the particularities of the late Iberian Mousterian.

# B41

## Archaeology of the Mesolithic in Europe: the Significance of Fen and Bog Sites

Organiser: Lars Larsson, Harald Lübke, John Meadows and Nicky Milner

Thursday 4th, (14:30-19:30)  
Meeting Room S04



2014 burgos  
1-7 sept.

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ORAL CONTRIBUTION

ORAL

## 1. EARLIEST MESOLITHIC BONE INDUSTRY FROM A PEAT BOG SITE STANOVOYE 4.

*Zhilin, Mikhail (Institute of Archaeology Russian Academy of Sciences, Moscow) mizhilin@yandex.ru*

The site Stanovoje 4 is situated at Podozerskoye peat bog between Ivanovo and Yaroslavl, Upper Volga region of Central Russia, about 250 km to the north-east from Moscow. 600 square meters were excavated there under the direction of the author in 1993-2002.

Its lower (IV) cultural layer is the earliest site of Butovo culture. The site was situated on a low lake shore at the source of a small river and was flooded by a lake transgression. Pollen spectra from the bottom layer of gyttja overlaying cultural layer IV in two cores are characteristic for the very end of the Younger Dryas. Samples of gyttja deposited during this transgression are dated to  $10.060 \pm 120 - 9850 \pm 60$  BP. Two tools made from elk bone and antler yielded  $^{14}\text{C}$  dates  $9879 \pm 50$  and  $9741 \pm 40$  BP. These data indicate habitation of this site during transition from the Younger Dryas to Preboreal period or in the very beginning of the Holocene.

54 bone and antler tools were found in the lower (IV) cultural layer of Stanovoje 4. All of them were subject for complex research including typological, technological and use-wear analyses. Experiments in making replicas of bone slotted arrowheads, shafting them into arrows and shooting with bow were carried out.

Weapons are represented by a long flat arrowhead and three similar ones with a slot along one side, one of which preserved inserts – two fragments of the same unretouched microblade still in their original position. Similar inserts, removed from one core dropped out from the second arrowhead and were found mainly within 1-5 cm from it. Two similar arrowheads have slots along both sides. Two broken lance points and a broken dagger with slots along both sides were found. Other tools include broad knives made from elk scapulae; narrow knives with rounded end; antler axe and adze blades and two sleeves for their mounting; awls made from various bones and antler; long side scrapers; burins-scrapers made from beaver mandibles; antler pressure-flakers and a punch. A wedge; a preform of a dagger made from elk tubular bone; a fragment of a harpoon preform; fragments of long splinters, removed

with “groove and splinter” technique from tubular bones; fragments of various undeterminable tools and worked bone; an antler perforated ornamented disk were also found in this layer.

Materials of the lower (IV) cultural layer of Stanovoje 4 demonstrate that already in the very beginning of the Mesolithic Upper Volga population worked out main groups of bone and antler weapons and tools needed for successful adaptation and life in the forest environment. Sites of Preboreal and Boreal periods show further development of these traditions in Butovo culture.

Acknowledgements Research was supported by RFBR, grant 12-06-00100.

ORAL

## 2. DATING FRIESACK 27A

*Groß, Daniel (Centre for Baltic and Scandinavian Archaeology) daniel.gross@schloss-gottorf.de*

The site Friesack 27a is located in the Warsaw-Berlin ice margin valley of the last Glaciation northwest of the modern town of Friesack. Nowadays it appears as a small hill on a meadow that is used for cow grazing. During the excavations in the 1980's the former shore area of a lake was excavated. In prehistory it was directly connected to a nearby settlement on higher ground. It was possible to differentiate four occupation phases, probably summarizing up to seven single occupation events. These events were characterized by sandy layers within the genuine peat, which resulted from erosion phases that subdivided the overgrowing process of the lake. The good conditions for preservation of organic remains made it possible to date the phases directly via radiocarbon dating and cross-check the results with relative datings by palynological analyses and peat-growth estimates.

The dating of the occupation phases was done by palynological analyses and radiocarbon measurements. The latter were included into a Bayesian model which included peat growth models such as the stratigraphy of the site.

Compared to the size of excavation quite a high number of radiocarbon samples was taken so that a fairly sound chronological model was established. Nevertheless it became obvious that there might be problem of conventional dates of plant material as these samples

turned out to give too young dates compared to AMS dated ones. Furthermore the radiocarbon plateaus in the beginning and end of the Preboreal are hard to deal with because high resolution dating is not possible without further ado. With regard to this, the peat growth model gave good hints to refine the AMS results with high standard deviations. Vice versa it was possible to refine the model itself with respect to the Bayesian modelling. Generally it can be said that the dating of unstratified or bulk samples are highly disputable in lake shore environments and that it is important to have a good idea of the stratigraphy to apply an adequate dating strategy.

Dealing with the plateaus in the early Holocene, and especially the Preboreal, is one of the most important tasks for the future. As long as the onset of Mesolithic traditions in the northern European lowlands is not clearly dated it will be impossible to solve the questions why and when these people immigrated into the area. Additionally, their reaction to the immense environmental changes at the beginning of the Holocene can only be understood if sites and environmental events are reliably parallelized. Therefore it is important to refine the chronology, not only by radiocarbon dating, and understand when and why the change from the Palaeolithic to the Mesolithic took place in different regions. Wet-land-sites bear the probably best potential to approach these questions as they give the most comprehensive material for environmental and archaeological research.

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ORAL

### 3. THE MESOLITHIC BOG SITE DUVENSEE 11, NORTHERN GERMANY. FIRST RESULTS OF THE SPATIAL, TECHNOLOGICAL AND CHRONOLOGICAL ANALYSIS.

*Lübke, Harald (ZBSA, Schleswig) harald.luebke@schloss-gottorf.de*  
*Meadows, John (ZBSA, Schleswig) jmeadows@leibniz.uni-kiel.de*  
*Göbel, Karin (ZBSA, Schleswig) goebel@schloss-gottorf.de*  
*Groß, Daniel (ZBSA, Schleswig) daniel.gross@schloss-gottorf.de*  
*Bokelmann, Klaus (ALM SH, Schleswig (retired) affodil@aol.com*

The Duvensee peat bog, Northern Germany, represents one of the most prominent Stone Age palaeo landscapes in Northern Europe, with several Stone Age campsites on small islands or peninsulas on the western border of the former Holocene lake. The outstanding preservation of these campsites allows detailed examinations of the spatial organisation of prehistoric hunter-gatherer campsites.

The most recently excavated is the boreal Mesolithic site Duvensee 11, where a concentration of hazelnut roasting hearths, bark-mat layers and incorporated small knapping areas with a diameter of about 4m was found. What initially appeared to be a uniphase central fireplace of a larger settlement area turned out to be a multiphase structure, which had accumulated intermittently on the highest and driest spot of a former island over an extended period.

Based on the existing excavation records (840 excavation plans, 8 section drawings, 65000 measurement points), a GIS-based 3D model of the site was created, which is used also for detailed intra-site analyses of the flint artefacts. A Bayesian chronological model was built, incorporating the 34 radiocarbon results (mostly from bark, hazelnuts and wood charcoal, dated at the Leibniz-Labor, Kiel, in 2000–2002), and the stratigraphic sequences illustrated in the 3D model. The model has 4 components: 3 vertical sequences (western and eastern bark-mat stacks and a series from the central fireplace), and a group of 6 unstratified samples from the shore area. The sequences are linked together both as components of the overall site occupation, and by cross-referencing events that affect more than one sequence.

The main period of activity spanned c.200 years. Site 11 was not occupied continuously throughout this period, as peat had started to form over some bark mats, but people may have returned to this location every few years, before trees could cover it from view. This pattern is consistent with the number of bark-mat layers, which (if each layer represents a single season) implies that the site was used at least once a decade, on average. Soon after 8500 cal BC it was abandoned, and the site was overgrown with peat, but there was at least one brief occupation episode afterwards, probably between 8400 and 8300 cal BC.

Radiocarbon measurements since the 1970s show that at least 7 sites at Duvensee date to the calibration plateau between 9000 and 8300 cal BC. Site 11 was probably the most frequently and extensively occupied of these sites. Radiocarbon dating has become more precise over time, but inspection of calibrated dates still gives exaggerated impression of site longevity. The Bayesian model for site 11 gives a more realistic idea of site chronology and helps to identify re-occupation of abandoned sites.

ORAL

#### 4. SOME RESULTS FROM AN ANALYSIS OF MESOLITHIC ANTLER FRONTLETS

*Wild, Markus (MONREPOS Archaeological Research Centre and Museum for Human Behavioural Evolution, RGZM)  
wild@rgzm.de*

Supposed Mesolithic antler head-dresses from Star Carr have been interpreted as either shamanic garb and/or hunting disguise (Clark 1954). This has had a lasting impact on our interpretation of Mesolithic and hunter-gatherer societies overall. The hypothesis that these objects were worn as a mask or head-dress has not yet been proven. However the recovery of comparable objects from sediments of roughly contemporaneous or slightly earlier age across the Northern European Plain keeps this model alive. Apart from the fact that these comparable artefacts are not yet well defined and their precise use and function still remains unclear and requires more detailed investigation, the apparent significance of the presence or absence of antler frontlets in extensively excavated Early Mesolithic bog sites across Central and Northern Europe is generally still not well understood.

16 out of a total of 37 modified cervid skulls with attached antlers from 8 sites which have been discussed in the context of the Star Carr antler frontlets have recently been re-examined morphometrically and technologically by the author. The following parameters were recorded for the specimens: animal species, minimum age, weight and preservation, abiotic and biotic modifications that include breakage patterns, perforations, cut marks and notches.

The analysis of these parameters allows for the division of the group of modified deer skulls into four distinct groups of which one is discussed here: Besides the artefacts from Star Carr already mentioned, only one intensively modified red deer skull each from Hohen Viecheln and from Berlin-Biesdorf and two laterally perforated deer skulls from Bedburg-Königshoven – are classed as belonging to the newly created group of *Hirschgeweihkappen* [deer antler caps].

*Hirschgeweihkappen* are a rare spatial and temporal occurrence, within the Northern Technocomplex (David 2005) of osseous material working [artefacts] during the Middle to Late Preboreal. Their occurrence is biased towards larger Early Mesolithic sites in the vicinity of lacustrine environments although they are absent from comparable sites like Friesack where the osseous

material otherwise shows technological parallels to that of sites with *Hirschgeweihkappen*. This phenomenon should be linked to the still poorly understood function of this latter type of artefact.

ORAL

#### 5. DANISH MESOLITHIC WETLAND SITES: LANDSCAPE RECONSTRUCTIONS AND ARCHAEOLOGICAL EVIDENCE

*Jessen, Catherine (The National Museum of Denmark)  
catherine.jessen@natmus.dk  
Mortensen, Morten F (The National Museum of Denmark)  
morten.fischer.mortensen@natmus.dk*

Denmark has a rich and important record of wetland archaeological sites from the Mesolithic period. Many of these sites were excavated in the middle of the last century, often as multidisciplinary studies which included extensive pollen analyses along with detailed descriptions of the bog profiles. The interpretation of these data in terms of landscape and resources involves the disentangling of proxy responses in a period of rapidly changing climate, the immigration of tree species and formation of woodland, sea-level changes and the impact of humans. Recent evidence from Lundby Mose, Sjælland has suggested that different landscape types are associated with different types of archaeological deposits. Here we present a synopsis of the important Danish Mesolithic wetland sites in relation to this new data and compare the environmental responses with those of the late glacial period. Additionally, this synopsis attempts to highlight any geographical, chronological and/or environmental patterns in the landscape changes associated with the known archaeological evidence.

ORAL

#### 6. NEW EXCAVATION RESULTS FROM THE BOG RÖNNEHOLM MOSSE, CENTRAL SCANIA, SOUTHERN SWEDEN

*Larsson, Lars Rönneholms mosse was a part of a large lake in the central part of Scania, southern Sweden. It was filled up with organic litter during a long period lasting until the mid part of the Atlantic. Due to vast turf exploitations of the bog (Institution of archaeology and Ancient History) Lars.  
Larsson@ark.lu.se  
Sjöström, Arne (Institution of archaeology and ancient history) Arne.Sjostrom@ark.lu.se*

Rönneholms mosse was a part of a large lake in the central part of Scania, southern Sweden. It was filled up with organic litter during a long period lasting until the mid part of the Atlantic.

Due to vast turf exploitations of the bog excavations and surveys have been conducted during a number of years. A large number of sites has been detected most of them very small with a fireplace and a small number of artefacts. They seem to have been used during a short stay lasting from a few hours until a few days. At one of these sites the proximal part of an arrow with the microlithic still intact was found. The area also includes a number of camp sites that was used for a somewhat longer time.

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ORAL

## 7. RADIOCARBON CHRONOLOGY OF WOODEN STRUCTURES ON THE SITE ZAMOSTJE 2 (MESOLITHIC-NEOLITHIC, CENTRAL RUSSIA)

*Lozovski, Vladimir (Institute for the History of Material Culture of the RAS) zamostje68@gmail.com*

*Lozovskaya, Olga (Institute for the History of Material Culture of the RAS) olozamostje@gmail.com*

Investigations on the site Zamostje 2 in 1989–2014 revealed a special fishing zone of the settlement with a high concentration of various fishing facilities from different periods.

The complex of fishing structures consists of three fish-traps of conical shape made from pine and fir splinters and bound by reed grass; two movable fences made from long pine and willow splinters (more than 4 m in length) with bindings from bulrush, which have been found in the bed of the Dubna river; as well as 230 wooden piles (including 150 piles found in the Dubna river bed). The radiocarbon dating revealed they belong to the different chronological periods. Results of morphological analysis of wood piles are of particular interest as well.

The findings of mobile fences in the river Dubna bed date to the Late Mesolithic – 7200 BP, the remains of the three fish-traps date to the Early Neolithic Upper Volga Culture — 6500 - 6400 BP. Selective dating of the piles found both in the Dubna bed and in the excavation site revealed a clear breakdown of the all piles into four chronological groups: the first group dates to the Late Mesolithic (7200 BP), the second group dates to the end of the Early Neolithic Upper Volga Culture (6300–6200 BP), the third one is clearly grouped around 6000 BP,

i.e. the transition period from the Early Neolithic to the Middle Neolithic. The last group dates back to the Middle Neolithic (5800–5200 BP). According to data from morphological analysis, hornbeam was the most popular material (23% of all piles), poplar goes second (17%), then bird cherry tree (16%), i.e. 56% of all items were produced from these species, other piles were also made of broad-leaved trees (willow, elm, alder, maple, ash). Pine and birch were used in only 9% and 2% of items, respectively.

It is worth mentioning that such chronological distribution of wooden structures partially contradict to the classical stratigraphic sequence traced during long-term excavations in Zamostje 2. Briefly, the local stratigraphy is as follows: 7900–7800 BP — Lower Mesolithic layer, 7400–7200 BP — Upper Mesolithic layer, 7100–7000 BP — Final Mesolithic layer, 6800–6100 BP — Early Neolithic Upper Volga Culture horizon, 5800–5200 BP — Middle Neolithic layer.

Thus, the wooden structures reveal objects constructed during the Upper Mesolithic, Early and Middle Neolithic periods. For periods of the existence on the site of the lower layer and final Mesolithic layers any structures have not been traced. And vice versa, quite a large group of piles dated back to about 6000 BP, i.e. the transition period from the Early to the Middle Neolithic, is not reflected as a separate layer in the classical stratigraphy of Zamostje 2. Also, for almost two millennia, from the Upper Mesolithic (7300 BP) to the Middle Neolithic (5200 BP), ancient inhabitants of Zamsotje 2 preferred broad-leaved species, and in particular hornbeam. This data contradicts the modern concepts of the vegetation development during the Early and Middle Atlantic, which are based on the palynological analysis.

# B42 The adoption of pottery in Prehistory: a functional perspective

Organiser: Julien Vieugué and James Skibo

Monday 1st (14:00 to 19:30)  
B28 Meeting Room



2014 burgos  
1-7 sept.

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ORAL CONTRIBUTION

ORAL

## 1. DATING EARLY POTTERY IN EAST ASIA

*Bar-Yosef, Ofer (Harvard University) ofer.baryosef@gmail.com*

The constant debate whether the invention of pottery occurred independently in several geographic localities within East Asia or emerged in a core area as a new technique for the production of usable making objects cannot be resolved with the currently available evidence.

This study, jointly conducted with Prof. Xiaohong Wu and Chi Zhang (Peking University), Paul Goldberg and David Cohen (Boston University) Prof. Yuan Jiarong (Institute of Archaeology, Hunan Province) and collaboration with colleagues from Jiangxi Institute of Archaeology, was carried out in the radiocarbon labs of Peking University and Weizmann Institute of Science.

Stratified pot fragments are currently dated in south China to 20-18,000 cal BP in three cave sites – Xianrendong, Diaotonghuan and Yuchanyan. In the Japanese archipelago first pots are dated to 16.5-15.0 cal BP in Odai TYamamoto and other sites, and somewhat similar dates were obtained in sites in Eastern Siberia. However, the vast landmass in between, the central plains of China produced only dates in the range of 11.5-10.5 cal BP. While the Southern Chinese pots are found in contexts of cobble-tools (e.g., choppers, cores and flakes with a few bone tools and Unio shell tools), those in central China, Siberia and Japan occur within assemblages dominated by microblades.

Thus, the debate on the origins of pottery making in East Asia cannot be resolved without further research in central China, where site of Terminal Pleistocene and early Holocene are buried under late alluvial accumulations.

ORAL

## 2. THE EARLIEST AFRICAN CERAMICS: MORE THAN 10,000 YEARS AGO BETWEEN THE SAHEL, THE SAHARA AND THE NILE VALLEY

*Huysecom, Eric (University of Geneva) eric.huysecom@nige.ch*

A vast complex of open-air sites in the Dogon Country in Mali, Ounjougou presents highly varied human occupations within a geological and paleoenvironmental sequence extremely rich in vegetal micro- and macro-re-

mains. The conditions necessary to link cultural, climatic and environmental variability over a long chronological period are thus exceptionally well met here.

The lowest layers in the sites of Ravin de la Mouche and Ravin du Hibou have yielded many new elements. Indeed, the stratigraphic sequence and the many dates obtained by C14 and OSL have provided a *terminus ante quem* of 9,400 cal BC for ceramic sherds found in association with a lithic industry containing small bifacial weapons. Geomorphological and sedimentary analyses indicate a powerful hydrological regime that remodeled the landscape of the bottom of the Yamé Valley where the Ounjougou site complex is found.

This allows us to confirm that the emergence of this techno-typological complex took place during one of the humid phases of the Pleistocene-Holocene transition recently identified in West Africa, most likely the climatic amelioration between 10,200 and 9,400 cal BC. Recent syntheses have confirmed that the monsoon front reached 14° N latitude around 9,500 cal BC. Our paleoenvironmental analyses indicate the landscape was transformed: surfaces that had been desert for several millennia were covered with an open steppe with grasses, some of them edible. This situation allowed the spread of prehistoric humans across the continent and probably favored a new behavior: the practice of selective and intensive gathering, that is, the targeted and rational harvest of wild grasses. Yet the seeds need to be not only kept dry and protected from rodents, but also need to be cooked for the body to absorb the starch, human lacking the necessary digestive enzymes to break it down; hence the utility of pottery. This suggests an invention context for pottery similar to that in the Far East, parallel to the production of weapons adapted in size to hunt small prey frequenting the open savannas.

The discoveries at Ounjougou this evidence the emergence of pottery south of the Sahara in relation to the spread of grasses in tropical Africa. This invention seems to have then spread toward the Sahara during the Early Holocene, at the end of the 10<sup>th</sup> and early 9<sup>th</sup> millennium BC, while the desert zone became increasingly green.

*Les découvertes à Ounjougou témoignent de l'émergence de la céramique au sud du Sahara en relation avec le redéploiement de la couverture végétale graminéenne en Afrique tropicale, et ce avant 9'400 BCcal. Cette invention semble avoir diffusé ensuite en direction du Sahara durant l'Holocène ancien, dès la fin du 10e et le début du 9e millénaire BCcal, alors que la zone désertique se couvrait de végétation.*

ORAL

### 3. SHIFTING PARADIGMS. THE ADOPTION OF POTTERY IN UPPER MESOPOTAMIA

*Nieuwenhuysse, Olivier (Leiden University)  
o.nieuwenhuysse@arch.leidenuniv.nl*

New discoveries on the Upper Mesopotamian plains are radically altering our paradigms for understanding early ceramic adoption and use in Western Asia. For decades many Near Eastern archaeologists assumed that pottery was initially adopted to facilitate cooking and bulk storage, thus allowing the successful establishment of the Neolithic economy. As well, implicit in many models was the assumption that following the initial adoption ceramic evolution followed a linear trajectory from coarse, experimental undecorated vessels towards increasingly stylistically and technologically elaborated products. These assumptions remained largely unchallenged for long, due to the near absence of well-dated early ceramic sites. This has changed over the past two decades as several early Pottery Neolithic sites have been excavated. They yield an early ceramic horizon well dated to between 7000-6700 cal. BC. The ceramic containers recovered from these sites do not confirm to our earlier expectations at all.

I shall summarize current work on the Late Neolithic (7th millennium) ceramics from Tell Sabi Abyad, northern Syria. Tell Sabi Abyad is one of several sites yielding an early ceramic horizon dated to ca. 7000-6700 cal. BCE. The archaeometry of the pottery is being studied with microscopic, petrographic, chemical and residue trace analyses.

The work at Tell Sabi Abyad and contemporaneous Late Neolithic sites across Upper Mesopotamia opens up new perspectives on the initial adoption of pottery in the region. The earliest pottery at the site was definitely not used for bulk storage. Its role as a facilitator of cooked food remains matter for debate. While cooking clearly seems to have been amongst its uses, the very low quantities of ceramic vessels at this early stage caution against a whole-sale culinary 'revolution'.

These important functions of pottery emerged at much later stages. The early ceramic containers are small and light weight, hence easy to carry around; indeed there is strong evidence to suggest that they circulated in networks of exchange. The great care with which they were crafted, finished, and sometimes decorated suggests that they played a role in stylistic signaling among Ne-

olithic communities. Pottery at this stage was certainly not the only material from which small-sized containers were crafted. Pottery vessels may have circulated in the same social framework as vessels made of stone.

ORAL

### 4. DEFINING EARLY POTTERY USE THROUGH LIPID RESIDUE ANALYSES

*Roffet-Salque, Mélanie (Organic Geochemistry Unit, School of Chemistry, University of Bristol, Cantock's Close, Bristol BS8 1TS, UK.) melanie.salque@bristol.ac.uk  
Evershed, Richard P. (Organic Geochemistry Unit, School of Chemistry, University of Bristol, Cantock's Close, Bristol BS8 1TS, UK.) R.P.Evershed@bristol.ac.uk*

Pottery is the most common artefact excavated at archaeological sites from the Neolithic onwards and the determination of preserved organic residues can provide major insights into vessel use and wider aspects of resource acquisition and diet. Such investigations shed light on whether vessels were used in food preparation or served other functions. The determination of lipids preserved in the porous fabric of potsherds is a particularly productive avenue of enquiry, with specific lipid biomarkers allowing the identification of animal fats, beeswax, resins, tars, plant lipids, etc. (Evershed 2008a). The application of stable carbon isotopic analyses of preserved fatty acids significantly increases resolution, enabling distinctions to be drawn between non-ruminant and ruminant animal fats, carcass and dairy fats (Dudd and Evershed 1998), and fats/oils from freshwater and marine organisms (Cramp and Evershed 2013). The detection of thermally altered fatty acids point to heating regimes above certain thresholds, e.g. ketones (Evershed *et al.* 1995) and  $\omega$ -(*o*-alkylphenyl)alkanoic acids (Hansel *et al.* 2004) both require heating in excess of 250°C to drive the transformations. The latter, together with long-chain dihydroxy fatty acids and isoprenoid acids, further help to define the sources of preserved fats and oils. Experimental approaches, zooarchaeological and palaeobotanical evidences are routinely used to build interpretive frameworks (Evershed 2008b).

Here we consider the use of early pottery vessels from the perspective of lipid residue analyses of potsherds from Early Neolithic contexts from the Near East and Europe, defining pottery use and the wider economic implications through characterization of their lipid contents.

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ORAL

## 5. THE ADOPTION OF POTTERY IN EASTERN MEDITERRANEAN: A LOOK THROUGH THE USE OF CERAMIC VESSELS.

*Vieugue, Julien (French research Center in Jerusalem)  
archeojulien@hotmail.com*

Pottery appears in the Northern Levant around 6900 cal B.C. Its invention occurs long after the development of agriculture and livestock. From this region, the production of ceramic vessels spreads toward Southern Levant and Anatolia, then into South-eastern Europe. In this last region, the pottery is introduced around 6500 cal B.C., like the agriculture and livestock.

It is generally known *when* and *where* the pottery appears, there are still many questions surrounding the factors that have caused to the emergence of this new technology. In other words, why did the populations from the 7<sup>th</sup> millennium cal B.C. start to use fired clay containers? The hypothesis that the ceramic vessels were used for food storage and cooking has been rejected several times over the past two decades. This paper seeks to contribute to this controversial debate through a functional study of pottery.

Analyses were recently undertaken regarding the function of the earliest ceramic productions from South-Eastern Europe and Southern Levant (6500-5800 cal B.C.). The research was carried out on a significant amount of pottery, including 2026 vessels and 72 128 sherds from 12 sites. The study was to combine the typometric characteristics (shape, size, volume, thickness) and the use-wears (residues and attritions) of Neolithic pottery.

The analyses have shown the diversity in the uses of the pottery. Fired clay containers had been involved in the storage and transfer of liquids, the cooking of meat, the preparation of bone powder, the grinding of materials or the consumption of foodstuffs. Although chronological changes are noticeable, the use range of pottery appears overall similar from the beginning to the end of the sites occupation. In parallel, the composition of ceramic assemblages presents strong regional variations. In Northern Levant and Thessaly, pottery used for the individual consumption of foodstuffs are prevailed. In the Southern Levant, Storage vessels and cooking pots are the most frequent functional categories.

Regional variations in the proportion of different functional classes of ceramic vessels indicate that the pop-

ulations from the 7<sup>th</sup> millennium cal BC. Did not adopt pottery for the same socio-economic purposes. The causes seem to be multiple. Depending on the cases, the adoption of pottery could be linked to a problem in the dietary resources management or to an economic reorganisation of societies.

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ORAL

## 6. THE ADOPTION OF POTTERY IN THE MIDWESTERN UNITED STATES:

*Skibo, James (Illinois State University) jmskibo@ilstu.edu  
Malainey, Mary (Brandon University) Malaineym@BrandonU.CA  
Kooiman, Susan (Michigan State University) kooimans@msu.edu*

Pottery appears in the Midwestern United States and signals the beginning of the Early Woodland Period. Although the timing for pottery varies considerably, it first appears by about 1,000 B.C. and then is found widely across much of the northern portion of the Midwest. The pottery has a number of regional names, such as Schultz Thick, Marian Thick, and Vinette I, but shares a number of basic attributes: thick, heavily grit tempered, with an open bowl form. A fundamental question that underlies the adoption and use of this new technology is, "What were they used for?" Ozker (1982) suggested long ago that the pottery at the Schultztz site, located at the confluence of the Tittabawassee and Shiawassee Rivers near present-day Saginaw, Michigan, was used to process acorns. Recently, we have identified nut lipids in early ceramic sites on Grand Island, Michigan using high temperature gas chromatography and mass spectrometry. Using a similar approach, in this study we test Ozker's hypothesis by examining the lipids from a sample of Schultz Thick to see if lipids associated with nut oil or other foods can be identified.



ORAL

## 7. INVESTIGATING THE EARLIEST APPEARANCES OF POTTERY IN THE ALASKAN ARCTIC

*Harry, Karen (University of Nevada Las Vegas), Liam Frink - liam.frink@unlv.edu (University of Nevada Las Vegas) karen.harry@unlv.edu*

The earliest pottery in the Alaskan Arctic dates to between 1500 and 500 B.C. Evidence suggests that the technology was introduced from Siberia, and that (like later pottery) the earliest ceramics took the form of utilitarian cooking pots and oil lamps. In this paper we explore what triggered the initial adoption of ceramics in this region.

We rely on data obtained from multiple sources, including the archaeological record, ethnoarchaeological and experimental studies, and nutritional reports.

Our results indicate that, unlike other areas of the world, the adoption of the cooking pot was not triggered by a major dietary shift or the introduction of new foods, nor did it offer any nutritional advantages over other food preparation techniques. Instead, we suggest that pottery was adopted because it made efficient oil lamps and allowed the Arctic people to expand their culinary experiences. But the need for oil lamps and the desire for culinary variety could not have been new. If the appearance of pottery cannot be explained by newly created needs. what does explain its adoption?.

We propose that the answer to this question lies in understanding both the nature of pottery production in the Arctic and the nature of the sites at which the earliest pottery is found. In the Arctic, the production of pottery would have been limited to a short window in the summer (Frink and Harry 2008) and required the use of oil as a coating for the necessarily porous vessels (Harry et al. 2009). However, access to oil in the summer would not always have been possible. We suggest that the appearance of pottery coincides with the appearance of new technologies (specifically, the seal float and the seal poke) that made it possible to (a) reliably harvest sea mammals and thus obtain sea mammal oil during the summer months, and (b) store oil for long periods of time. This conclusion is based on the co-occurrence of the earliest ceramics with the earliest-maritime based sites to yield evidence of reliance on open sea hunting.

We conclude that the adoption of pottery in Alaska was not triggered by new dietary needs, but resulted from a desire for culinary variety and efficient oil lamps. We

further conclude that the timing of its adoption is explained by the appearance of new technologies that made it possible to overcome, for the first time, the environmental challenges associated with making pottery in the Arctic. These findings demonstrate the importance of understanding the full suite of technologies available to a society when considering why one particular artifact was adopted.

# B43

## Testing social behaviour with novel approaches in the Prehistoric mortuary record of Iberia

Organiser: Domingo Carlos Salazar-García and Oreto García Puchol

Tuesday 2nd, (9:00-13:30)  
Meeting Room S4



2014 burgos  
1-7 sept.

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ORAL CONTRIBUTION

ORAL

**1. ISOTOPE ANALYSIS AND COLLECTIVE BURIALS: THE CASE OF SECTION 3 OF STJ IN MARROQUÍES SITE (JAÉN, SPAIN).**

*Cámara Serrano, Juan Antonio (Departamento de Prehistoria y Arqueología. Universidad de Granada) jacamara@ugr.es*  
*Molina González, Fernando (Departamento de Prehistoria y Arqueología. Universidad de Granada) molinag[arroba]ugr.es*  
*Delgado Huertas, Antonio (Laboratorio de Biogeoquímica de Isótopos Estables. Instituto Andaluz de Ciencias de la Tierra) antoniodelgado@ugr.es*  
*Riquelme Cantal, José Antonio (Departamento de Geografía y Ciencias del Territorio. Universidad de Córdoba) gt-1satoj@uco.es*  
*Sánchez Susí, Rafael (Arqueólogo) jacamara@ugr.es*  
*Martin Flórez, Sebastián (Antrópologo) jacamara@ugr.es*  
*Spanedda, Liliana (Departamento de Prehistoria y Arqueología. Universidad de Granada) spanedda@ugr.es.*

While performing the works of Jaén Tramway System passing through Marroquíes archaeological site, various archaeological contexts were investigated. Especially in the so-called Section 3 a concentration of funerary features was located. Their analysis has documented a series of ritual practices involving the displacement of human remains between neighboring graves and sacrifice-offering of numerous animal remains for an extended period of time between the Chalcolithic and Bronze Age (2600-1750 cal BC). To assess possible changes in the environment and especially in the diet during this period and analyze possible differences between individuals, a study of carbon and nitrogen isotopes has been undertaken.

65 human bone samples from 9 different pits have been selected for isotope analysis. 18 of them have been C14 dated in order to get a chronological frame. 33 samples belong to female remains and 23 to male ones. 54 individuals are adult, 9 are infant and 2 are young individuals. Collagen extraction has enabled  $\delta^{13}\text{C}$  and  $\delta^{15}\text{N}$  analysis by Elemental Analyser (Carlo Erba Model NA1500 NC Series 2) and a Mass Spectrometer (Delta Plus XL).

Temporal changes can be appreciated in  $\delta^{13}\text{C}$  and  $\delta^{15}\text{N}$  values. Other differences can be related to age, sex or burial pit.

According to  $\delta^{15}\text{N}$  values two groups of women can be found and lower values belong to the few young individuals which have been studied. An increase in the

consumption of animal protein and arid conditions can be suggested in this area between the 3<sup>rd</sup> and 2<sup>nd</sup> Millennium BC.

ORAL

**2. UNBURIED NEANDERTHALS IN IBERIA? PALEOANTHROPOLOGICAL, FORENSIC AND EXPERIMENTAL APPROACH TO CARNIVORE MODIFICATION OF HOMINID INHUMATIONS**

*Camarós, Edgard (Institut Català de Paleoeologia Humana i Evolució Social (IPHES) ecamaros@iphes.cat*  
*Cueto, Marián (Universitat Autònoma de Barcelona) mcueto@gmail.com*  
*Lorenzo, Carlos (Institut Català de Paleoeologia Humana i Evolució Social (IPHES) carlos.lorenzo@urv.cat*  
*Teira, Luis (Instituto Internacional de Investigaciones Prehistóricas de Cantabria (IIIPC) luis.teira@unican.es*  
*Rivals, Florent (ICREA at Institut Català de Paleoeologia Humana i Evolució Social (IPHES) florent.rivals@icrea.cat*  
*Darlas, Andreas (Ephoreia of Paleoanthropology and Speleology of Northern Greece) adarlas@culture.gr*  
*Harvati, Katerina (Senckenberg Center for Human Evolution and Paleoenvironment - Eberhard-Karls-Universität Tübingen) katerina.harvati@ifu.uni-tuebingen.de*

The identification of neanderthal intentional burials is not common, although there are several examples of such phenomena. The main problem that complicates their interpretation in the archaeological record is related with taphonomic processes erasing the evidence that would allow inferring inhumation practices. One of those taphonomic agents that most contribute to this lack of record are the large carnivores. A form of indirect interaction between hominins and carnivores is the alternate use of caves by both agents to develop different activities. Our previous experimental and archaeological research has shown that due to this alternation, the anthropic spatial structure of a site is altered and a significant part of the record is erased. Human burials may have also been susceptible to being destroyed during the Pleistocene as a result of such interaction. Is it possible then to recover this information?

We studied several neanderthal bones from archaeological sites from the Iberian Peninsula, such as Cova Negra (Valencia), Valdegoba (Burgos), Jarama VI (Guadalajara) and Los Moros de Gabasa (Huesca). They all presented carnivore damage on their bone surface, that compared to actualistic forensic observations, differ from the bone modification pattern resulting from a carnivore attack.

Therefore, bone damage on neanderthal bones suggests carnivore scavenging on exhumed hominin corpses by carnivores. This interpretation is supported by experimental series that show how carnivores are capable of erasing evidence of human inhumations.

Results show that there are strong paleoanthropological, forensic and experimental evidences to suggest that the neanderthal bones we analyzed are the result of scavenged corpses that may have been exhumed by large carnivores. This would mean that in some specific archaeological contexts, where the interaction between hominins and carnivores is present in the form of an alternation in the use of common spaces, the research concerning neanderthal burials has to be conducted from a different perspective. It is important therefore to reconstruct all the processes that have erased and destroyed the evidences of intentional inhumation. In this sense, it is necessary to apply a methodology were a taphonomic approach to bone surface, the development of experimental series and a forensic perspective are all combined to develop a useful research frame.

Our results are compared with other similar cases of modified neanderthal bones such as the femur from Hohlestein Stadel (Germany) and the navicular from Kalamakia (Greece), with the aim of obtaining a general framework on a phenomenon that seems to be common among Middle Paleolithic hominin remains.

Our methodology is a valid approach to recover information related to Neanderthal burials and therefore to understand a modern patterned social practice.

ORAL

### 3. BUILDING CHRONOLOGIES FROM BURIAL CONTEXTS TO TEST LATE NEOLITHIC AND CHALCOLITHIC SOCIAL DYNAMICS IN EASTERN IBERIA.

*García Puchol, Oreto (Investigadora Programa Ramón y Cajal. Departament de Prehistòria i Arqueologia. Universitat de València) oreto.garcia@uv.es*

*Salazar García, Domingo Carlos (Max-Planck Institute for Evolutionary Anthropology) domingo\_carlos@eva.mpg.de*  
*McClure, Sarah (Department of Anthropology. Pennsylvania State University) sbm19@psu.edu*

*Romero, Alejandro (Departamento de Biotecnología. Facultad de Ciencias. Universidad de Alicante) a.romerorameta@gmail.com*

*de Miguel, M<sup>a</sup> Paz (Área de Prehistoria. Universidad de Alicante) osteoarqueologia@gmail.com*

*Roca de Togores Muñoz, Consuelo (MARQ Museo Arqueológico de Alicante) crocat@diputacionalicante.es*

In this paper we present direct radiometric AMS datasets, paleodietary results from stable isotopes, and microwear analysis of teeth from Late Neolithic and Chalcolithic human remains from the Valencia region (Eastern Spain) to discuss diachronic social patterns. Most of the data generated come from three funerary contexts (Llometes, Pastora Cave, and La Vital) in the framework of recent research projects investigating social dynamics through funerary practices.

We compare this information with patterns observed in intra- and inter- site storage capability at settlements in order to obtain new insights for testing social inequalities.

The results suggest that different patterns can be observed based on the dataset, reinforcing the need to advance several lines of evidence in order to characterize the nature and underlying factors of shifting social patterns during these periods.

ORAL

### 4. NEOLITHIC FUNERARY PRACTICES FROM NORTH-EAST IBERIA. A HOLISTIC AND MULTIDISCIPLINARY APPROACH

*Gibaja, Juan Francisco (IMF-CSIC) jfgibaja@imf.csic.es*

*Subirà, Maria Eulàlia (UAB) eulalia.subira@uab.cat*

*Allièse, Florence (CNRS) florence.alliese@gmail.com*

*Arroyo, Eduardo (UCM) eduardoa@ucm.es*

*Chambon, Philippe (CNRS) philippe.chambon@mae.cnrs.fr*

*Díaz-Zorira, Marta ( Universität Tübingen) marta.diaz-zorita@ifg.uni-tuebingen.de*

*Fontanals, María (UAB) mariafontanalscoll@gmail.com*

*Knudson, Kelly (Arizona State University) Kelly.Knudson@asu.edu*

*Lopes, Claudia (UCM) clopes01@ucm.es*

*López, Diego (UAB) diego20lopez@gmail.com*

*Palomo, Sara (UCM) sarapalomodiez@med.ucm.es*

*Santana, Jonathan (Universidad Las Palmas) jonathan\_sc@hotmail.com*

*Santos, Francisco Javier (CNA) fj.santos@csic.es*

Within the framework of the research project "Approach to the first Neolithic communities from the north-east of the Iberian peninsula through their burial practices" our main goal is to get to know better the agricultural and farming societies who lived during the 5<sup>th</sup> and 4<sup>th</sup> millennia in this area. The archaeological context is unique due

to the inhumation in single burials and occasionally next to another individual.

In this paper we would like to show not only the new results of analysis and methodologies employed but the working strategy we have developed. Thus, there are two fundamental aspects: 1) the absolute dating is the main focus and 2) the collaboration with other researchers and laboratories need to be close (It is not our intention to ask for results to a laboratory, but to work with the people involved in the sampling since they know the advantages and disadvantages of each of the employed techniques).

The first results have already given information about the timing of these funerary practices, the morphology of the burials, the use of the perishable material, the diet and the degree of mobility of the populations, the kinship as well as the diary activities.

The ongoing analysis will offer us insights of multiple views of those first Neolithic groups through the analysis of the individuals.

#### ORAL

### 5. ISOTOPE DIETARY PATTERNS FROM THE MESOLITHIC AND NEOLITHIC PERIODS OF EASTERN IBERIA

*Salazar García, Domingo Carlos (University of Cape Town / Max-Planck Institute for Evolutionary Anthropology) domingo\_carlos@eva.mpg.de*

*Aura Tortosa, Joan Emili (Universitat de València) emilio.aura@uv.es.*

*García Borja, Pablo (Independent Researcher) domingo\_carlos@eva.mpg.de*

*García Puchol, Oreto (Universitat de València) oreto.garcia@uv.es.*

*Richards, Michael P. (University of British Columbia / Max-Planck Institute for Evolutionary Anthropology / University of Durham) michael.richards@ubc.ca*

We report here on the results of carbon and nitrogen stable isotope analysis of humans and fauna from more than twenty Mesolithic and Neolithic sites from Eastern Iberia. In other parts of Europe there is isotopic evidence for an abrupt change in diet between these periods, especially in coastal regions of Northwestern Europe. To date, there are few isotopic studies for these periods from the Mediterranean. This poster reports new isotopic data from the eastern Iberian Peninsula, from sites dating to the Mesolithic, and early, middle and late Neolithic. The

results show no major diet shift between these two periods, and suggest that some dietary changes were introduced during the last stages of the Neolithic.

#### POSTER

#### POSTER

### 6. INDUCTIVELY COUPLED PLASMA MASS SPECTROMETRY FOR ANALYSIS OF ARCHAEOLOGICAL BONES FOR RECONSTRUCTION OF PALEODIET

*Santamaría Herrera, Alba (Universidad de Burgos) ash0016@alu.ubu.es*

*Palmero Diaz, Susana (Universidad de Burgos) spaldi@ubu.es*  
*Carmona Ballester, Eduardo (Universidad de Burgos) educarmonaball@gmail.com*

*Colina Santamaría, Álvaro (Universidad de Burgos) acolina@ubu.es*

The elemental composition of archaeological bones provides useful information for the dietary habits of ancient people because of food is considered as one of the patterns that best define the characteristics of the different populations, the environment in which they live and their adaptation.

Considering food as main factor incorporation of organic and inorganic substances to human body, it is possible to establish a direct relationship between the presence of certain substances in human bones and consumption of foods that provide these elements. The metals most frequently used in studies palaeodiet are: barium, copper, magnesium, iron, vanadium and zinc. It is also very important to consider aspects such as the choice of samples, cleaning processes to which they are subject or the possible effects of pollution thereof.

Human remains used for the study come from the archaeological site of Arroyal I, located in the town of Arroyal (Burgos, Spain). Bones were recovered through archaeological excavation conducted by a team from the Archaeology Area of the University of Burgos. We have tested a total of 15 samples for analysis, of which 9 are humerus and 6 are ulna, trying to have variability in sex and age of selected individuals. Non spongy part of the bone is taken because a part of the bone that has a sufficient thickness so as to eliminate contaminated surface before taking the sample for analysis is preferred.

The sample is subjected to a calcination process and subsequent acid solution of ash. The analysis of the met-

als of interest is performed by ICP-MS technique to detect metal portions level per billion (ppb).

A principal component analysis with the concentrations calculated from the analysis was carried out. Initially, samples are separated into three groups. For one side, samples with a higher content of zinc and copper (predominant metals in carnivorous diet) and moreover the samples with higher concentrations of strontium, vanadium, and barium (metals associated with rich diets) and finally samples containing predominantly iron and magnesium. In this separation no differences in sex or age of individuals is observed.

Thus, ICP-MS of archaeological bones permits the successful determination of elements, important for paleodiet reconstruction. This is a serious advantage of the method over existing methods when complex investigations with numerous samples are to be performed. The interpretation of the analytical data indicates that the population under study time in Arroyal I has not dominantly vegetarian or carnivore diet. The pattern suggests a non-restrictive access to food resources. In social terms, the study has shown that differences are related to individual habits of consume, not linked to sex or age.

# B44

Within ditches and walls.  
Settlements, fortifications,  
enclosures, monuments,  
villages and farms in the third  
Millenium BCE

Organiser: Victor S. Gonçalves and Ana Catarina Sousa

Thursday, 4th (14:30 to 19:30)  
A21 Meeting room



2014 burgos  
1-7 sept.

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XVII Congreso Mundial de UISPP

ORAL CONTRIBUTION

ORAL

**1. FORTIFIED SETTLEMENTS IN PORTUGUESE ESTREMADURA DURING THE THIRD MILLENNIUM BCE. RADIOCARBON CHRONOLOGY FOR VILA NOVA DE SÃO PEDRO (AZAMBUJA, PORTUGAL).**

*Gonçalves, Victor S (UNIQ: University Of Lisbon) vsg@campus.ul.pt*

*Sousa, Ana Catarina (UNIQ: University Of Lisbon) sou-sa@campus.ul.pt*

*Boaventura, Rui (UNIQ: University Of Lisbon) rui.boaventura@campus.ul.pt*

The Portuguese Estremadura is the region with the highest concentration of fortified settlements in Central and Southern Portugal.

Within this territory there are available now more than one hundred <sup>14</sup>C dates from a dozen of these sites: in the North bound (Lisbon Peninsula) Leceia, Zambujal, Penedo do Lexim, Olelas, Penha Verde, Castelo and Pragança; and in the South bound (Setúbal Peninsula) Rotura, Chibanes and Outeiro Redondo.

The discussion of absolute and relative chronologies of fortified sites in the Portuguese Estremadura started somewhat late: firstly with the relative chronology of Rotura (Gonçalves, 1966), then with the first radiocarbon dating of Zambujal (Schubart, 1975) and later with the important sequence of Leceia (Cardoso e Soares, 1996). Vila Nova de São Pedro (Azambuja), eponymous site of the 'Vilanovense' Culture during the historical-cultural paradigm, remains out of focus on all the interpretive proposals.

In 2010, following an emergency situation, the authors made a small rescue intervention in Vila Nova de São Pedro, cleaning a section and recovering some material (organic and artifacts). This is unpublished research data from the Work Group on Ancient Peasant Societies.

The first absolute dating from Vila Nova de São Pedro contributes to the review and discussion about the set of radiocarbon dating available for the fortified sites within the Portuguese Estremadura. Questions of chronology and patterns of use will be analyzed in connection with the information available for fortified settlements in other regions of Central and Southern Iberian Peninsula.

ORAL

**2. A BIOGRAPHY OF AGGREGATION PLACES: APPROACHING IBERIAN LATE PREHISTORIC DITCHED ENCLOSURES THROUGH BAYESIAN MODELING.**

*Balsera Nieto, Verónica (Instituto de Historia, CCHS, CSIC) veronica.balsera@cchs.csic.es*

The aim of this presentation is to analyze the spatial dynamics of ditched enclosure building of Iberia through the use of Bayesian modeling of radiocarbon determination. One of the key issues at play in the debate concerning the functions and use of these kinds of sites relates to their temporality. The lack of academic consensus suggests that other research lines should be considered in order to avoid falling into the already traditional interpretation.

As it has been demonstrated through groundbreaking investigations in the UK, the application of Bayesian modeling has turned into an extremely useful tool for the interpretation of the chronological sequences of these sites and thus for the understanding of their life histories. The advantages should be particularly useful when applied to the Iberian Copper Age, where multilayered sites are unusual and where the contemporaneity of the features becomes crucial. Contrasting chronological models allow assessing their likelihood, working as an "experimental laboratory" of alternative hypothesis.

Our presentation will focus on two well-known Iberian Copper Age enclosures: Camino de las Yeseras (San Fernando de Henares, Madrid) and Perdigões (Évora, Portugal). Both sites have an important set of published <sup>14</sup>C determination, allowing alternative models and different internal biographies that can be contrasted through robust statistical analysis. Our modeling is aimed to shed light on the temporal dynamics of ditch construction and its relation to dated mortuary practices inside these sites.

ORAL

**3. CURRENT STATE OF RESEARCH ON CHALCOLITHIC SOUTHERN IBERIAN DITCHED ENCLOSURES.**

*Marquez-Romero, Jose E. (Universidad de Malaga) jemarquez@uma.es*

*Jimenez-Jaimez, Victor (University of Southampton) V.J.Jimenez-Jaimez@soton.ac.uk*



Until recently, the discovery of a Chalcolithic ditch in Southern Iberia was automatically identified with the need for defence or drainage of a number of hypothetical villages that marked the consolidation of sedentism and, sometimes, the emergence of social complexity. The layout of the enclosures was often unclear, as well as the number and spatial organisation of the archaeological structures or the geographic distribution of the sites. The prevailing methods and techniques applied were surface survey and more or less small-scale trenching, while temporality and chronology were the focus of little research. In general terms, known sites were exclusively analysed within geographic environments of reduced size. In only a few years the situation has changed considerably. Documented examples have multiplied, especially in Southern Portugal. The quality and quantity of information about each one of them has grown, mostly because of the application of a wider range of methods and techniques, such as aerial photography and geophysical survey. Temporality has started to receive the attention it deserves, and new interpretive models have arisen. In this contribution we will describe the current state of research as regards Southern Iberian ditched enclosures, focusing on these and other relevant aspects.

ORAL

#### **4. PIT-DIGGING AND GRAIN STORAGE IN SOUTHERN IBERIAN CHALCOLITHIC DITCHED ENCLOSURES. A NON-REDUCTIONIST APPROACH.**

*Jimenez-Jaimez, Victor (University of Southampton) V.J.Jimenez-Jaimez@soton.ac.uk*  
*Marquez-Romero, Jose E. (Universidad de Malaga) jemarquez@uma.es*

Prehistoric and historical archaeology of Western Europe is full of examples of underground features, pits, interpreted as subterranean granaries, being particularly prolific the Neolithic and Copper Age, the Iron Age and the Middle Ages in some European and Iberian regions. In the southwest of the Iberian Peninsula, the idea of pits as storage facilities for grain has been very widespread since the end of the XIXth century, allowing for the interpretation of the countless underground features known, both within enclosed areas and in unenclosed pit sites dating from the IV and III millennia BC (Neolithic and Copper Age), as silos. Some observers have gone beyond that: the notion of pit as silo has often been the starting point for scientific postulates arguing an intensification of agricultural activities and

cultural complexity in the Southern Iberian Copper Age. Therefore, the way archaeologists position themselves as regards this issue has considerable implications at the level of historical interpretation, beyond the simple attribution of functions to archaeological structures.

In this paper we will challenge the prevalent ideas on the basis of historical, ethnographic and archaeological sources.

ORAL

#### **5. IDENTIFYING HOUSEHOLD CLUSTERS AT LATE NEOLITHIC EXTENSIVE PIT-SITES IN THE CENTRAL AREA OF THE MEDITERRANEAN COAST OF THE IBERIAN PENINSULA.**

*Gómez Puche, Magdalena (IPHES) mgomez.puc@gmail.com*  
*Bernabeu Aubán, Joan (Departament de Prehistòria i Arqueologia. Universitat de València) jbauban@uv.es*

In this work we propose a new methodological approach to identify household units at Late Neolithic pit-sites. Pit-like features represent the most common and visible habitation structure of the Neolithic in the Iberian Peninsula. Its documentation in the Spanish open-air site archaeological record is dated to Early Neolithic (c.5400-5200 cal BC), although their number meaningfully increases in subsequent Neolithic phases, especially during the Late Neolithic and Chalcolithic (c.3600-2200 cal BC) when they reach their maximum number and functional diversity.

Despite its ubiquity in the Iberian archaeological record, very little attention has been paid to defining intra-site functional clusters of domestic units. Besides, on the last decade fieldwork results have provided numerous examples of nucleated villages composed by clusters of underground features, some of them surrounded by ditch enclosures.

Beyond different approaches that have specifically addressed the functional and socio-economic interpretation of pit sites, as those that have focussed on pit deposition practices (examining cultural vs. ritual filling patterns), and those who try to quantify the scale of storage practices, we believe that the recognition of household units and the understanding of the spatial organization of domestic activities, merits a great attention since the estimation of household units and its evolution throughout the Late Neolithic is bound up with fundamental socioeconomic changes

such as dissolution of kinship networks, agricultural intensification, resource accumulation and aggregation processes.

Methodologically, this work will be supported on the morphological trends of the best-preserved examples of Late Neolithic houses, recently discovered in the central area of the Mediterranean coast of the Iberian Peninsula. Then, through combined GIS spatial and statistical analyses we will investigate intra-site distribution patterns of pit structures and archaeological materials to falsifying the following assumptions: (i) pit structures are randomly distributed in Late Neolithic sites; (ii) big pits contain biggest amount of archaeological findings; (iii) there is a spatial correlation among some archaeological categories and specific areas. Finally, we will run a cluster analysis based on the structure's location to establish the association of pits in spatial clusters. We will illustrate this procedure with three study cases from different Late Neolithic and Chalcolithic sites of Eastern Spain.

The result has implications not only for understanding the intrasettlement spatial structure of IV-III millennium cal BC sites, but also for demographic reconstructions in population size that allow specifying the scale of social relationships and socioeconomic processes occurred along Late Neolithic and Chalcolithic periods.

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ORAL

## 6. ELEMENTS OF PRESTIGE RESIDENTIAL STRUCTURES VALENCINA DE LA CONCEPCIÓN (SEVILLA).

*Pajuelo Pando, Ana (Universidad de Sevilla) anapajuelo@gmail.com*

*López Aldana, Pedro Manuel (Universidad de Sevilla) aldanaostrogodo@gmail.com*

Social formations of the III millennium a.n.e. have left us a body of evidence that manifest with high complexity for understanding and possibilities of explanation from the material record. In the Chalcolithic settlement Valencina de la Concepción (Sevilla) this difficulty meridian way showing.

The structural variability, the problems of their location under the current population, the excavated space sparse compared to its size (over 400 ha.) makes scientific reading is subject to strong and healthy disagreements among different researchers. Based on the questionable basis of the existence of two major functional areas within the reservoir (necropolis area and residential

/ productive area), a model that we share, we present certain distinctive elements provided by the excavation in C / Trabajadores in Valencina de la Concepción where occupational sequence spanning much of the III millennium BC was obtained and provided significant elements of the organization of this human settlement in the Valley of the Guadalquivir.

Metallurgical products in copper and gold, in coexistence with other elements, speak of a complex and unequal social organization, with groups of skilled artisans at the power instituted sustained on a structured ideological apparatus.

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ORAL

## 7. A NEW READING ON CHALCOLITHIC FORTIFICATIONS AT CERRO DE LA VIRGEN (ORCE, GRANADA, SPAIN)

*Cámara Serrano, Juan Antonio (Departamento de Prehistoria y Arqueología. Universidad de Granada) jacamara@ugr.es*  
*Molina González, Fernando (Departamento de Prehistoria y Arqueología. Universidad de Granada), fmolina@ugr.es*  
*Pérez Bareas, Cristóbal (Arqueólogo Cerro de la Virgen located at Orce municipality is an important archaeological site in the eastern area of Granada province.*

Chalcolithic and Bronze Age occupations have been defined and certain features have been continuously referred by their )

Cerro de la Virgen located at Orce municipality is an important archaeological site in the eastern area of Granada province. Chalcolithic and Bronze Age occupations have been defined and certain features have been continuously referred by their importance in the study of Southeastern Iberia Chalcolithic such as round mud-brick houses, irrigation channel and fortification walls with herringbone pattern masonry.

Thanks to a protective intervention on the Cerro de la Virgen, which did not affect the unexcavated deposits, the situation of different stretches of fortification walls identified by W. Schüle has been analyzed.

It was possible to confirm the existence of levels dated prior to the erection of the main wall which in any case was built in an old time of the sequence, radiocarbon dated circa 2450 cal BC. The modification of the access area with the building of a new wall that seals the gate in the Bronze Age, around 2000 cal BC, has also been

attested. Anyway, the most interesting hypotheses have to do with the Chalcolithic parallel walls that had been previously proposed by W. Schüle.

Although these new proposals should be contrasted from extensive excavations, we can suggest that these parallel walls were originally part of the main wall and fell down in a depressed area generated by trimming vertical rock under the main wall which would be over 6 m high. In this sense the proposed irrigation channel could actually be a boundary ditch.

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ORAL

## 8. VALENCINA AND MARINALEDA, SETTLEMENTS WITH DITCHES IN THE IIIIRD MILLENIUM B.C.

*Mejías García, Juan Carlos (Universidad de Sevilla)*

*jcmejias@us.es*

*Cruz-Auñón Briones, M<sup>a</sup> Rosario (Universidad de Sevilla)*

*rcab@us.es*

Rising prehistoric settlements IIIrd millennium BC, where ditches are documented, holds a debate which focuses attention on the special functionality that they want to attribute to them.

Far from understanding these settlements as true villages with special characteristics, that should be explained within its socio-economic context and the territoriality involving their spatial distribution, they generate theories that interpret them as bounded spaces for ritualized practices, for inter and intragroup cohesion, for the defense, etc.

Therefore we present a depth analysis and research that we have done in the last 5 years in the settlements of the IIIrd millennium BC of Valencina and Marinaleda. This study allows us to handle a volume of data and information that shows clearly the daily life in these villages, the economic activities that transcend the boundaries of the site itself, and how death is used, including a planned way, to express strong social inequalities that are close to the definition of social classes.

To get our aims we have designed a Geographical Information System (GIS) to manage, to process, to analyze and to map the information about the sites and the results of the research.

We show examples of habitat structures, economic activity, planning and partitioning of interior spaces, planning and organization of the space of the necropolis,

and of course, the existence and use of ditches those in some cases for reinforcing and giving meaning to our particular hypothesis about these settlements.

Finally we'll share a project that we are developing, called SIAC (Shared Archaeological Information System), in which all data and information of our work is offered to the research community for their disposal and use.

The phenomenon is becoming so large and widespread that it becomes increasingly difficult to sustain these monofunctional approaches. If those theories are true we must ask: where people live? Moreover we do not reject that these features may be a part of the characteristics of the settlements.

Our approach goes through to vindicate the evidences in these settlements as true villages where the daily life of people is developed and in where social relations hold a mode of production in which the evidence of the existence of social classes are becoming stronger.

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ORAL

## 9. SETTLEMENT PATTERNS ON THE LOWER GUADIANA DURING THE THIRD MILLENNIUM BCE

*Inácio, Nuno (Universidad de Huelva) nuno.inacio@dhis1.uhu.es*

*Nocete, Francisco (Universidad de Huelva) nocete@dhis1.uhu.es*

*Bayona, Moisés (Universidad de Huelva) moises.rodriguez@dhis1.uhu.es*

In this congress we present the general objectives of MISURP (Mining and Metallurgical Activity of III Millennium BCE in Lower Guadiana) project and the preliminary results of the archaeological prospection survey developed on the left bank of the lower Guadiana (Alcoutim and Mértola Municipality). Within Iberian Pyrite Belt, one of the most important mining districts in the world, this project was designed with the aim of providing empirical information to the identification of settlement patterns associated with procurement processes, exploration, production and distribution of copper.

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ORAL

**10. THE TWO FORTIFIED SETTLEMENTS OF S. PEDRO'S SITE (REDONDO, ALENTEJO, PORTUGAL).**

*Costeira, Catarina (Uniarq) catarinacosteira@gmail.com*

The archaeological site of S. Pedro was located on top of prominent elevation within the village of Redondo (Central Alentejo, South of Portugal). The archaeological excavation was carried out by the archaeologist of the municipality of Redondo, it was motivated by the construction of a road that would condition the conservation of the site.

At the S. Pedro's site were identified five major moments of occupation, framed chronologically between the end of the 4th millennium BCE and most of the 3rd millennium BCE, two of which were characterized by the construction and use of two fortification structures with different dimensions and architectures.

In this communication we intend to analyse the structural characteristics of the two fortifications, in relation to the size, morphology and constituent elements (walls, towers, gates), as well as presenting the interior and exterior spaces demarcated by them. The intersection of all these data will allow reflection on the functionality and dynamic construction / reconstruction and abandonment of these structures fortification.

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ORAL

**11. WALLS WITHIN WALLS WITH DITCHES INSIDE: BACK TO THE THIRD MILLENNIUM AT VILA NOVA DE S. PEDRO (AZAMBUJA, PORTUGAL).**

*Arnaud, José (Associação dos Arqueólogos Portugueses) jarnaud@sapo.pt*

*Diniz, Mariana (UNIARQ e Associação dos Arqueólogos Portugueses) m.diniz@fl.ul.pt*

*Neves, César (UNIARQ e Associação dos Arqueólogos Portugueses) c.augustoneves@gmail.com*

*Martins, Andrea (Associação dos Arqueólogos Portugueses) andrea.arte@gmail.com*

Vila Nova de S. Pedro (VNSP), (Azambuja, Portugal) is a major Chalcolithic site in Western Iberia, systematically excavated since 1936 until 1966, then episodically in the 80's, that have been almost forgotten during the last decades in the debate while archaeological research moved to the vast enclosures recently identified in

Southern Portugal. The vast amount of artifacts from the 30-60's campaigns is kept in the Carmo Archaeological Museum (Lisbon) and since then several analyses have been made concerning particular groups of materials.

This paper is intended to be the departure of a research project focused within and around VNSP walls in which early data from previous excavation and some future specific field work will be used - under a third millennium agenda and methodology - to discuss Chalcolithic landscapes and cultural systems.

In order to fulfill this aim, a review of all the literature published relating to the site will be made, using new data to understand old archaeological excavations results. Particular attention will be paid to what concerns VNSP structures, stratigraphy and settlement diachrony. The descriptions and the graphic information produced throughout the 30's - 60's excavations carried out by Afonso do Paço and Eugénio Jalhay will be critically examined in detail.

What was described in the literature as VNSP's foundational deposit and a careful reading of what Paço (1943-44) published of its finding context, points to the existence of at least one ditch in VNSP. The description of the work done and the figure that illustrated that area, leaves no doubt about what was in fact being excavated: an asymmetrical ditch with 2 m depth where, as in other ditches, an intentional deposition of things - at least animal bones and a complete pottery vessel - seems to be present. After the ditch was fulfilled, at least in that sector, the occupation at VNSP goes on, which is reflected by the existence of a Chalcolithic hut floor on the top of the ditch.

Whether this was or not a foundational deposit, a symbolic, intentional, *ab initio* gesture at VNSP or just part of a ditch intentional fulfilling process is something that only future research may clarify.

The existence of at least one ditch previous to the walls in VNSP makes this settlement's history even more complex than it was previously assumed. Radiocarbon dating of the organic material from VNSP's stratigraphical sequence and in particular from this ditch could result in adding a VNSP 0 phase, to the traditional three phase picture.

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ORAL

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**12. LOWER VALLEY OF THE TAGUS RIVER, BETWEEN WALLS AND DITCHES, IN THE 3RD MILLENIUM BCE**

*Gonçalves, Victor (UNIARQ - University Of Lisbon) vsg@campus.ul.pt*

*Sousa, Ana Catarina (UNIARQ - University Of Lisbon) sou-sa@campus.ul.pt*

In the 3rd millennium BCE, in Lower Tagus we can see emerging new forms of social and territorial organization, also structured settlements, probably with different levels of hierarchy. On the global scale of central and southern Portugal we find different realities in different landscape units, reflecting their internal dynamics, exogenous influences and interactions with the landscape. It is particularly relevant the difference between the Estremadura and Alentejo. These areas have different research routes: Estremadura with mainly old research and Alentejo highlighting the new results carried out by preventive archaeology.

At the Lisbon peninsula the settlement is often represented by fortified sites. The sites with pits and ditches are practically absent. In the Alentejo, recent studies demonstrated the existence of a network of complex settlements with the coexistence of enclosures and fortified settlements. The sites with ditches begin before the 3rd millennium and persist until the end of the 3rd, probably assuming different meanings. The fortified settlements only begin around 2800 BCE and in the middle of the 3rd millennium are already under ruin. The Lower Tagus lies well between walls and ditches. On the right bank we found a set of fortified settlements on the edge of the Tagus basin. On the left bank, the information is very scarce. In addition to specialized sites on the exploitation of salt, in the vestibular area of the Tagus river, only the Sorraia area, a tributary of the Tagus (county Coruche) is actually under systematic research. In the Sorraia valley, the authors have been developing a research project to identify the network of settlements. It was possible to carry out excavations and geophysical surveys at two of the sites identified resulting in both cases in the discovery of ditches.

In Cabeçodo Pé da Erra, a small Copper Age farm near Coruche, the intervention area already amounts to 356 m<sup>2</sup>. Around the farm, we have found a defensive ditch with two phases of use, bordering a residential area with a minimum of seven huts with stone foundations and walls of clay, and functional areas (kitchens and

combustion areas, traces of cereal processing, milk, cheese and salt use...). The absolute chronology indicates a short occupation of the site in the 3rd quarter of the 3rd millennium.

Barranco do Farinheiro is located just 4 kilometers from the Cabeço do Pé da Erra. A preliminary survey revealed the presence of a ditch. The absolute chronology indicates an occupation in the middle of the 3rd millennium. The current vegetation difficult a reading of the surface, but it is likely that this site is older and bigger than Cabeçodo Pé da Erra.

The valley of the Tagus, on the left bank, is historically a privileged area of movement. In the Chalcolithic different influences seem to converge here at the level of material culture and the morphology of the settlements. We will present explanatory hypotheses for the specific dynamics of this territory and a generic perspective of the entire central and southern Portugal during the Chalcolithic.

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ORAL

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**13. NEW CAUSEWAYED ENCLOSURES IN NORTHERN SPANISH PLATEAU.**

*García García, Marcos (Universidad de Valladolid) mggarcia@fyl.uva.es*

The aim of this paper is to present 18 causewayed enclosures discovered in northern Spanish Plateau in the last 20 years. These sites are spread over the Douro basin, throughout the fertile sedimentary lands of several provinces of the Castile and Leon region: Palencia, Salamanca, Segovia, Valladolid and Zamora. Causewayed enclosures are a well-known kind of prehistoric sites in Europe, and they have been increasingly found in Spain and Portugal since the eighties. They show the same characteristics as their European 'relatives': one to three concentric and discontinuous ditches in a circular or oval design that surround sites between 0.5 to 4 hectares.

The majority of our enclosures were founded in the third millennium BC. In fact, the available radiocarbon dates offer an approximated range of 3300-2350 cal. BC. Some of them were reoccupied during the Bronze Age. Nevertheless, as far as we know from El Casetón de la Era II, ditches were filled after their desertion in 2350 BC. The confluence of several climatic phenomena (known as '4,0 ka BP event') on that date has led us to consider the change into a drier and warmer climate as a most

likely explanation for the end of the occupation of the enclosures.

Their structures have been identified using aerial photography. However, the archaeological data come from different research projects, including non-prehistoric or even emergency excavations. The camerawork is also heterogeneous: either oblique and orthographic or real colour and infrared. Anyway, we were able to find orthographic frames or, at least, to correct and georeference the oblique pictures. After that, we followed the visible alterations on the crop marks to draw a clean interpretation of the ditches using GIS and Remote Sensing software. Since the new data was georeferenced, it was easy to measure their parts and analyse their relationship with different geographical features such as rivers, heights and potential land uses. Therefore, we have stated several hypotheses of their possible strategies of subsistence and about their functionality from the analysed data.

Our conclusion is that the causewayed enclosures of the Douro represent the agrologic colonization of this region. From that point of view, their monumentality and singular deposits of entire animals symbolize the ritualization of new ways of production and social organization related to Sherratt's secondary products revolution.

29 samples were studied. Among the methods used, highlight the sedimentological analysis (grain size and texture), mineralogical (with the application of X-ray diffraction), chemical analysis (pH, conductivity and determination of organic matter) and finally, in one case, the micromorphological study (with thin sections).

These analyzes were performed in different laboratories of the Autonomous University of Madrid, and in the case of micromorphology in the McBurney Geoarchaeology Laboratory, University of Cambridge.

Mainly, we want to know the processes that led to a filling of the trenches, and determine if they are caused to a natural genesis, or conversely, whether a human intentionality in its existence. We present this communication because we can not always know the nature of the sedimentary fillings, unfortunately, by human disturbance (agriculture and other activities affecting soils) or by catastrophic environmental changes.

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#### ORAL

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#### **14. THE ENCLOSURE OF "CAMINO DE LAS YESERAS" (MADRID): SEDIMENTOLOGICAL APPROACH TO THE STUDY OF SOME SINGULAR STRUCTURES**

*Arteaga Cardineau, Carlos (Universidad Autónoma de Madrid) carteaga2000@yahoo.com*

*García Giménez, Rosario (Universidad Autónoma de Madrid) rosario.garcia@uam.es*

*Liesau von Lettow-Vorbeck, Corina (Universidad Autónoma de Madrid) corina.liesau@uam.es*

*Pérez Martín, Estefanía (Universidad Autónoma de Madrid) estefania.perez@estudiante.uam.es*

*Menduiña, Roberto*

*Vega, Jorge*

*Blasco, Concepción*

The aim of this paper is to present the preliminary results of physico-chemical study of sediments that fill various human structures belonging to the Chalcolithic site of "Camino de las Yeseras" (San Fernando de Henares, Madrid).

# B46 Iron Age communities in Western-central Europe: new approaches to landscape and identity

Organiser: Gonzalo Ruiz Zapatero and Manuel Fernández-Götz

Friday 5th (14:30 to 19:30)



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ORAL CONTRIBUTION

ORAL

## 1. ARCHAEOZOOLOGY AND IDENTITY: THE SYMBOLOGY OF ANIMALS IN THE IRON AGE SOCIETIES

*Albizuri Canadell Silvia (Universitat de Barcelona) silvia.albizuri@upc.edu*

*Nieto Espinet, Ariadna (Universitat de Lleida) nevolote@hotmail.com*

The presence of animal remains in the form of singular deposits and/or offerings in necropolis as well as in towns is a very usual fact in Catalonia during the Iron Age. The inherent complexity of the study on the animal role at the core of human societies pushes us beyond what's strictly the economical field and makes us taking into account aspects as, for instance, the collective imaginary, the social complexity, the symbolic codes, the beliefs, the import of new traditions and the affective relationships, fruit of their interaction with people. For this reason, the study of these singular practises and/or ritual patterns is an important contribution in the analysis of the construction and the evolution of the regional and/or local identity of a society. The symbols are the ones to help us when establishing the borders between territories and towns, the ones that allow the distinctness for ethnic groups, social status or genders. Symbols that are many times exemplified based on certain animals. And depending on the physical, ethological and ecological characteristics of these animals they will end up becoming totems or elements of prestige. Symbols that, through the sacrifice and the offering, perpetuate the collective imaginary in life and in death of a community.

This paper wants to offer a territorial radiography of the content, selection, context and location of the different deposits with animal offerings. All of this by analysing the regional particularities, the evolution of the above mentioned practises and their sociocultural implications from the end of the Bronze to the Iberian Age in Catalonia.

The results are obtained from integrated studies of faunal remains in various sites of the Iron Age in Catalonia. The most important are the Iberian settlement of Ca n'Oliver and the Early Iron Age settlement of Can Roqueta, in the pre-littoral depression, and the Iberian settlement of Vilars in the western plain.

The most representative bone assemblages of ritual practices are studied.

ORAL

## 2. ETHNICITY AND ARCHAEOLOGY IN CELTIC IBERIA. WHAT WAS TO BE VETTON, VACCEO, LUSITANIAN OR GALLAECIAN IN LATE IRON AGE?

*Álvarez Sanchís, Jesús Rafael (Departamento de Prehistoria (Universidad Complutense, Madrid) jralvare@ghis.ucm.es*

The ethnic groups of ancient Iberia, like many ethnic groups throughout the Celtic Europe, were not ultimately racial, linguistic, religious or cultural communities, but social groups whose origins were just as often imagined as they were real. The potential of material culture as an indicator of ethnic identity constitutes a difficult avenue of research, but one with future. For purposes of examining the emergence of ethnic groups during the Iron Age, we need to focus on expressions through material culture that survive the passage of time. By the III-I centuries BC some ethnic groups had a highly developed society which can be labelled as a "tribal states" comparable with those in other parts of central Iberia and in temperate Europe. Like these other states it possessed urban settlements (oppida) and a hierarchical society, apparently dominated by a military aristocracy. However, it had many characteristics which distinguish it from its contemporary societies, but we still need extensive field work and excavation of settlements to understand better how it functioned.

In this work, I examine evidence for some of the ways that Late Iron Age peoples of western and central Iberia created, transformed and expressed their identities. I shall highlight three principal problems: (a) the nature of the written sources, (b) how greek and roman authors perceive and express identities of peoples they encounter and (c) how that peoples restructured and reinforced their identities in response to the ways that romans represented them.

ORAL

## 3. BREAKING UNIFORMITIES: ETHNIC INDICATORS IN PRE-ROMAN CENTRAL SPAIN.

*Arenas Esteban, Jesús Alberto (Universidad a Distancia de Madrid) jesusalberto.arenas@udima.es*

Pre-Roman communities of the eastern Spanish Plateau have traditionally been categorized under the generic name of Celtiberians. This ethnonym was coined by historians who accompanied the Roman troops in their



confrontation with the Carthaginians during the Second Punic War. Hence, it is an etic interpretation of a complex cultural reality, in which foreign observers identified cultural traits they had met previously in other places: the Celtic world in central and western Europe and the "Mediterranean" Iberian Culture of the eastern coast of the Iberian Peninsula.

The development of new interpretive models, however, has allowed the static vision of Celtiberia as a cultural complex almost unchanged during its more than 500 years to be replaced by a more dynamic one, which is beginning to recognize some social and ideological internal processes, sometimes parallel in time. And against this cultural background, the configuration of specific identity spaces is taking increasing relevance.

Already in the formative process of the Celtiberian world, it is possible to recognize the confluence of different cultural traditions, of both indigenous and exogenous origin; traditions that have their own reflection in specific and perfectly distinguishable material manifestations. But it is during the plenitude stage of the Celtiberian culture, between the IV and II centuries BC, when this confluence becomes more apparent, especially because it manifests itself both in the settlement patterns and in the material culture. In those moments it is possible to recognize "intrusive cultures" in the static world construed by traditional Iron Age archaeology.

This paper analyzes the material evidence that may reflect specific identity frameworks. On the one hand, the specific configuration of some settlement patterns will be studied, together with the architectural traits associated; on the other, the adoption in pottery of decorative patterns highly distinctive with respect to the material environment into which they are embedded.

This research leads to the recognition of the arrival of a series of cultural stimuli from the Mediterranean coast. Its appearance could be linked to large geostrategic control infrastructures. This phenomenon could imply, at least at its beginning, the arrival of human groups who established their identity by means of a distinctive material culture, clearly discernable from the dominant cultural environment.

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ORAL

#### **4. CRAFT-PRODUCTIONS OF VERRACOS SCULPTURES AS ETHNICAL SYMBOLS FROM SPANISH IRON AGE: NEW APPROACHES TO AN OLD SUBJECT.**

*Berrocal-Rangel, Luis (Universidad Autónoma de Madrid)*  
*luis.berrocal@uam.es*

*García Giménez, Rosario (Universidad Autónoma de Madrid)*  
*rosario.garcía@uam.es*

*Manglano Valcárcel, Gregorio Ramón (Universidad Autónoma de Madrid)*  
*gregorio.manglano@gmail.com*

Great walls with stone masonry and big animal sculptures, both usually made in granite rocks, are the most characteristic productions in the Archaeology of the Late Iron Age in Western of Iberian Peninsula. The second ones, animal sculptures are representations of male boars and bulls known as "verracos", are the most important skilled labours between the stone's craft productions from these communities, the "Vettonos" according to Roman and Greek classical writers. Recent investigations have interpreted them as a technical borrowing from the Iberian people, who lived in Mediterranean Iberia from 5<sup>th</sup> Century B.C. forward, but also it is proposed the existence of a link between the ethnical and communal values of the older "verracos" and a functional change to funerary monuments during Roman times, with individual meanings. Our approaches through petrological and macro-wear analyses for identifying differences in the making of these sculptures that help to explain these functional and meaning changes and develop our knowledge about these sculptures, as popular as usually without archaeological context. From these approaches we have defended the earlier presence of itinerant craftsmen, authors of sculptures in blocks or slabs from quarries and in the same bed rock, but also it is possible define the existence of later factories, places where the figures were shaped through standardized process. Between them, the production of "verracos" shows an intermediated stage, where the links between the place of making the sculptures and the communities that produced them started to be fixed, but sizes, shapes and spatial relationship with nearest *oppida*, allow to defend new values of ethnical and communal nature, that matched very well with the first Mediterranean presences (Carthaginian and Roman armies...) in the Western Meseta.

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ORAL

#### **5. NEGOTIATING IDENTITIES: ETHNIC AND POLITICAL CONSTRUCTS IN IRON AGE EUROPE**

*Fernández-Götz, Manuel (University of Edinburgh)*  
*M.Fernandez-Gotz@ed.ac.uk*

The possibility of exploring identities in past societies

constitutes one of the most exciting fields of Iron Age research. In European archaeology, much of the interest in ethnicity has been centred on the First Millennium BC, which is natural since the incipient availability of texts and ethnonyms stimulates the search for ethnic identities in the archaeological record. Building upon the reassessment of the conceptualization of ethnicity in the human sciences, this paper will focus on the frequent identification between ethnic and political processes.

Both elements complement each other perfectly in processes of collective construction. Instrumentalist perspectives have underlined the important role of ethnicity when reinforcing and harnessing socio-political formations. In fact, the Ancient world is filled with examples of political entities being imbued with strong group identity, from the Greek poleis to the Late Iron Age Gallic polities. This paper will argue that a distinction between city-states and tribal-states is useful for gaining a better understanding of Iron Age communities. Moreover, in both cases sanctuaries and the worship of founding heroes played a key role in the symbolic construction of political and ethnic communities.

ORAL

## 6. BORDERLANDS IDENTITIES IN SOUTHWESTERN IBERIA IN THE 9TH TO 6TH CENTURIES BC

*Marín Aguilera, Beatriz (Universidad Complutense de Madrid) beatriz.marin@ghis.ucm.es*

By the early first millennium BCE, Phoenicians had established permanent colonies all across the Mediterranean. Southern Iberia was the area where most of those settlements were founded (9<sup>th</sup> to 6<sup>th</sup> centuries BC). The nature of the relationship between Phoenicians and locals in Iberia during this period is still a controversial matter, although scholars seem to agree that in terms of economy such a relation was based on mutual dependence. However, studies of South Iberian material culture have traditionally been dominated by art historical approaches that have greatly emphasised the Orientalisation of local elites, i.e. the Phoenician supremacy.

Consequently, analyses have been focused on the nature of the Oriental imports (serving ware, amphorae, etc.) and Phoenician customs (funerary banquets) in local cemeteries. Problems arise when local necropoleis are studied in depth, because funerary ware and practices are quite different from the Oriental rituals and very

similar to the traditional ones. This paper seeks to analyse the pottery assemblage of La Joya Necropolis, located in Huelva (Spain) as a case study to quantify and qualify the impact of the Oriental influences and practices on local communities between the 9<sup>th</sup> and 6<sup>th</sup> centuries BC.

Ritual consumption vessels at La Joya necropolis can be divided into three different categories: tableware, serving ware, and storage/offering ware. Local-style pottery is present in more than 50% of both tableware and storage ware. A Phoenician ritual assemblage is only present in Tombs 17 and 18, i.e. two of nineteen, and even in such tombs a bronze vessel service composed of a piriform jar and/or a ritual recipient replaces Phoenician serving pottery in both tombs.

Before the Phoenician arrival, South Iberian communities already had ritual funerary banquets, and they continued to have them during the Phoenician presence in their territory (9<sup>th</sup>-6<sup>th</sup> centuries BC). Moreover, local elites at La Joya commonly used traditional pottery shapes as both serving ware and tableware between the 9<sup>th</sup> and 6<sup>th</sup> centuries BCE instead of Phoenician assemblages. Ritual banquets and offerings were thus connected to local cuisine and deeply rooted in traditional practices, not in Phoenician ones.

ORAL

## 7. PRE-HISTORIC LANDSCAPE 3K YEARS AGO: CHARACTERIZATION VARIABLES FOR ARCHAEOLOGICAL PREDICTIVE MODELS IN DEMPSTER-SHAFFER THEORY USING GIS PLATFORM.

*Maximiano Castillejo, Alfredo (IIIIPC University of Cantabria) maximianoam@unican.es*

This dissertation is part of a scientific initiative namely: *Prehistoric Landscape Research in the northern mountainous area of Burgos via geocomputacional technology*. We introduce the results of archaeological survey oriented by spatial predictive models about fortified habitats around 3k BP years.

The main difficulty of this study was the very low population ( $n = 3$ ) (Bohigas *et al.* 1984; Peralta Labrador ...; Sacristan de Lama 2007) and total absence of archaeological excavations in extensive area -100sq km- (a sector inside Natural Park of *Hoces del río Ebro y Rudrón*). In this circumstances, we could not apply conventional spatial prediction methodology like *Logistic regression, Boolean algebra, Bayesian statistics, or*

*cellular automate* (Leusen 2002; Verhagen 2006). The use of spatial predictive modeling is something significantly useful not only for predicting archaeological locations, but also it is an exercise in understanding the landscape characterizing and weighting of certain variables and attributes (e.g. topography, geomorphology, anthropology, ecological ...).

With this, we could establish a holistic perception of territory in which a particular set of social actions performed in certain historical moments (*Landscape*). From methodological issues, our spatial predictive modeling is based on the Dempster-Shafer theory (Beynon *et al.* 2000, Canning 2005), with our low population and the complex problem in determinate an answer to the predictive modeling question in terms of binary opposites (site/non-site); however we work with degree of probability (through different levels of certainty-uncertainty) that a given event (presence/nascence of site) happens or not. In other words, the DS models are used to assess the degree to which evidence provides concrete support for a hypothesis (belief) and the extent to which it does not disprove the hypothesis (plausibility). We employed as a cross-tool, a GIS in which we quantified and reclassified variables with spatial implications about territory. Alongside this, we included a number of historically parameters linked with the social dynamics of fortified settlement 3k years ago in this area of the Iberian Peninsula (e.g. visual control, easy defense, accessibility to resources, mobility in territory...)

Finally, we create a predictive model where we achieved positive results in finding new archaeological sites; but also, we have characterized a set of relationships -statistically significant- between environment and social practices: Landscape of Iron Age in the concurrence of Castilla-León plateau and Cantabrian Mountains.

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ORAL

## **8. VILLANUEVA DE TEBA NECROPOLIS (LA BUREBA, BURGOS): GENDER AND SOCIAL HIERARCHY.**

*Ruiz Vélez, Ignacio (UNED. Burgos) igruvel@yahoo.es*

Villanueva de Teba necropolis, which dates back to the second Iron Age, has some common features to that of its time, but also specific ones that somehow allow us to identify interesting social aspects related to gender and social hierarchy. The study of the bones at cremation and the reachness of its trousseaus lend themselves to deduce some conclusions. This necropolis proves that

there are also arms in female tombs as an indicator of their social status; and that the ratio of men to women is similar to that of other necropolis, dating back to the Iron Age, within the Iberian Peninsula. It also proves that there are no infant tombs and that the trappings of horses also indicate the social status.

On the other hand, social hierarchy is shown by certain funerary objects. The large belt brooches show a high social class; the trappings of a horse, the brooches of belts of Iberian type and the fibula, allow us to know the in-between periods. Needless to say, all the funerary objects are of great beauty and have a big size.

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ORAL

## **9. RECENT PERCEPTIONS ON IRON AGE LANDSCAPES.**

*Ruiz-Zapatero, Gonzalo (Complutense University, Madrid) gonzalor@ghis.ucm.es*

In the last two decades different European archaeological traditions have been approaching in different ways landscapes lived and perceived by Iron Age peoples. In fact the approaches have used different scales of time and space inside a diversity of theoretical paradigms. But a more or less general agreement seems to consider as the right question: How Iron Age peoples perceived and understood their worlds?

Approaching landscapes involve a wide range of methodologies which have included: a) agricultural archaeology, b) symbolic dimensions embebed in landscapes, c) exploration of landscapes as dynamic entities through practice and activity, d) attempts of getting insights on non-visual sensory experience in landscapes, e) propositions for discovering the sense of being and maenings behind creating Iron Age sites in particular settings, f) understanding ancient skyscapes as inspiring objects decoration and special patterning of site features in relation to wider landscape.

In this paper I review different case studies on different Iron Age landscapes through Europe dealing with those approaches in order to develop operative research lines and to evaluate how the diversity of European traditions enrich our ways of thinking ancient landscapes.

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ORAL

## 10. LANDSCAPES AND ARCHITECTURE IN THE IRON AGE OF ATLANTIC SCOTLAND.

*Sharples, Niall (University of Cardiff) sharples@cardiff.ac.uk*

In this paper I will examine the location of the monumental roundhouses, brochs, of Atlantic Scotland. These structures are normally understood through examination of their architecture which is striking and dramatic, with walls standing up to 13m in height at the best preserved example, Mousa in Shetland. However, I will argue that the significance of these structures is best understood by examining their location in the landscape. The occupants and builders use the drama of landscapes that are characterised by sea cliffs, lochs, cliff defined hills, bog and ancient monuments to draw important distinctions between wild and domesticated that provide clear signposts to the social significance of the architecture and the role of the occupants.

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ORAL

## 11. SETTLEMENT PATTERNS, AGRICULTURE AND ENVIRONMENTAL DYNAMICS IN NW IBERIA DURING THE IRON AGE.

*Tereso, João Pedro (CIBIO - Research Center in Biodiversity and Genetic Resources - University of Porto) jptereso@gmail.com*

The Iron Age in northwest Iberia is a period of increasing complexity. In the sequence of Late Bronze Age trends, settlements became more solid and complex, reinforcing themselves as territorial marks. Being a time of well-known changes in terms of climate, vegetation and soil erosion, it is determinant to understand how human communities coped with it, namely regarding their subsistence strategies. Here we will focus the trade-offs between climate, landscape and agriculture during the Iron Age in NW Iberia.

A thorough revision of archaeological and carpological data was made. To allow comparisons between sites, the revision of data was preceded by a homogenization of crops' nomenclature. Carpological data was contrasted with the abundant palynological and sedimentary data available for the region. The chronological parameters used were those presented in the bibliographic references specific to each site and whenever the information concerning the provenience or chronology of archaeobotanical material

was considered unreliable, those sites were excluded from this synthesis.

Data from Iron Age sites in northwest Iberia document a complex and diverse agricultural system based on different cereals. The more abundant cereals are *Panicum miliaceum*, *Avena*, *Hordeum vulgare* subsp. *vulgare* and hulled wheat (mostly *Triticum turgidum* subsp. *dicoccum* and *Triticum aestivum* subsp. *spelta*). Still, the presence of naked wheat - *Triticum aestivum/durum/turgidum* - is very significant. On the other hand, there is little diversity of non-cereal crops and only *Vicia faba* has been constantly retrieved in the excavations. Hence, there is an increasing relevance of hulled wheat in the Iron Age, contrasting with previous periods. This trend is in clear contrast with other well studied Iberian regions.

Palaeoenvironmental data demonstrates the Iron Age is a period of marked anthropogenic landscape change, namely regarding deforestation and soil erosion. On what climate is concerned, a cooler and wetter period seems to have begun in the early phases of Iron Age. This scenario may have favoured the use of hulled wheat, since they are more productive in case of climate deterioration and poor soils. Still, the growing importance of hulled wheats and the predominance of crops adapted to harsh environmental conditions must be interpreted not only on the basis of paleoclimate data but mainly in the context of relevant social and settlement changes. In fact, in a region where communities were losing mobility and territorialisation was enhanced, boundaries are likely to have emerged, constraining and regulating human action. Thus, when agricultural soils became weary, mobility was no longer an option and communities were limited to whatever solution their own land would provide. They had to develop ways to restore fertility, adapt their crops and optimize the use of their territory. The main characteristics of Iron Age agriculture and landscape are, thus, a result of long-term dynamics regarding settlement patterns, territorialisation and crops' preferences. Environmental factors such as soils and climate may have acted as significant constraints.

POSTER

POSTER

**12. AN INTEGRATED GEOARCHAEOLOGICAL APPROACH TO ASSESS HUMAN FORCING ON LANDSCAPE EVOLUTION OF A LATE BRONZE AGE AND IRON AGE OPPIDUM (CORENT, AUVERGNE, FRANCE).**

*Mayoral Pascual, Alfredo (Clermont Université, Université Blaise Pascal, GEOLAB, BP 10448, F-63000 Clermont-Ferrand, France/CNRS, UMR 6042, GEOLAB, F-63057 Clermont-Ferrand, France) alfredo.mayoral@univ-bpclermont.fr*

*Peiry, Jean-Luc (Clermont Université, Université Blaise Pascal, GEOLAB, BP 10448, F-63000 Clermont-Ferrand, France/CNRS, UMR 6042, GEOLAB, F-63057 Clermont-Ferrand, France) j-luc.peiry@univ-bpclermont.fr*

*Berger, Jean-François (CNRS, UMR 5600, EVS-IRG & Université Lyon 2, 5 avenue Pierre Mendès-France, F-69676 Bron Cedex) jean-francois.berger@univ-lyon2.fr*

*Poux, Matthieu (CNRS, UMR 5138, Laboratoire Archéométrie et Archéologie & Université Lyon 2, MSH Maison de l'Orient et de la Méditerranée, 7 rue Raulin, F-69365 Lyon cedex 07) matthieu.poux@univ-lyon2.fr*

*Milcent, Pierre-Yves (CNRS, UMR5608, TRACES & Université de Toulouse 2 le Mirail, Maison de la Recherche Bât 26 Laboratoire 5, allée Antonio Machado F-31058 Toulouse Cedex 9) milcent@univ-tlse2.fr*

*Vautier, Franck (CNRS, USR 3550, MSH, F-63057 Clermont-Ferrand, France /Clermont Université, Université Blaise Pascal, Maison des Sciences de l'Homme, BP 10448, F-63000 Clermont-Ferrand, France) franck.vautier@univ-bpclermont.fr*

*Miras, Yannick (Clermont Université, Université Blaise Pascal, GEOLAB, BP 10448, F-63000 Clermont-Ferrand, France/CNRS, UMR 6042, GEOLAB, F-63057 Clermont-Ferrand, France) yannick.miras@univ-bpclermont.fr*

In Western Europe, recent studies show that emerging urban worlds developed during the Iron Age, yet there are many questions surrounding the dynamics of these occupations, the non-linear processes of urbanisation, long-term socio-environmental interactions and land use history .

The AYPONA programme (dir. Y.Miras & F.Vautier) represents an innovative and integrated project that aims to better understand these agglomerations in the long term, through geoarchaeology, environmental archaeology and geomatics. This combination of palaeoenvironmental and archaeological datasets will be used to provide a more complete knowledge of the

origin of these agglomerations, their characteristics, the drivers of their evolution, their environmental impacts, and their connections with the rural environment.

The volcanic plateau of Corent situated 250 m above the valley of the River Allier in Auvergne (France), is an agglomeration with a long archaeological record covering the last 5000 years, including an Iron Age oppidum which may have been the capital of the Arverni. Archaeological work directed by M.Poux and P.Y.Milcent since 2001 has revealed monumental urban characteristics, but also impressive commercial and cultural wealth, showing early links with Mediterranean world. This original setting in a high plateau over the well-known context of Limagne plain, a long-term occupation and first order archaeological importance, makes Corent an exceptional site to conduct the AYPONA programme.

This paper introduces the geoarchaeological objectives of the AYPONA programme, which are threefold:

- i) characterize geomorphologic impacts of human occupation on the plateau slopes and alluvial plain of the Allier river in terms of connectivity and morphological evolution.
- ii) determine whether human activity or climate variability are the primary drivers of physical processes (erosion-sedimentation rates, thresholds in sediment fluxes due to major changes in landscape use).
- iii) use the findings to produce a geomorphological evolution model.

Geoarchaeological work will be developed in four phases:

- i) a preliminary phase, comprising geomorphological characterization and mapping through fieldwork, geological and archeological information analysis, carto-photointerpretation and LiDAR data exploitation.
- ii) secondly, specific prospection will be focused on areas with geoarchaeological potential, with coring and trenching.
- iii) laboratory analysis, including granulometry, micromorphology, anthracology, magnetic susceptibility and geochemistry in order to evaluate and characterize the origin and nature of sediment fluxes, human impact and erosive phases of high geomorphological connection between slopes and alluvial plain, vs. phases of stability and soil formation.
- iv) finally, reconstructing

slopes and alluvial palaeodynamics and comparing their connection phases to occupation periods and human activity, but also with natural hydroclimatic phases, will allow an appreciation of the origins of forcings that will permit the production of a geoarchaeological evolution model.

To date the first phase of geoarchaeological work at the Oppidum of Corent has produced valuable information detailing the geomorphological setting and processes, providing a robust basis for further work. Most importantly, it has allowed the detection and characterization of areas, on the top of the plateau, the slopes and low alluvial plains, where sediment accumulation probably dates from the late Holocene (especially the Iron Age). This will be highly useful for focusing geoarchaeological work in the following phases of investigation.

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POSTER

**13. QUARRIED LANDSCAPE IN IRON AGE TALAYOTIC SETTLEMENTS: MENORCA, SPAIN.**

*Perez-Juez, Amalia (Boston University) amaliapj@bu.edu*  
*Goldberg, Paul (Boston University) paulberg@bu.edu*

The island of Menorca, Spain, hosted the development of the Talayotic Culture in the first millennium BC. During this period, the landscape was transformed by the construction of megalithic structures, both for public buildings –watchtowers and sanctuaries- as well as private buildings –domestic spaces, storage areas-. These striking features have been extensively studied in recent decades. Major archaeological projects have been carried out in buildings, dealing primarily with the architecture and the objects found in them. Interestingly enough, although all these structures are built with a specific local limestone, there has been very little attention paid to the provenance of raw materials and quarrying techniques. A similar lack of interest applies to the inter-building spaces in the settlements or non-architectural environment, which have wonderful potential for understanding the complete fabric of the living space.

Quarrying of the limestone took place both within buildings, as well as within open public space, and most likely from nearby outcrops. Jointing of the bedrock plays a major role in quarrying activities, which in turn determines the shape of the buildings and their internal organization. Moreover, the overall site layout – structure public spaces, open areas, circulation paths – is

conditioned by the underlying bedrock and the way it was exploited.

In this poster we present some initial results of our excavations and interdisciplinary research at Torre d'en Galmés, Menorca, that contribute to a greater understanding of the large site complex as a whole, quarrying and building methods specifically, and how all this relates to other sites in the Balearic Islands.

Although there have been attempts to locate Talayotic quarries, a new approach is needed to further document the use and source of building materials. Prehistoric quarrying was carried out everywhere, both within sites and in the open landscape. At Torre d'en Galmés, Menorca, we have carried out an interdisciplinary approach to provide holistic insight into non-traditional areas of study. By applying geoarchaeology, micromorphology, as well as the study of phytoliths, charcoal, bones and pottery we have come to a variety of conclusions that we present in this poster.

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POSTER

**14. NURAGIC SETTLEMENT DYNAMICS BETWEEN BRONZE AND EARLY IRON AGE: THE CASE STUDY OF THE SOUTHERN SULCIS (SOUTH-WESTERN SARDEGNA, ITALY).**

*Velli, Adriano (Universidad de Granada) adrianoveli@libero.it*  
*Velli, Emiliano (Independent researcher) geminiem@tiscali.it*  
*Cabras, Marco (Universidad de Granada) marcocabras@correo.ugr.es*

In this paper we discussed the settlement dynamics related to a portion of sulcis (south-western sardinia) between the bronze and early iron age. More generally it fits in the now more frequent studies of landscape archaeology that analyze the potential applications of statistical and spatial analysis in a GIS-based research aimed at evaluating the settlement choices of nuragic civilization in sardinia. Despite the small amount of data from archaeological excavations, together with the increasing risk to which the archaeological heritage of the area is exposed due to the poor protection made by the relevant authorities, the important remains of the bronze and early iron age that characterize and mark still so deeply this area make important to fully understand the relationship between men and environment and settlement strategies adopted by the sardinian populations of recent prehistory.

More precisely, this is a 68 square kilometres morphologically heterogeneous area composed by a broad alluvial plain enclosed by the sulcis massif and the sea. This is an inclusive area among the rivers rio gutturu saidu and the rio palmas, and is bordered to the east by the hills of masainas and sant'anna arresi and from the gulf of palmas coast to the west. The earliest evidences of anthropic settlements from this area date back to neolithic. The following paper tries to explain the settlements pattern of the nuragic age in this part of sulcis analyzing 32 sites dated back between the bronze and the early iron age. In most cases investigations have highlighted badly preserved structures which, however, testify to a particular settlement choices related to specific territorial features. This work was conducted with the most modern methods of landscape studies: statistical analysis methods (cluster and principal components analysis) and other tools for GIS-based analysis for the study of relationships between sites and territory (map algebra, viewshed analysis, cost surface analysis, least-cost path).

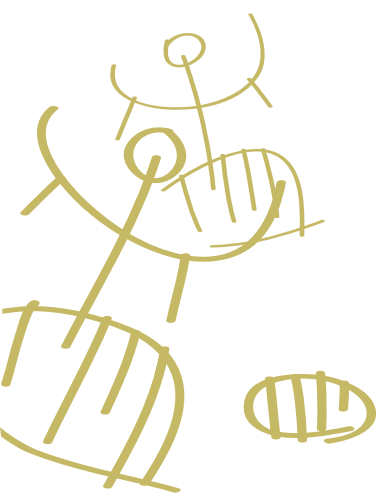
This research, developed through a series of field surveys carried out by the authors, have shown the presence of at least 7 unknown nuragic sites, never described before. The GIS analysis applied to the settlement pattern have also shown particular interest in certain sensitive areas, and more suitable for specific economic activities.

In conclusion this work shows that the sites are mostly concentrated in the areas closest to the inner portions of the territory, near the hills that surround the alluvial plain, to control the access routes to the proximal mountain regions known for the abundance of minerals. The coastal area seems to be also settled, especially for agricultural activities. The archaeological record therefore suggests a massive occupation of the considered area from bronze till early iron age for purposes strictly related to environmental features.

# B48 “To come, to go, to stay”: ancient DNA and C/N and Sr isotopes analyses as indicators of human relationships during the Holocene

Organiser: Manuel Ángel Rojo Guerra, Rafael Garrido Pena and Kurt W. Alt

Friday, 5th (09:00-13:30 15:00-19:30)  
B05 Meeting room



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ORAL CONTRIBUTION

ORAL

**1. THE SIGNIFICANCE OF ANCIENT DNA AND ISOTOPE ANALYSES IN THE NEOLITHIC OF CENTRAL, SOUTHEAST AND WESTERN EUROPE ? CONCEPT, DESIGN AND REALIZATION OF THREE MULTIDISCIPLINARY PROJECTS**

*Alt, Kurt W. (Integrative Prehistory and Archaeological Science, Basel University, Switzerland; Danube Private University, Krems, Austria; State Office for Heritage Management and Archaeology Saxony-Anhalt and State Museum of Prehistory Halle, Germany) alt.kurt@unibas.ch*  
*Roth, Christina (Institute of Anthropology, Mainz University, Germany) rothch@uni-mainz.de*

*Tejedor, Cristina (Fundación del Patrimonio Histórico de Castilla y León, Valladolid, Spain) tejedor.cristina@gmail.com*  
*García, Íñigo (Laboratoire TRACES UMR5608, University of Toulouse, France) igmtzl@gmail.com*

*Rojo Guerra, Manuel A. (Department of Prehistory and Archaeology, University of Valladolid, Spain) marojo@fyl.uva.es*  
*Kunst, Michael (German Archaeological Institute, Madrid, Spain) michael.kunst@dainst.de*

*Garrido Pena, Rafael (Department of Prehistory and Archaeology, Autónoma University of Madrid, Spain) rafael.garrido@uam.es*

*Risch, Roberto (Departament de Prehistòria, Edifici B, Universitat Autònoma de Barcelona, Spain) roberto.risch@uab.es*  
*Haak, Wolfgang (Australian Centre for Ancient DNA, University of Adelaide, Australia) wolfgang.haak@adelaide.edu.au*

*Brandt, Guido (Bioarchaeometric Group, Institute of Anthropology, Johannes Gutenberg-University of Mainz, Germany) brandtg@uni-mainz.de*

*Siebert, Angelina (Institute of Anthropology, Mainz University, Germany) angelina.siebert@uni-mainz.de*

*Friederich, Susanne (State Office for Heritage Management and Archaeology Saxony-Anhalt and State Museum of Prehistory Halle, Germany) sfriederich@lda.mk.sachsen*

*Meller, Harald (State Office for Heritage Management and Archaeology Saxony-Anhalt and State Museum of Prehistory Halle, Germany)*

*Szécsényi-Nagy, Anna (Institute of Anthropology, Mainz University, Germany, Hungarian Academy of Science, Budapest, Hungary)*

*Keerl, Victoria (Institute of Anthropology, Mainz University, Germany)*

*Fecher, Marc (Institute of Anthropology, Mainz University, Germany)*

*Banffy, Eszter (German Archaeological Institute, Roman-Germanic Commission, Frankfurt a.M, Germany)*

Funded by grants from the German Research Foundation, anthropologists and archaeologists are working together intensely on three projects concerning the population and settlement history of prehistoric Central, Southeast and Western Europe. Our first study region is the Middle Elbe-Saale region in Central Europe, the second is the Carpathian Basin, which played a key role in the early Neolithic settlement in Central and Southeast Europe, and the third region is the Iberian Peninsula. This latter has been proposed to be the scene of a contemporaneous but independent Neolithic cultural history, especially in comparison with the other two study regions. The three projects share a coherent underlying concept. First, this concept involves an integrated multi-disciplinary approach including archaeological, anthropological, molecular, biochemical and geochemical methods. Secondly, our aim is to generate an overview of the Neolithization of Europe by regarding not only the route from the Middle East through the Balkans towards central Europe. We also investigate how data from Germany, Hungary, Croatia and the Iberian Peninsula can be utilized in the light of developing a broader, pan-European understanding of population dynamics in the Neolithic.

ORAL

**2. DIACHRONIC DIET RECONSTRUCTION USING STABLE CARBON AND NITROGEN ISOTOPES OF EARLY NEOLITHIC TO BRONZE AGE SITES IN SPAIN**

*Held, Petra (Institute of Anthropology, University of Mainz) pheld@uni-mainz.de*

*Garrido Pena, Rafael (Department of Prehistory and Archaeology, Autónoma University of Madrid, Spain) rafael.garrido@uam.es*

*Rojo Guerra, Manuel A. (Department of Prehistory and Archaeology, University of Valladolid, Spain) marojo@fyl.uva.es*

*Risch, Roberto (Departament de Prehistòria, Edifici B, Universitat Autònoma de Barcelona, Spain) roberto.risch@uab.es*

*Rihuete Herrada, Cristina (Departament de Prehistòria, Edifici B, Universitat Autònoma de Barcelona, Spain) cristina@sonformes.mallorca.museum*

*Lull, Vicente (Departament de Prehistòria, Edifici B, Universitat Autònoma de Barcelona, Spain) lubio@arrakis.es*

*Micó, Rafael (Departament de Prehistòria, Edifici B, Universitat Autònoma de Barcelona, Spain) rafael.mico@uab.es*

*Tejedor, Cristina (Fundación del Patrimonio Histórico de Castilla y León, Valladolid, Spain) tejedor.cristina@gmail.com*

*García, Íñigo (Laboratoire TRACES UMR5608, University of Toulouse, France) igmtzl@gmail.com*

*Flores-Fernandez, Raúl (Professional Archaeologist, Parla,*

Madrid, Spain)

Royo Guillén, J.I. (Technical Superior. Gobierno Aragon, Spain)

Arcusa Magallon, Hector (Professional Archaeologist, Spain)

Alt, Kurt W. (Integrative Prehistory and Archaeological Science, Basel University, Switzerland; Danube Private University, Krems, Austria; State Office for Heritage Management and Archaeology Saxony-Anhalt and State Museum of Prehistory Halle, Germany) alt.kurt@unibas.ch

Stable isotope analysis is a powerful tool to reconstruct the diets of prehistoric and historic populations. Until now only few isotopic studies have been carried out for the prehistoric Iberian Peninsula. In the present study human and animal bones from four different sites (Cueva de Els Trocs, Alto de Reinoso, Humanejos, and La Bastida) dating from the Early Neolithic to the Bronze Age (El Argar culture) were sampled and stable carbon and nitrogen isotope analysis were conducted. For each site isotopic values and diet reconstructions will be discussed in detail in context to their anthropological and archaeological settings. For the site of La Bastida findings on weaning practices will also be presented. Comparing the four sites we demonstrate how diet was influenced by subsistence patterns, settlement systems, cultural factors and by the specific environmental givens.

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#### ORAL

### 3. FROM LOCAL TO CONTINENTAL LEVELS : HOW PALEOGENETICS CAN ADDRESS ARCHAEOLOGY QUESTIONING? THE EXCEPTIONAL CASE OF A FRENCH NEOLITHIC SITE, GURGY 'LES NOISATS'

Rivollat, Maïté (Université de Bordeaux - PACEA) maite.rivollat@u-bordeaux.fr

Le Roy, Mélie (Université de Bordeaux - PACEA) melie.leroy@u-bordeaux.fr

Mendisco, Fanny (Université de Bordeaux - PACEA) fanny.mendisco@u-bordeaux.fr

Pemonge, Marie-Hélène (Université de Bordeaux - PACEA) marie-helene.pemonge@u-bordeaux.fr

Coutelier, Clément (Université Bordeaux Montaigne - Ausonius) clement.coutelier@u-bordeaux3.fr

Couture-Veschambre, Christine (Université de Bordeaux - PACEA) christine.veschambre-couture@u-bordeaux.fr

Tillier, Anne-marie (Université de Bordeaux - PACEA) anne-marie.tillier@u-bordeaux.fr

Rottier, Stéphane (Université de Bordeaux - PACEA) stephane.rottier@u-bordeaux.fr

Deguilloux, Marie-France (Université de Bordeaux - PACEA) marie-france.deguilloux@u-bordeaux.fr

Paleogenetics, like other bioarchaeological methods, have greatly benefited the last years from major technical advances. Various funerary and population questions could be addressed through ancient DNA analyses. Our aim is to illustrate some aspects of this advancement through the exceptional example of the Neolithic site Gurgy 'Les Noisats', in the French Paris basin.

This site consists of a necropolis (4900 - 4500 BC) grouping 128 individuals. Mitochondrial DNA markers (HVRI and SNP analysis) were analyzed on 102 individuals and HVRI sequences were successfully recovered for 39 individuals.

Characterization of the maternal genetic pool, the biggest obtained so far for the Neolithic period, provides new and major arguments in the discussion of local and regional/continental questions.

Thanks to a Geographic Information System (GIS), a first intra-population approach was conducted to highlight potential correlation between genetic structure of the group and archaeological parameters (spatial distribution, chronology and funerary data). Some specific links were found between graves and enabled us to propose interesting hypotheses concerning the site organization.

Furthermore phylogeographical analyses were made with regard to the debate of European neolithisation. The chronological and geographical position of Gurgy 'Les Noisats' site is particularly significant to this debate. Indeed, in Early and Middle French Neolithic, Gurgy 'Les Noisats' is the most important necropolis located at crossroads between the Danubian and Mediterranean waves of neolithisation. The results of the phylogeographic analyses (Fst, shared haplotypes, haplogroups frequencies) point out an equal contribution of Central and Southern European Neolithic populations in the elaboration of the Gurgy genetic pool. These results support the archaeological arguments previously collected on the site.

Then, the data obtained from these French Neolithic farmers represent a major contribution to the understanding of population movements in the Neolithic time and illustrate the multiple interests of a paleogenetic approach to various archaeological questions, from local to continental scale.

ORAL

**4. THE NEOLITHISATION OF IBERIA: COLONIZATION, ADOPTION OR AUTOCHTHONOUS ORIGIN?**

*Rojo Guerra, Manuel A. (Department of Prehistory and Archaeology, University of Valladolid, Spain) marojo@fyl.uva.es*  
*Garrido Pena, Rafael (Department of Prehistory and Archaeology, Autónoma University of Madrid, Spain) rafael.garrido@uam.es*

*García, Íñigo (Laboratoire TRACES UMR5608, University of Toulouse, France) igmtzl@gmail.com*

*Tejedor, Cristina (Fundación del Patrimonio Histórico de Castilla y León, Valladolid, Spain) tejedor.cristina@gmail.com*

*Alt, Kurt W. (Integrative Prehistory and Archaeological Science, Basel University, Switzerland; Danube Private University, Krems, Austria; State Office for Heritage Management and Archaeology Saxony-Anhalt and State Museum of Prehistory Halle, Germany) alt.kurt@unibas.ch*

The Neolithisation of Iberia is one of the major topics of recent Prehistory. The profound and quick changes experienced by human populations have always stimulated diffusionists accounts which explain those transformations in terms of a true colonization by groups coming from outside the Peninsula, mostly from the Mediterranean realm (cardial pottery standard model). Recent discoveries show that perhaps the arrival of the production economy could be earlier than previously thought, and different hypotheses are also being proposed whether the origin of this eventual demographic input is to be searched in different areas of the Mediterranean or through inland routes crossing the Pyrenees.

However, since the last decade other proposals emerged in the Iberian research which stressed the important role of local Mesolithic hunter gatherers in the adoption process of this whole new way of life. Even some scholars have tried to argue about an eventual local or autochthonous domestication of plants and animals. The impact of radiocarbon debates on the basis of a much more ample database of samples analyzed in the last decade has strongly pushed these debates into strong disagreements.

An overview of the current debate on this topic is offered here, as a theoretical framework necessary to understand the new lab data (DNA, isotopes) that the rest of the communications are going to present in order to better understand the empirical support of the different models which explain the appearance of the

Neolithic in the Iberian Peninsula.

ORAL

**5. ANCIENT DNA DATA FROM THE IBERIAN PENINSULA IN AN EUROPEAN CONTEXT**

*Roth, Christina (Institute of Anthropology, Mainz University, Germany) rothch@uni-mainz.de*  
*Brandt, Guido (Bioarchaeometric Group, Institute of Anthropology, Johannes Gutenberg-University of Mainz, Germany) brandtg@uni-mainz.de*  
*Garrido Pena, Rafael (Department of Prehistory and Archaeology, Autónoma University of Madrid, Spain) rafael.garrido@uam.es*

*Haak, Wolfgang (Australian Centre for Ancient DNA, University of Adelaide, Australia) wolfgang.haak@adelaide.edu.au*  
*Kunst, Michael (German Archaeological Institute, Madrid, Spain) michael.kunst@dainst.de*

*Risch, Roberto (Departament de Prehistòria, Edifici B, Universitat Autònoma de Barcelona, Spain) roberto.risch@uab.es*

*Rojo Guerra, Manuel A. (Department of Prehistory and Archaeology, University of Valladolid, Spain) marojo@fyl.uva.es*

*Alt, Kurt W. (Integrative Prehistory and Archaeological Science, Basel University, Switzerland; Danube Private University, Krems, Austria; State Office for Heritage Management and Archaeology Saxony-Anhalt and State Museum of Prehistory Halle, Germany) alt.kurt@unibas.ch*

The Neolithic lifestyle developed in the Near East about 12,000 years ago and spread into Central Europe and the Iberian Peninsula via different routes during the following millennia. Subsequently, a number of significant phenomena emerged, like the construction of large residential areas, the emergence of fortified settlements, the development of elaborate burial customs, the production of metals as well as an increasing social stratification with the establishment of Elite societies. Each newly introduced cultural or social element raises questions to its origins and dissemination, whether this was achieved via an exchange of ideas or directly via human migration. Here, palaeogenetic studies can step in by opening a window directly into the past and tracing population shifts on a genetic level. So far, ancient DNA studies based on mitochondrial DNA have revealed discontinuities between Central Europe's autochthonous hunter-gatherers and early farmers as well as between the latter and the present-day population. Furthermore, new data of a comprehensive study of subsequent Neolithic to Bronze Age populations from Central Europe revealed multiple population dynamic events during the Neolithic which involved genetic influx from various regions. Ancient DNA data from the Iberian

Peninsula suggest that a number of characteristic *Linear Pottery Culture* lineages also spread through the Mediterranean region, although at least in Spain and Portugal a larger fraction of hunter-gatherer lineages was retained. However, statements about population dynamics after the initial Neolithic in Western Europe are rare and based on limited data. We will compare a comprehensive mitochondrial dataset of more than 200 published and new Mesolithic to Bronze Age individuals from the Iberian Peninsula to contemporaneous data from Central Europe in order to expose commonalities and differences in population dynamics between the arrival of the first farmers and the establishment of Early Bronze Age societies.

ORAL

## 6. SAMPLES AND SAMPLING - METHODOLOGICAL OUTLINES FOR ANCIENT DNA AND STABLE ISOTOPE RESEARCH IN ARCHAEOLOGY

*Roth, Christina (Institute of Anthropology, Mainz University, Germany) rothch@uni-mainz.de*

*Brandt, Guido (Bioarchaeometric Group, Institute of Anthropology, Johannes Gutenberg-University of Mainz, Germany) brandtg@uni-mainz.de*

*Knipper, Corina (Curt-Engelhorn-Centre of Archaeometry, Mannheim, Germany) corina.knipper@cez-archaeometry.de*  
*Alt, Kurt W. (Integrative Prehistory and Archaeological Science, Basel University, Switzerland; Danube Private University, Krems, Austria; State Office for Heritage Management and Archaeology Saxony-Anhalt and State Museum of Prehistory Halle, Germany) alt.kurt@unibas.ch*

Over the last decade, new projects and publications on ancient DNA (aDNA) and/or stable isotope analyses have been contributing to archaeological research to an increasing extent. However, for archaeology and the natural sciences to successfully cooperate, it is essential that there is a mutual awareness of the potential but also of the pitfalls of specific analytical methods and approaches. At the outset of every interdisciplinary project between archaeology and bioarchaeology should stand the two most basic questions: "What answers can bioarchaeological procedures provide with regard to the specific research question?" and "What requirements must be met in order to successfully conduct the appropriate analyses?". For example, contamination-free sampling is crucial for successful ancient DNA analyses and should ideally be conducted as early as during the excavation itself. This talk will give an overview about factors that influence DNA preservation,

about comparative samples needed for isotope analyses (carbon/nitrogen, strontium, and oxygen), sampling strategies, and the general work-flow of the analyses themselves.

ORAL

## 7. ONCE UPON A TIME IN THE WEST ? NEW ANCIENT DNA DATA FROM PREHISTORIC IBERIA

*Roth, Christina (Institute of Anthropology, Mainz University, Germany) rothch@uni-mainz.de*

*Garrido Pena, Rafael (Department of Prehistory and Archaeology, Autónoma University of Madrid, Spain) rafael.garrido@uam.es*

*Haak, Wolfgang (Australian Centre for Ancient DNA, University of Adelaide, Australia) wolfgang.haak@adelaide.edu.au*  
*Kunst, Michael (German Archaeological Institute, Madrid, Spain) michael.kunst@dainst.de*

*Risch, Roberto (Departament de Prehistòria, Edifici B, Universitat Autònoma de Barcelona, Spain) roberto.risch@uab.es*

*Rojo Guerra, Manuel A. (Department of Prehistory and Archaeology, University of Valladolid, Spain) marojo@fyl.uva.es*

*Alt, Kurt W. (Integrative Prehistory and Archaeological Science, Basel University, Switzerland; Danube Private University, Krems, Austria; State Office for Heritage Management and Archaeology Saxony-Anhalt and State Museum of Prehistory Halle, Germany) alt.kurt@unibas.ch*

Ancient DNA studies focusing on the Iberian Peninsula have mainly investigated the Mesolithic-Neolithic transition in few areas due to the limited data available. Within a comprehensive international project founded by the German Research Foundation, we genetically analysed more than 300 Mesolithic to Early Bronze Age individuals from the Iberian Peninsula. Altogether, mitochondrial results of 250 individuals could be successfully reproduced.

Together with published data from the Iberian Peninsula, results were pooled into 19 groups of different chronological and regional context all over the research area. We applied several statistical methods to reveal continuities and discontinuities among populations on chronological as well as spatial level and will here present the results for the first time.

ORAL

**8. RESIDENCE AND MARRIAGE PATTERNS AMONG LATE HOLOCENE COASTAL HUNTER-GATHERERS IN SOUTHERNMOST AFRICA FROM D15N IN BONE AND DENTIN**

*Sealy, Judith (University of Cape Town) judith.sealy@uct.ac.za*

During the second half of the Holocene, we can trace significant changes in population size, technology and social organization among hunter-gatherer societies in southern Africa. Along the south coast, communities became more sedentary, occupying well-defined territories and probably defending their boundaries. Thus far, the area that has been studied in greatest detail is the Robberg Peninsula and adjacent Plettenberg Bay. This area offered especially rich marine foraging opportunities, including access to a mainland seal colony and unusually productive localities for shore-based fishing, leading to very high  $\delta^{15}\text{N}$  values in human skeletons. In contrast, skeletons from Matjes River Rock Shelter, only 14 km to the east, have lower  $\delta^{15}\text{N}$  values, indicating less reliance on high trophic level marine foods. These analyses are of bone collagen, representing long-term averages of the diets eaten over many years of the individual's life. Such a marked discrepancy indicates significantly different marine foraging strategies at Robberg and Matjes River: in effect, an economic difference between the two sites that could only have been maintained by long-term segregation of the two communities. Through the intervening coastal plain flows the estuary of the Bietou/Keurbooms River, which likely marked the boundary between two hunter-gatherer territories.

New research compares  $\delta^{15}\text{N}$  in the dentin of early-forming permanent teeth (incisors and first molars) with bone from the same skeletons, in order to ascertain whether people from Robberg/Plettenberg Bay married within their own group (in which case both dentin and bone should show high  $\delta^{15}\text{N}$ ), or whether they sought marriage partners from further afield (in which case  $\delta^{15}\text{N}$  in dentin should be lower than in bone).

The preliminary data set available thus far supports within-group marriage. This raises interesting questions about group size (how large did groups have to be to maintain long-term viability?) and about the nature and extent of regional networks at this time.

ORAL

**9. THE ARCHAEOLOGY AND BIOARCHAEOLOGY OF THE MIDDLE NEOLITHIC SITE OF ALTO DE REINOSO (FRESNO DE RODILLA, BURGOS)**

*Zesch, Stephanie (Museum of World Cultures, German Mummy Project, 68159 Mannheim, Germany) S.Zesch@gmx.de*  
*Held, Petra (Institute of Anthropology, University of Mainz) pheld@uni-mainz.de*

*Roth, Christina (Institute of Anthropology, Mainz University, Germany) rothch@uni-mainz.de*  
*Knipper, Corina (Curt-Engelhorn-Centre of Archaeometry, Mannheim, Germany) corina.knipper@cez-archaeometry.de*

*Rojo Guerra, Manuel A. (Department of Prehistory and Archaeology, University of Valladolid, Spain) marojo@fyl.uva.es*  
*Garrido Pena, Rafael (Department of Prehistory and Archaeology, Autónoma University of Madrid, Spain) rafael.garrido@uam.es*

*Tejedor, Cristina (Fundación del Patrimonio Histórico de Castilla y León, Valladolid, Spain) tejedor.cristina@gmail.com*  
*García-Martínez de Lagrán, Inigo (Postdoctoral Program of the DEUI of the Basque Government, University of the Basque Country, U.P.V./E.H.U., Spain) igmtzl@gmail.com*

*Alt, Kurt W. (Integrative Prehistory and Archaeological Science, Basel University, Switzerland; Danube Private University, Krems, Austria; State Office for Heritage Management and Archaeology Saxony-Anhalt and State Museum of Prehistory Halle, Germany) alt.kurt@unibas.ch*

Both artefacts and radiocarbon dates (3769 - 3540  $2\sigma$  cal BC) assign the Megalithic tomb of Alto de Reinoso to the Middle/Late Neolithic of Spain. The tomb was analysed following an integrative concept with a close collaboration between archaeology, physical anthropology, molecular genetics (ancient DNA) and biogeochemistry. For a comprehensive characterization of the interred individuals we used different osteological parameters as well as ancient DNA and isotope analyses to explore the group's demographic structure, health status, possibly kinship relations, and to reveal information on mobility and dietary strategies. Skeletal material from Alto de Reinoso included complete and incomplete skeletons as well as a large number of isolated bones with a moderate poor state of preservation.

The minimum number of individuals buried at Alto de Reinoso was estimated at 49 individuals. The demographic and genetic profiles of the group, intra-group kinship, homogenous dietary data, restricted mobility, moderate disease frequencies, and a low incidence of stress markers draw a picture of a rural population not exposed to great external hazards.

The result of our integrative study provides notable insights into the social organization and structure of this community.

POSTER

POSTER

## 10. INTEGRATING DENTAL MICROWEAR AND STABLE ISOTOPIC ANALYSES TO RECONSTRUCT DIET AT ZHOUIJIAZHUANG, A NEOLITHIC SITE IN CHINA.

Mocen Li (Department of archaeology, Jilin University) [natalieputina@163.com](mailto:natalieputina@163.com)

Qun Zhang (Department of archaeology, Jilin University) [zhangqun724@163.com](mailto:zhangqun724@163.com)

Zhichao Sun (Department of archaeology, Jilin University) [296933393@qq.com](mailto:296933393@qq.com)

Lusi Wang (Department of archaeology, Jilin University) [cclusi3112@sina.com](mailto:cclusi3112@sina.com)

Quanchao Zhang (Department of archaeology, Jilin University) [py2000sdqy@sina.com](mailto:py2000sdqy@sina.com)

Hong Zhu (Department of archaeology, Jilin University) [zhuhong@jlu.edu.cn](mailto:zhuhong@jlu.edu.cn)

Stable isotope and dental microwear analyses are integrated to determine diet at the prehistoric site of Zhoujiazhuang, China, 2250 B.C. The Zhoujiazhuang site is located in central Yellow River area and belongs to the late Neolithic Longshan culture. During this period, civilization was originating and cities were emerging. The evidence for reconstructing diet of the Longshan population can be obtained by dental microwear analysis directly and effectively.

Dental microwear analysis focuses on the microscopic scratches that formed on tooth's surface as the result of chewing. Different microwear patterns of scratches on the buccal surface indicate different dietary composition. In this study, scratches of the buccal surface have been studied on molars from the Zhoujiazhuang site. All samples have been observed at 200X magnification by scanning electron microscope. The length and orientation of each scratch on the buccal surface have been determined and measured. We also use stable isotope ratios of carbon and nitrogen in bone collagen to examine the diet of the Zhoujiazhuang population.

The results obtained show that people of the Zhoujiazhuang site ingested both plant products and animal products. This result is concordant with the result of stable isotope analysis. Nitrogen isotope ratios of bone

collagen also show that these inhabitants ate animal products and plant products. Carbon isotope ratios of bone collagen show that most plant products came from C<sub>4</sub> plants. That means subsistence of the Zhoujiazhuang population included agriculture and animal husbandry. This study demonstrates the importance of integrating different analytical methods when reconstructing diet of prehistoric populations.

POSTER

## 11. BETWEEN FRAGMENTATION AND THE STONE HARD CRUST: THE RECOVERY OF HUMAN REMAINS AT THE SITE OF LA MINA (ALCUBILLA DE LAS PEÑAS, SORIA)

Rindlisbacher, Laura (Integrative Prehistory and Archaeological Science, Basel University, Switzerland) [lor.rindlisbacher@stud.unibas.ch](mailto:lor.rindlisbacher@stud.unibas.ch)

Rojo Guerra, Manuel A. (Department of Prehistory and Archaeology, University of Valladolid, Spain) [marojo@fyl.uva.es](mailto:marojo@fyl.uva.es)  
Garrido Pena, Rafael (Department of Prehistory and Archaeology, Autónoma University of Madrid, Spain) [rafael.garrido@uam.es](mailto:rafael.garrido@uam.es)

Tejedor, Cristina (Fundación del Patrimonio Histórico de Castilla y León, Valladolid, Spain) [tejedor.cristina@gmail.com](mailto:tejedor.cristina@gmail.com)  
García, Íñigo (Laboratoire TRACES UMR5608, University of Toulouse, France) [igmtzl@gmail.com](mailto:igmtzl@gmail.com)

Alt, Kurt W. (Integrative Prehistory and Archaeological Science, Basel University, Switzerland; Danube Private University, Krems, Austria; State Office for Heritage Management and Archaeology Saxony-Anhalt and State Museum of Prehistory Halle, Germany) [alt.kurt@unibas.ch](mailto:alt.kurt@unibas.ch)

Pichler, Sandra (Integrative Prehistory and Archaeological Science, Basel University, Switzerland) [sandra.pichler@unibas.ch](mailto:sandra.pichler@unibas.ch)

The Megalithic tomb of La Mina (Alcubilla de las Peñas, Soria), dating to the early 4<sup>th</sup> millennium BC, was excavated in 2009-2011. The undisturbed communal burial chamber held a minimum number of twenty individuals. Tomb, artefactual and bioarchaeological remains are in the focus of ongoing investigations directed at cultural as well as bioarchaeological issues. The human skeletal remains are analysed in a Master's project at the University of Basel which will cover individualization, demographic and palaeopathological analyses as well as the collection of dietary data.

The excavation of the skeletal remains was difficult because of the fragility of the bones. To prevent further fragmentation, complete bones were recovered in blocks using linen bandages and glue as a binding

agent on-site. In these blocks the bones could be safely transported. In the lab analysis, this mode of salvaging the remains presents challenges which impact the analysis of the skeletons. As an advantage, it is possible to take direct bone measurements prior to removal of the caskets. On the other hand, the stability of the blocks hinders an easy removal of the skeletal parts. This is especially problematic with fragile elements such as the pelvic bone. The poster discusses the pros and cons of different methods to remove the block bindings as well as their impact on the further analyses of the skeletal material.

# B50 Paleoenvironment and early cultural dynamics in the Maya area

Organiser: Marcos Noé Pool Cab

Tuesday, 2nd (14:30 to 19:30)



2014 burgos  
1-7 sept.

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ORAL CONTRIBUTION

ORAL

## 1. CLIMATE CHANGE, HUMAN SOCIETY, AND PRE-HISTORY IN THE YUCATAN PENINSULA

*Cobos, Rafael (Universidad Autónoma de Yucatán) rachcobos@aol.com*

Underwater archaeological research conducted in sinkholes in the Yucatán peninsula reveals submerged contexts containing faunal as well as human skeletal remains. These contexts were dry at the end of the Pleistocene and the beginning of the Holocene. The presence of human and faunal remains dating back more than 10,000 years before present, suggests that climate conditions in southeastern México provided the appropriate environment for nomadic hunters and their prey. This way of life is very similar to what has been documented elsewhere in the world.

ORAL

## 2. MINERAL RAW MATERIALS AND PROCUREMENT MODALITIES DURING LATE PRECERAMIC AND EARLY FORMATIVE IN MEXICO

*Espinosa Vázquez, María Alejandra (Universidad Autónoma de Yucatán) maeva1999@yahoo.fr*

Utilization and exploitation of siliceous rocks has been a minor research topic within the archaeological investigations carried out in Mexico. Overall, research has been mainly focused on description of archaeological artifacts, mostly without a previous geological investigation. In the state of Yucatan, identification of raw material, procurement, and circulation as well as the fabrication process of stone tools are topics of research still to explore in a systematic way. In this paper I present, as an example, a research concerning raw materials supply and exploitation during late Preceramic and early Formative in the Valley of Oaxaca. The case of Oaxaca provides methodological information in the development of further research in Yucatan.

In this paper I present a research regarding the main lithological formations and diverse modalities of procurement carried out by late hunter-gatherers and early sedentary farmers at the Valley of Oaxaca. The data obtained allowed the determination of the geological origin of the rocks employed for the fabrication of

tools during late Preceramic and early Formative as well as analyzing the supply and exploitation modalities employed by human groups during the mentioned periods. A comparative analysis of the chipped stone material from three archaeological sites was carried out through a technological approach and an in-depth study of the raw materials. In order to characterize and determine the geological origin, the study of the raw materials was accomplished through geological survey and petrographic analysis. Thus, this research project addresses a pluridisciplinary approach, linking archaeology and geology, clarifying aspects thus far maintained as assumptions.

This example illustrates the relevance on developing geoarchaeological research based on a similar approach in the state of Yucatan. Research in the Maya area has covered broad issues from varying angles of view through out all the chronological sequence documented so far. In spite of the vast amount of data generated, archaeological evidence of early occupations as well as data related to the first inhabitants in the state of Yucatan is extremely rare. A step further in this emerging line of investigation relates to the identification and location of siliceous rock sources in Yucatan.

Comparing data from a late Preceramic rockshelter and from two early Formative agricultural villages allowed to clarify aspects concerning the context of stone tool production and the differential use of raw materials available in the Valley of Oaxaca. This approach represents a further research guideline on sources of mineral raw material in the state of Yucatan.

ORAL

## 3. LA VIDA COTIDIANA DE LOS MAYAS PREHIS-PÁNICOS: APROXIMACIONES RECIENTES EN AR-QUEOLOGÍA

*Fernández Souza, Lilia (Universidad Autónoma de Yucatán) fsouza123@yahoo.com*

Food preparation and consumption are some of the human ubiquitous activities. Ingredients, preparation techniques and cooking, as well as kitchen implements have been studied in relation to environment management, gender relations and roles, ethnicity, agency and performance, to mention only a few aspects. The goal of this paper is to offer a review of existing data from early Maya contexts in search of artifacts that may inform us about food preparation and to discuss possible

pattens and variations in practices and techniques of elaboration and consume. I will emphasize on grinding and cutting artifacts, as well as in their relation with animal or vegetal remains, when possible. Finally, I will discuss how conjunctive and transdisciplinary approaches may contribute to a finer understanding of past culinary technology.

This is a conjunctive approach reviewing contextual, artifactual, ethnoarchaeological and, when possible, archaeometry and paleobotany data related to grindining stones and cutting artifacts. I will search for: location and spatial relation of the artifacts, between them and with ecofacts; forms, variations and possible functions; registered use marks; modern evidence of artifactual variation as a result of different processes and techniques.

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ORAL

#### **4. EARLY CULTURAL MANIFESTATIONS OF THE YUCATAN PENINSULA: LANDSCAPE AND PREHISTORIC MATERIAL EVIDENCE**

*Hernandez, Hector (Universidad Autónoma de Yucatán)  
hhernandez@uady.mx*

Along decades it has been debated the relative absence of solid evidences concerning the origin of prehistoric man on the Yucatan peninsula. Nevertheless, recent research has demonstrated that the climatic ans landscape changes during the end of the Pleistocene and the beginning of the Holocene periods encouraged the presence of the first human groups in the peninsular context.

This paper is an attempt to summarize the new archaeological, paleoclimatic, and paleobotanical evidence about the presence of early humans in the northern Yucatan palins. Our goal is to synthesize the recent discoveries dealing with early cultural developments and landscape modifications to discuss the adaptation of a pre-Maya presence in Yucatan.

Preceramic remains do exist in Yucatan and have existed for a considerable length of time. Recent explorations have shown that the evidence of early cultural developments in this region is limited mostly to caves and cenotes. Instead of that, with some data from lacustrine sediment samples, I will try to reconstruct the vegetation changes that occurred in Yucatan during the Holocene. The emphasis will be on the anthropogenic

modifications through the Paleoindian, Archaic, and Prehispanic Maya periods.

We must approach this problem in a different way by combining archaeological, paleoclimatic, paleontologic, and paleobotanic evidence that deals with the setting of the first peninsular populations.

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ORAL

#### **5. THE FIRST SIGNS OF MAN IN SOUTHEAST MESOAMERICAN.**

*Mier Aragón, Román (Universidad Autónoma de Yucatán)  
roman.mier@uady.mx*

The main part of these beginnings is intimately linked to the way in which man nature of collectors, hunters and fishermen fits; you must also take into account the prehistory of our continent is taken as an event that has great preponderance in evolution, because you get to consider Latin American history begins with the arrival of the conquerors.

But it may be mentioned that even before this event and the Latin American peoples had a history itself; assumes that human activity takes place in America later compared to their peers in other continents manner.

to do our work for the analysis of research related to the theme for the Mesoamerican Southwest necessary; that allows us to have a more complete picture ideas for this region.

In the Maya area, specifically Yucatan can be localized prehistoric evidence Loltún Cave (Pleistocene) ranging from cave paintings, negative hands up bones of different animals typical of the time ; to El Salvador this period is clearly exemplified in the Cave of the Holy Spirit where besides rock art paintings and artifacts used for the activities of this group during the practice of their daily activities were located.

A complete collection of the main signs of early man to the area of southeastern Mesoamerica, emphasizing the features that can be placed to Yucatán.

ORAL

## 6. POPULATION , CULTURE AND IDENTITIES IN ARCHAIC YUCATAN PENINSULA AND CENTRAL AMERICA

*Pool Cab, Marcos Noé (Universidad Autónoma de Yucatán)  
poolcab@hotmail.com;marcos.pool@uady.mx*

Late Paleoindian period and during the Archaic ( 11 000 and 6000 BC ) occurred human adaptations in various environmental areas of southern Mesoamerica and Central America. The changes known occurred for example in the Pacific Coast of Chiapas are seen in contexts dated to 5500 BC . Such changes should promote human exploitation of certain biospheres.

Moreover, the evidence of human occupation between the Paleoindian and Archaic , basically been observed in caves. Evidence oriented artifacts using lytic, paints and pollen traces , of domesticated plants such as corn.

pictographs, stone and paleobotanical data

The present paper aims , through a review of the major works that have been made in the Yucatan and Central America, know who they were, what they did and how human groups who settled in the region lived ( though perhaps not permanently ) , on dates as far back as the Archaic and the end of the Paleoindian.

Farming in the Yucatan Peninsula and parts of Central America dating from the Archaic period is manifested in the form of organization, as an exogamous tribes. During this period, human groups settled in what is now known as Maya area are primarily gatherers, hunters and / or fisherman. It has the company of animals to accompany him and his leadership is based on the theory of the fittest, who must prove his supremacy in order to retain the leadership of the group. Moreover, the change in the way of living also influences technological change. Magic let their religious beliefs reflected through paintings and gafitis was also a feature of the region under study.

ORAL

## 7. LA EXPANSIÓN DE LAS PLANTAS DOMÉSTICAS EN EL ÁREA MAYA

*Zimmermann, Mario (Universidad Autónoma de Yucatan)  
zimmermann.fca.uady@hotmail.com*

During last two decades, research on ancient Maya agriculture turned up evidence for the appearance of domestic crops prior to the Preclassic period. This paper represents a summary of available information including new botanical data for Yucatan's northwestern plains. Specifically, pollen analysis results for a sediment core taken close to the Mayapan site will be presented. Based on this empirical knowledge, the sociocultural panorama for the Maya Area during the Archaic will be re-evaluated.

# B51 Reconstructing human mobility in the Palaeolithic: building new frameworks

Rebecca Wragg Sykes and Julien Riel-Salvatore

Thursday, 4th (09:00 to 13:30)



2014 burgos  
1-7 sept.

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ORAL CONTRIBUTION

ORAL

**1. MOBILITY OF MATERIALS, MOBILITY OF PEOPLE: MISCONCEPTIONS AND FACTS, EXAMPLES FROM THE DU PALAEOOLITHIC OF HAUTE-LOIRE (MASSIF CENTRAL, FRANCE)**

*Raynal, Jean-Paul (CNRS) jpraynal@wanadoo.fr*  
*Fernandes, Paul (Paleotime / CNRS) paul.fernandes@paleotime.fr*  
*Delvigne, Vincent (Univ. Bordeaux 1) vincent.delvigne@hotmail.fr*

The alteration of flint sometimes leads to a misleading homogenization of their textures, for example confusion between Jurassic and Cretaceous flint, or between a lacustrine/marine and silcrete. The detection of these "false friends" within archaeological assemblages may substantially alter the assumed origins and direction of movement of mineral raw materials, thereby changing the archaeological interpretation. A detailed study of the state of flint alteration is essential and usefully contributes to the reconstruction of raw material exploitation in the Middle and Upper Paleolithic.

Three case studies of misidentification are presented:

Oligocene lacustrine flint from Cantal vs. Stampian lacustrine flint from the Etampes region (final Upper Magdalenian of St. Anne II and Badegoulian of Roche Tavernat)

Alluvial flint in secondary context from the Aalenian - Bajocian in Lozère vs. Bedoulian Ardèche flint / Upper Turonian Indre -et-Loire flint (Mousterian at Baume-Valley and Badegoulian at Rond-du-Barry)

Turonian flint from Loir-et-Cher vs. Miocene silcretes from the Upper Loire (Gravettian from Blot).

The distances for raw material collection are reduced in these examples, but new directions for sourcing also demonstrated, improving our picture of the regional sphere of lithic exploitation.

ORAL

**2. ASSESSING SCALE AND RESOLUTION IN ANALYSES OF PALEOLITHIC MOBILITY: CASE STUDIES FROM LIGURIA**

*Riel-Salvatore, Julien (University of Colorado Denver) julien.riel-salvatore@ucdenver.edu*

In spite of its central importance, the concept of mobility in the Paleolithic remains often poorly defined and operationalized. Even focusing on a single artifact class doesn't necessarily resolve this issue since, for instance, stone tools comprise multiple dimensions (e.g., raw material, technology, reduction intensity), each of which might give a different 'signal' of prehistoric mobility. The challenge for archaeologists lies in reconciling these various dimensions into coherent interpretations. Furthermore, it is crucial to ensure that individual assemblages can be used to diachronically track shifting manifestations of the phenomenon of mobility at the level of the site, and that data recovered from distinct excavations are made commensurate in order to compare distinct sites and archaeological levels to one another. Thus, the scale at which mobility is looked at is critically important to the kinds of questions about it that can be asked and the kinds of answers we can hope to provide to them. In a like manner, the level of resolution of the archaeological data used in answering questions related to Paleolithic mobility is also key, in that it determines whether assemblages and/or sites can be integrated in single analyses. One specific aspect of resolution, whether data from excavations conducted several generations ago commensurate with those collected from present-day projects (or several different modern projects), is especially relevant in these discussions. To highlight some of these conceptual issues, two Ligurian case studies – Riparo Bombrini and Caverne delle Arene Candide – are presented. The region of Liguria (NW Italy) provides an interesting backdrop for this as it is largely devoid of high-quality lithic raw material, which imposed a further set of constraints on how to think about mobility on the basis of lithic material. The analysis shows that differences in scale and resolution of the available data are not necessarily fatal to integrated models of Paleolithic mobility within a constrained region, though they can impose biases that can mistakenly be given behavioral significance.

ORAL

### 3. RECONSTRUCTING MIDDLE PALEOLITHIC MOBILITY IN THE CENTRAL COAST REGION OF PORTUGAL USING PIXE ANALYSIS ON CHERT ARTIFACTS.

*Pereira, Telmo (ICArEHB) telmojrperreira@gmail.com*  
*Alves, Luis (Laboratório de Aceleradores e Tecnologias de Radiação (IST) lcalves@ctn.ist.utl.pt*  
*Alves, Eduardo (Laboratório de Aceleradores e Tecnologias de Radiação (IST) ealves@ctn.ist.utl.pt*  
*Haws, Jonathan (University of Louisville) jonathan.haws@louisville.edu*  
*Benedetti, Michael (Department of Geography & Geology, UNC-Wilmington) benedettim@uncw.edu*  
*Manso, Claudia (Camara Municipal do Bombarral) claudiammanso@gmail.com*  
*Bicho, Nuno (ICArEHB) nbicho@ualg.pt*

Paleolithic archaeologists have long focused on mobility in their reconstructions of past human behaviour. Many models emphasize the acquisition of lithic raw materials as a means of understanding prehistoric mobility patterns. Determining the source of the raw material is therefore key to tracing the movement of raw material across landscapes and understanding human decision-making. There are several destructive and non-destructive analyses that allow for geochemical fingerprinting of lithic materials. Here we use Proton Induced X-Ray Emission (PIXE) to characterize chert sources and provenance of Middle Paleolithic artifacts from sites in the central coast of Portugal. The sites, Praia de Rei Cortiço, Mira Nascente and Gruta Nova da Columbeira, represent a time span from ~100 to 41 ka. Praia Rei Cortiço and Mira Nascente are open-air, single component archaeological sites located in the coastal cliffs. Praia Rei Cortiço is located within quartz and quartzite gravel deposits but contains chert artifacts that likely originated from presently known chert outcrops >5 km away. Some nodules might have been available closer in the past. Mira Nascente is located 10 km from primary chert sources. Gruta Nova da Columbeira is a multi-component cave site located ~13 km inland, with the chert rich Cesaredas Plateau in between. The river that runs along the foothill carries quartz, quartzite and some chert.

The assemblages from Praia Rei Cortiço and Mira Nascente have low chert variability while Gruta Nova da Columbeira has a large variability with nodules presenting different types of cortex, which might suggest their acquisition in primary, sub-primary and secondary sources.

Most artifacts are spotted, banded and smudged which demanded more than one reading for some. Analyses were also made on several artifacts from a same refitted block in order to understand variability within a single nodule.

Our results suggest low relation between sites, which was not a surprise for Mira Nascente since it is 35 km from Praia Rei Cortiço and 43 km from Gruta Nova da Columbeira. However, Praia Rei Cortiço and Gruta Nova da Columbeira are only 14 km distant from each other. This suggests a close range of chert acquisition, probably under a 7 km radius. The chert variability seen in the archaeological record is not yet completely covered by the regional geological sources meaning that more analysis will be performed in the future and, consequently, these results must be seen as preliminary. Despite their preliminary nature, the current results have implications for our understanding of lithic raw material use, human movement and mobility patterns during the Middle Paleolithic.

We would like to thank the Archaeological Institute of America for funding the PIXE analysis, the Laboratório de Aceleradores e Tecnologias de Radiação (IST) for the analysis and Câmara Municipal do Bombarral to allow us to study the Gruta Nova da Columbeira assemblage.

ORAL

### 4. WHY DID EARLY HUMANS MIGRATE?

*Bouissac, Paul (University of Toronto) paul.bouissac@utoronto.ca*

We now take for granted that modern humans migrate in search of a better life. Anticipation and motivation are fed by communication. Many animal species, notably birds and fishes, seasonally migrate over long distances. Primates, however, are limited in their capacity to engage in long migrations toward unknown lands. Finding out why early humans started their journey out of Africa to eventually populate most of the planet is a tantalizing question. Did they spread over successive short distances, or did they engage in deliberate long migrations once they had become bipedal? Did they move opportunistically, or were they displaced by external forces, natural or social. Some conditions are necessary for such adaptive migrations to occur: perceptual, cognitive, and social adaptations are prerequisites. Perception must have evolved to cover distal space since surviving in a savannah environment required the

processing of information from a greater distance than what is optimal in arboreal niches; moreover, migrating humans needed advanced cognitive capacities to project actions beyond the immediate future and plan longer-term, adequate strategies; finally, successful migrations must be sustained by a sufficient level of social organization. This paper examines the perceptual and cognitive conditions for dispersal beyond proximal boundaries and discusses the evolution of the sense of perspective and its limitations as a determining factor in priming long distance migrations.

ORAL

## 5. MOBILITY OF LITHIC RAW MATERIALS IN THE MIDDLE STONE AGE OF MOROCCO.

*Fernandes, Paul (Paleotime / CNRS), RAYNAL Jean-Paul - jpraynal@wanadoo.fr (CNRS) paul.fernandes@paleotime.fr*

The Mousterian-Aterian lithic assemblage of the Grotte des Gazelles in DarBouazza (Morocco) is composed of two groups of flint. The majority were collected on fossil beaches, close to the cave: they are nodules of small size representing evolved facies of the phosphatic flint from the region of Houribga, transported to the ocean by the Oued Mellah river and redistributed by longshore currents onto beaches south of Casablanca. A second smaller group consists of similar but less evolved flint. This demonstrates direct collection from the phosphate plateau 70 km to the east, therefore a probable movement of people between the hinterland and coastal Middle Stone Age in this part of Morocco. Details and timing of this mobility remain to be further explored.

ORAL

## 6. STABLE BUT NOT STATIC: CHANGES IN RAW MATERIAL PROCUREMENT AT ROCA DELS BOUS (EASTERN PRE-PYRENEES, IBERIA)

*Roy Sunyer, Miquel (CEPAP-UAB) miquel.roy@uab.cat*  
*Roda Gilabert, Xavier (CEPAP-UAB) javier.roda@uab.cat*  
*Mora Torçal, Rafael (CEPAP-UAB) rafael.mora@uab.cat*  
*Martínez-Moreno, Jorge (CEPAP-UAB) jorge.martinez@uab.cat*

Properties of the physical environment and its resources have major effects on the organization of human activities as well as the importance of cultural tradition. Both factors contribute to the decision-making process and this is reflected in the archaeological sites. To explain

the meaning of the patterns observed in landscape management is essential to analyze the notion of mobility, a key attribute in the organization of Pleistocene human groups.

Variations in raw material procurement are an option to assess the relevance of a particular resource. These let us wonder about behavioral features of human groups such as the use of the landscape, the knowledge of the environment or the patterns of mobility of human groups. Likewise, variations in the choice of raw materials can co-vary with other aspects such as the technological configuration of lithic assemblages.

Assuming these principles, we propose to analyze the variations that are seen in the archaeological units N10, N12, N14 and S9. These belong to the Middle Palaeolithic and are assigned at the end of MIS 3.

The abrupt changes detected in the supply of rocks rheologically different such as flint, quartzite and limestone, allow the analysis of various aspects related to the management of these resources.

The variety of strategies in raw material procurement identified in Roca dels Bous suggests radical changes in the organization of settlement patterns. The causes for these changes in the Middle Palaeolithic subsistence will be discussed.

ORAL

## 7. A COMPARATIVE STUDY USING SOCIAL CARNIVORES TO UNDERSTAND MOBILITY AMONG NEANDERTHALS

*Croxall, Elinor (Leiden University) ecroxall@gmail.com*

Mobility is an integral part of the interpretation of archaeological sites, regional patterns and the behavioural characteristics of particular hominins (Binford 1980, Grove 2009). The Neanderthal archaeological record in particular has been interpreted as differing from that of modern humans due to a higher frequency of residential moves and lower intensity of site use. Neanderthals are known to have exploited mobile resources in highly seasonal environments, but in such contexts behavioural models would predict a pattern of mobility different to that associated with Neanderthals (Charnov 1976). To explore the behavioural options available to Neanderthals in the colder and more seasonal parts of their range, a comparative framework is presented that

investigates patterns of spatial behaviour among large social carnivores and their similarities and differences to patterns among mobile human societies. Species and populations are selected where there is a seasonal climate and/or availability of resources. Annual and seasonal movements are therefore analysed among wolves (*Canis lupus*) in different seasonal environments and different species within the Serengeti (*Panthera leo* and *Crocuta crocuta*). This is then compared against the large literature of human mobility patterns in mobile societies.

Contrary to assumptions, but consistent with foraging models, social carnivores rarely follow migratory prey. Overall patterns are very similar to human populations in similar environments. Spatial behaviour among both carnivores and hunter-gatherers is strongly influenced by the importance of fallback prey and other foods, territoriality and a number of reproductive and social reasons for the use of central places. The specific patterns each species adopts relies heavily on a combination of particular ecological, social and reproductive factors. Simple comparisons between human and other animals are therefore found to be less dichotomous and are combined into a detailed predictive framework of mobility responses.

Rather than trying to recognise patterns of mobility against direct analogues it is important to understand the reasons for different aspects of mobility patterns. For Neanderthals diet, reproductive and social strategies and population density are of particular importance in predicting aspects of mobility patterns that can then be tested in the archaeological record. With current evidence in these areas a mobile pattern can be envisaged, but within a relatively small annual range compared to the distances travelled by any migratory prey. Future research in these areas will be able to refine these predictions. Similarly, another key area for research is the potential plasticity of ungulate social behaviour in warm and cold Pleistocene environments. The movement of prey animals is a large part of the predictions for Neanderthal behaviour. The predictive framework developed provides an ecological basis for framing questions about mobility that are independent of assumptions regarding intelligence and cultural complexities.

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ORAL

*Kuhn, Steven (University of Arizona) skuhn@email.arizona.edu*

8. Discussant



# B52

# How far is it possible to compare Europe and continental Asia? Focus on Middle Pleistocene. Track record and perspectives

Organiser: Amélie Vialet, Sophie Grégoire and Christophe Falguères

Tuesday, 2nd (14:30 to 19:30)  
A24 Meeting room



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XVII Congreso Mundial de UISPP

ORAL CONTRIBUTIONS

ORAL

## 1. CHRONOLOGICAL FRAME OF ACHEULIAN SITES IN EUROPE AND IN ASIA

*Falguères, Christophe (CNRS/MNHN) falguere@mnhn.fr*  
*Bahain, Jean Jacques (MNHN) bahain@mnhn.fr*

When we look at some important chronological marks for the Acheulian technique, we can observe that its arrival is around 1.4 Ma in Middle East, circa 1Ma in China, then a little bit later in Indonesia and India at the Brunhes/Matuyama boundary (0.8 Ma). However, it appears that some wide continents such as China and India did not reveal all their secrets about this topic. In Europe, more and more data suggest that this « culture » settles around 0.6-0.7 Ma both in Northern part of Europe and around the Mediterranean Basin. These ages rise the issue about the author of this culture which possibly would be not *Homo heidelbergensis* knowing that several sites yielding bifaces are older than the age of Maüer mandible dated to 610 ka (Wagner et al., 2010). A number of sites containing bifaces range between 200 and 500 ka among some of them having yielded artefacts flaked according to the Levallois technique.

Today, even though the gap for the appearance of Acheulian tends to decrease, it remains 300 ka difference between the oldest Acheulian asiatic sites and the oldest Acheulian European sites.

ORAL

## 2. PRELIMINARY DATING OF SOUTH KOREAN EARLY PALEOLITHIC SITES USING COSMOGENIC NUCLIDES <sup>26</sup>Al AND <sup>10</sup>Be

*Lebatard, Anne-Elisabeth (CEREGE-CNRS) lebatard@cerege.fr*  
*Bourlès, Didier L. (CEREGE-AMU) bourles@cerege.fr*  
*Braucher, Régis (CEREGE-CNRS) braucher@cerege.fr*

Recent discoveries of numerous early Paleolithic sites in South Korea raised the question of their chronological framework. Using the pair of in-situ produced <sup>10</sup>Be and <sup>26</sup>Al cosmogenic nuclides, coherent burial ages for quartz pebbles from the Mansu-Ri (Loc. 4) and Wondang-Jangnamgyo sites were first determined. New results obtained using the same burial dating method at other early Paleolithic sites in South Korea, among which the Cheongok-ni (Loc. 3) site, will be presented. These

dating will allow providing an absolute chronological framework for the South Korean lithic industries and to confront it to other early Paleolithic sites in occidental Europe, Africa and Asia.

ORAL

## 3. RUPTURES, TECHNOLOGICAL CONTINUITIES AND VARIABILITY FACTORS OF TECHNOLITHIC SYSTEMS IN MIDDLE PLEISTOCENE OF EUROPE AND ASIA

*Celiberti, Vincenzo (Cerp Tautavel UPVD Perpignan, UMR 7194 CNRS) vincenzo.celiberti@cerptautavel.com*  
*Cauche, Dominique (Laboratoire Départemental de Préhistoire du Lazaret, Nice, UMR 7194 CNRS) dcauche@yahoo.fr*  
*Notter, Olivier (MNHN, UMR 7194 CNRS, Musée d'Anthropologie préhistorique de Monaco) notterolivier@hotmail.com*  
*Rossoni-Notter, Elena (Musée d'Anthropologie préhistorique de Monaco) elenarosso@hotmail.fr*  
*Grégoire, Sophie (Cerp Tautavel UPVD Perpignan, UMR 7194 CNRS) sophie.gregoire@cerptautavel.com*

Lithic productions in Europe and Asia during the Middle Pleistocene are characterized by the presence of bifacial pieces associated with pebble and *débitage* productions. This common finding in these two broad geographical entities hides a cultural mosaic specificity. While in Europe, sequencing of ancient Palaeolithic phases was established thanks to developments in the technocomplexes (gradual disappearance of bifacial pieces, *débitage* becoming dominant, appearance and expansion of *Levallois* method), these ruptures are more fleeting in east Asia and do not take this aspect. Also raises the question of technical phases disseminations and isolations between these two continents. The lithic assemblages allow us to speculate on the nature and sense of technical evolution, the modalities of manufacture, use of the technical objects, these phenomena in terms of innovation, invention or technical transformation.

Long stratigraphic and cultural sequences in Europe, including in particular the Caune de l'Arago (Tautavel, France) and the Gran Dolina site (Atapuerca, Spain), but also the French Mediterranean sites such as Terra Amata, the Baume Bonne, Orgnac 3 and the Lazaret, let us appreciate the variability of technoeconomic behaviors, their continuity and evolutions.

Many sites dated and assigned to the Middle Pleistocene have been recently discovered or/and studied in India,

China (the Bose Valley in South China, the Yunxian site), the Korean peninsula and in Southeast Asia. However, compared to the long stratigraphic and cultural sequence of Zhoukoudian (China), most of them have a less extensive and a more partial sedimentary and chronological record. Nevertheless, the lithic assemblages of these deposits enable us to highlight the technological behaviours, cultural traditions and specific characters of these groups. Moreover, the presence of handaxes and cleavers in most of these assemblages questions the nature of Asiatic Mode 2 and more generally the bifacial phenomenon.

What are the cultural specificities of each site? Each geo-cultural area? What are the similarities and major differences? Are we globally confronted with a model of diffusions and assimilations? Or rather a cultural convergence? Can we follow the Acheulean cultures of Europe as guidelines and try to interpret the Asiatic middle Pleistocene?

POSTER

POSTER

#### 4. NEW EVIDENCE OF LITHIC ASSEMBLAGE CONTAINING TARDIVE BIFACES IN SITU FROM THE HOUFANG SITE IN THE HANSHUI RIVER VALLEY OF CENTRAL CHINA.

*Yinghua, Li (School of History, Wuhan University, China) ly-hfrance2005@yahoo.fr*

*Xuefeng, Sun (School of Geographic and Oceanographic Sciences, Nanjing University, China) xuefeng-sun@163.com*

Since the proposition and determination of "Movius Line", the presence or not of bifaces in China, their relationship with Acheulean industries of Europe and Africa as well as the nature and characteristic of Chinese Paleolithic cultures have been hotly debated. Now the existence of bifaces in Chinese Paleolithic is beyond question in light of their discovery in several site complex including Bose Basin, Luonan Basin and Hanshui River Valley. However, until now, most of bifaces were surface finds and only in a very few of sites were they unearthed in primary context and dated. These sites include Fengshudao, Damei Nanbanshan in Bose Basin, Shuangshu in the Hanshui River Valley and Liangshan Longgangsi, which were all dated to over 600 ka (late Early Pleistocene to early Middle Pleistocene). As a matter of fact, up to present few lithic industries with the association of bifaces *in situ* and reliable date to later period (e.g. Late Pleistocene)

have been formally reported. In view of this, our newly-discovered site, the Houfang site from the Hanshui River Valley which yielded a lithic assemblage containing bifaces *in situ* and dated to Early Late Pleistocene will provide new well-documented evidence of tardive bifaces and contribute greatly to our understanding about the nature and evolution of lithic assemblages containing bifaces in China and East Asia.

A total of 162 stone artifacts were unearthed, including 89 pieces from the 2<sup>nd</sup> layer and 73 pieces from the 3<sup>rd</sup> layer.

In order to explore cognitive modes of hominids and compare different lithic assemblages between different regions of the world, the lithic technological and techno-functional method was proposed and applied to many industries of Paleolithic in the world. It was proven to be a new perspective for study of lithic industries. Yet this methodological system has never been applied to Chinese Paleolithic industries in a systematic way, so we used this method in study of lithic artifacts from the Houfang site in an attempt to provide a reference for future work and construct the basis for comparing lithic industries of Europe and Asia.

In summary, two characteristics concerning the lithic assemblage bearing bifaces in the Houfang site were clearly made: in statistical level, the percentage of bifaces in the Houfang site is much lower (<3%) than in classical Acheulean Complex; in technological perspective, the concept and method of producing typical bifaces of the Houfang site are totally different from those of typical Acheulean implements.

In conclusion, our discovery of the Houfang site indicated that bifacially-worked concept and implements did exist in China but they had a very low percentage in the assemblage (<3%) and were technologically different from those of classical Acheulean implements. The only common characters between them would be convergent morphology and bifacial knapping. This discovery provides new evidence for existence of bifaces in Late Pleistocene of East Asia and brings new clues for exploring the nature and evolution of biface-bearing industries in East Asia and discussing the cultural relationship between the East and West.

ORAL

ORAL

## 5. LA CULTURE DE L'HOMME DE YUNXIAN EN CHINE

*Feng, XiaoBo (College of applied Arts and Science BUU)  
fdd1994@sina.com*

Le site de Xuetingliangzi ou site de l'Homme de Yunxian se trouve à quelques centaines de mètres au nord de la rivière Han, à proximité d'une école (école de Mituosi ou école de l'ancien temple d'Amidha), près de Quyuanhekou, à 1 km à l'ouest du confluent des rivières Han et Quyuan. Il est situé à 10 km au sud du bourg de Qingqu, à 40 km à l'ouest de la ville de Yunxian, à 34 km au nord-nord-ouest de la ville de Shiyan et à 550 km au nord-nord-ouest de Wuhan, dans le nord-ouest de la province de Hubei, Chine du sud.

L'outillage est essentiellement taillé sur galet massif: choppers, chopping-tools, choppers à bords convergents, pics, bifaces. Présence de nombreux remontages. Des éclats ont été débités sur place à partir de nucléus; les chaînes opératoires de débitage sont complètes. Des outils ont été façonnés sur place; les chaînes opératoires de façonnage sont complètes.

Sur les sites de plein air qui correspondent à des haltes de chasse une industrie caractérisée par les galets aménagés est présente, aussi bien en Chine qu'en Europe du Paléolithique inférieur.

Autre la taille des éclats et des outils, dans ces campements de longue durée du fait d'une forte exploitation de la matière, la tradition culturelle reste bien évidente.

Les petits outils, nous informent de l'évolution technologique de chaque culture. Ainsi leur diversification des types et standardification des mêmes permet de bien caractériser leur stade culturel.

Sur les sites les plus anciens (Yunxian et terrasses de Roussillon) ces petits outils ont des fractures primitives, avec des rares retouches continues. Et sur les sites plus évolués, ce sont des racloirs, grattoirs, avec une diversité de formes. Notons la présence de ces deux types d'aménagement des petits outils dans les sites vieux de 700 000 ans, tel que la Pineta en Europe méridionale.

ORAL

## 6. THE LOWER AND MIDDLE PALAEO-LITHIC SEQUENCES OF EL KOWM (SYRIA) IN COMPARISON WITH THOSE OF ATAPUERCA AND TAUTAVEL

*Le Tensorer, Jean-Marie (University of Basel IPNA) jean-marie.letensorer@unibas.ch*

Due to the intensity of its archaeological remains, the region of El Kowm, in Central Syria, has been under particular scientific attention for 30 years. Huge stratified well-sites or surface scatters in the vicinity of raw material outcrops vouch for a continuous occupation of the area since the Lower Pleistocene. The four major sites of the region, Aïn al Fil, Hummal, Nadaouiyeh Aïn Askar (Swiss-Syrian team) and Umm el Tlel (French-Syrian team), taken together cover 2 million years of human settlements and evolution. The area encompasses some of the biggest archaeological sequences in Eurasia.

Hummal presents the longest archaeological sequence. Numerous archaeological levels allow an exceptional insight into technological traditions ranging from Oldowan culture to the beginning of Upper Palaeolithic. Plenty of faunal remains enable a diachronic observation of a distinctive fauna in an arid environment. The lithic assemblages contribute to current discussions about Pleistocene human dispersal and adaptation in the Middle East. For the first time a Lower Palaeolithic Oldowan culture has been found in central Syria. The Post-Acheulean sequence includes Yabrudian, Hummalian and Mousterian assemblages and their technological variability delivers further information about the emergence of complex blade and flake producing industries at around 250'000 years BP. Human remains were uncovered in Mousterian layers. They contribute another piece of evidence to the human adaptive diversity in Middle Palaeolithic sites of the Levantine region.

The site of Nadaouiyeh shows a sequence roughly covering a span-time of 600,000 years. The older part is especially well documented. The spring site comprises 32 layers of Acheulean and levels of Yabrudian, Hummalian and Levallois-Mousterian. Most certainly, with a 32 m thick stratigraphy, the Nadaouiyeh sequence is the most extensive site for the Acheulean cultures in the Levant. This steppe area played an important role in the conquest of Eurasia. This was underlined in 1996 by the discovery of a large cranial fragment of *Homo erectus* at the site of Nadaouiyeh. The site of Umm el Tlel shows a very long sequence from the Acheulean to the Neolithic with a

remarkable Mousterian and Initial Upper Palaeolithic stratigraphy. The site has been yielding several Middle Palaeolithic Human remains.

The aim of this study is to provide an overview of the natural and cultural context and evolution during the Pleistocene in the Syrian Desert in comparison with the large sequences at the Sierra de Atapuerca on the one hand, especially for the sites of Sima del Elefante and Gran Dolina and, on the other hand, with the huge stratigraphy of la Caune de l'Arago.

ORAL

## 7. THE DISTRIBUTION OF ACHEULEAN CULTURE AND ITS POSSIBLE ROUTES IN TURKEY

*Taskiran, Harun (University Of Ankara) htaskiran@ankara.edu.tr*

As it is known Turkey is a country located at the crossroads of possible migration routes between the three continents and plays a pivotal role in the distribution of Acheulean culture into the Eurasia.

Although Acheuléen culture, which is considered to have reached Turkey via the Levant corridor, shows a wide distribution in Turkey's Anatolian side, it cannot be seen in the Thrace part of Turkey. Therefore, the dissemination of Acheuléen culture from Turkey towards Balkan Peninsula or Southeastern Europe via the Turkish Thrace cannot be mentioned. Although there is not much evidence yet, the geographical situation of the Aegean Sea and the possible land bridges in Pleistocene should not be ignored.

However, the cultural remains of Acheuléen culture are seen densely in the Eastern and Southeastern regions of Anatolia. The Acheulean cultural remains, especially bifaces which found on the open air sites taking place on the old river terraces, generally in the Euphrates and Tigris Basin are strong evidence indicating the distribution of Acheulean culture in Anatolia and also the possible migration route of *Homo erectus* from Anatolia to the Caucasus. Many Acheulean sites which have been recently identified in the Caucasus and ancient *Homo erectus* fossil remains found in Dmanisi (Georgia) seem to support this distribution as well.

In this paper, according to the geographic regions the distribution of Acheulean culture and possible routes in Turkey will be discussed.

ORAL

## 8. GENERAL VIEW OF MIDDLE PALEOLITHIC IN TURKEY

*Özçelik, Kadriye (Ankara University) kozcelik@ankara.edu.tr*

It is observed in Turkey that Mousterian culture has a wide dispersal area, especially in Anatolian peninsula. This peninsula, so, has a unique significance for its geographical position between Asia and Europe.

In many of Turkey's open-air sites and caves, the traces of this culture can be realized. Karain cave, placed between these sites, situated near Antalya with its very favorable environmental conditions and geographic location, has presented a very long sequence of stratification for the Middle Paleolithic period in comparison with other caves.

Karain Cave is comprised of many chambers separated from each other with calcific formations. Chambers E and B within the same structure contain remains of Middle Paleolithic cultures. Dates obtained through TL and ESR indicated 160.000- 60.000 for the Middle Paleolithic of Karain E. The term "Karain Type Mousterian" is regarded as industries whose tools are dominated by side-scrapers and points, and in which the Levallois technique is observed intensely between the geological levels I.1- III.2. Other tools from this industrial group include perforators, discs, denticulated and notched pieces. The variety observed in raw materials is noteworthy. While large flakes and tools were knapped from quality flint of distant origins, knapping wastes and some tools were manufactured from local radiolarite.

Beneath "Karain Type Mousterian" are Charentian characters between the geological levels III.3 and III.4. Simple, convergent and transversal side- scrapers were shaped with stepped scaled retouches. Between the geological levels of III.5 and IV.5, the materials are mostly proto-Charentian or denticulated Charentian. The Levallois technique disappears entirely. The stone assemblage is comprised mostly of denticulated pieces. Chamber E Karain Cave contains not only three phased Middle Paleolithic industries but also the remains of bones and teeth belonging to a Neanderthal man who produced these industries.

Although work was conducted only in a very limited area, chamber B reveals clearly the presence of "Karain Type Mousterian".

Karain Cave sets a privileged example that features a Middle Paleolithic chronology in Turkey, especially with the techno-typological features and varieties of its industries in the stratigraphic sequence as well as the presence of skeletal remains of Neanderthal man.

Turkey, especially the Anatolian peninsula with its bridging role between Asia and Europe, did the honors to Neanderthal man being inhabited for a long time in Middle Paleolithic period.

ORAL

### 9. SPECIFICITIES OF THE ECONOMIC PATTERN ASSOCIATED TO THE HANDAXES CULTURES IN MEDITERRANEAN EUROPE. THE CONTRIBUTION OF LITHIC RAW MATERIAL SUPPLY.

*Grégoire, Sophie (Centre Européen de Recherches Préhistoriques de Tautavel, Université de Perpignan Via Domitia, UMR 7194 du CNRS) gregoire@cerptautavel.com*

In Europe, Middle Pleistocene sequences of the mediterranean region constitute for several years a support of multidisciplinary studies for the understanding of the economic patterns associated to the acheulean cultures. These patterns seem to be different from current models in other prehistoric cultures and so can constitute a signature of acheulean populations and their behavior that we try to define.

For example we will present the evolution of economic pattern during the long sequence of Caune de l'Arago cave in which acheulean levels are sometime succeeded by non-acheulean levels. This type of succession allow us to compare the lithic raw material supply model and define the economic pattern applied on each cultural phase.

With the support of others acheulean occupation like Terra Amata open air site and le Lazaret cave, in south of France, we will try to define the specificities of the economic patterns of the acheulean culture.

The aim of this study will be finally to observe if these specificities also exist in the handaxes cultures known in Asia with the purpose to identify the degree of filiation between both cultural groups.

ORAL

### 10. THE HOMO HEIDELBERGENSIS ASIAN EXPANSION: A RELEVANT INQUIRY?

*Vialet, Amélie (MNHN UMR7194) vialet@mnhn.fr*  
*Chevalier, Tony (UPVD UMR7194) tony.chevalier3@gmail.com*

Since it was coined, in 1908, the species *H. heidelbergensis* has generated a lot of publications. Nowadays, this specimen benefits from a renewed interest for several decades as a result of the increase of the fossil record in Europe. However, the studies have focused on the skull, on the one hand, and were based on the African and European hominids, on the other hand. In addition, the recent contribution of genetic analysis in the taxonomic interpretation of Central Asian populations has extended the range of Neanderthals 2,000 km further east. Thus, issues related to Neanderthals cannot be restricted anymore to Europe and the Levant. In the same way, the extension of *H. heidelbergensis* (consensually considered as the ancestor of Neanderthals) in Asia has to be examined in the light of the new paleo-genetic data.

Thereby this study aims at making a global synthesis of the available data from post-cranial and cranial material together with a re-examination of some fossils mostly from Asia such as Hathnora, in India, Nankin 1, Zhoukoudian L-C, Hexian, Dali, in China. The concept of variability (intra- and inter-groups) which is needed to assess the definition of *H. heidelbergensis*, will be integrated in this overall reflection and considered from sites such as the Arago cave in Tautavel or Atapuerca (Gran Dolina and Sima de los Huesos).

This synthesis, bringing together diverse and sometimes unpublished data, will try to:

- Make a "state of art" of this issue (historical discoveries, fossil data, state of preservation, geographical and chronological distribution, taxinomic and phylogenetic interpretations, contribution of genetics)
- Identify consensual notions as a basis for our study (geographic expansion, post-cranial and cranial anatomical characteristics, phylogenetic position ...)
- Assess the contribution of Asian fossils to the understanding of the taxon *Homo heidelbergensis*.

ORAL

## 11. HOMININ VARIABILITY AND POPULATION DISCONTINUITY IN MIDDLE PLEISTOCENE ASIA AND EUROPE: THE DENTAL EVIDENCE.

*Martinón-Torres, María (Centro Nacional de Investigación sobre la Evolución Humana) maria.martinon.torres@gmail.com*

*Song Xing (Institute of Vertebrate Paleontology and Paleoanthropology (Beijing) xingsong@ivpp.ac.cn*

*Wu Liu (Institute of Vertebrate Paleontology and Paleoanthropology (Beijing) liuwu@ivpp.ac.cn*

*Bermúdez de Castro, José María (Centro Nacional de Investigación sobre la Evolución Humana) josemaria.bermudez-decastro@cenieh.es*

In previous studies we proposed a “sink and source” model where the variability of the fossil hominin samples in Early and Middle Pleistocene Europe were explained as a result of repeated population dispersals, fragmentation, and re-combination of surviving populations inside Europe in response to climatic fluctuations, and also as result of repeated episodes of immigration from Southwest Asia<sup>1-3</sup>. “Source” populations would have lived in those parts of southern Europe where hominins could have survived glacial periods. “Sink” populations would have been in those areas that were only suitable for occupation in warm interglacials and often, they would have depended upon “source” populations for recruitment to maintain a stable occupation. When environmental conditions deteriorated, many “sink” populations would have become extinct and/or retreated to the southern refugia where they would have mixed with the resident groups. This pattern of isolation, local extinction and recombination would explain the high morphological variability maintained by European populations throughout the Middle Pleistocene. Recently, the retrieval and analyses of ancient DNA sequences from Denisova (Siberia) or Sima de los Huesos (Atapuerca)<sup>4-5</sup> seem to ratify a scenario of complex population interactions *within* Eurasia including the possibility of hybridization between “paleontological species”.

While the European fossil record is relatively well-characterized, only recently new specialized studies on old and new dental findings have started to contribute to a more precise picture of human evolution in Asia<sup>6,7</sup>. The analysis of the rich dental collections from the Asian Middle Pleistocene such as Zhoukoudian, Hexian, Chaoxian or Panxian Dadong expands the metrical and morphological variation known for the East Asian hominins.

Our study warns about the possibility that the Asian hominin variability may have been taxonomically oversimplified. Like in Europe, primitive-derived gradients in Asia are not satisfactorily fitted along a chronological sequence and suggest complex evolutionary scenarios with the coexistence and/or survival of different human lineages. Future research should explore whether the “sink and source” model proposed for Europe can be suitable to explain human evolution in Asia.

ORAL

## 12. MOBILITY DURING MIDDLE PLEISTOCENE ACROSS EURASIA: FAUNA, PEOPLE AND TECHNIQUES

*Violet, Amélie (MNHN UMR7194) violet@mnhn.fr*

*Moigne, Anne-Marie (MNHN UMR7194) moigne@mnhn.fr*

*Notter, Olivier (MNHN MAP Monaco) notterolivier@hotmail.com*

*Gaillard, Claire (MNHN UMR7194) gaillacl@mnhn.fr*

At the Eurasian scale, two main geographical units appear to operate differently during Quaternary: the Palaeartic zone ruled by alternation of glacials and interglacials and the subtropical / Mediterranean zone with more stable conditions allowing regular occupation.

Between these two large regions different technical traditions are observed, probably linked to the relation with the natural habitat (mineral, animal or vegetal) whether for food or for raw material. East-west movements are recorded from 800 ka onwards. However, while arrival of Asian fauna occurs in the West and contributes to a clear renewal of the faunal assemblages, these do not change much in the East. Similarly the lithic industries remain stable while a “true” Middle Palaeolithic develops in Europe.

Regarding the hominid remains, they are clearly lacking in the Palaeartic zone unlike southern regions. In the latter, the amplitude of variability among fossils in Europe, on the one hand, and among those of Asia, on the other hand, can be considered in order to distinguish specific settlement dynamics (regular intake of gene flow in the West versus evolutionary stasis in the East). All combined these sets of data allow to better approach the circulation of fauna across Eurasia during the Middle Pleistocene and to assess the possible correlation with movements of human groups on the basis, when fossils are missing, of lithic industries where both permanent traditions and new adaptations to local conditions are imprinted.

# B53 The archaeology of early fire use

Organiser: Mareike C. Stahlschmidt and Christopher E. Miller

Tuesday, 2nd (15:30 to 19:30)



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ORAL CONTRIBUTION

ORAL

## 1. IS THIS THING BURNT? ON THE NATURE OF EVIDENCE FOR HUMAN USE OF FIRE IN THE PALEOLITHIC

Miller, Christopher E. (Institute for Archaeological Sciences, University of Tübingen) [christopher.miller@uni-tuebingen.de](mailto:christopher.miller@uni-tuebingen.de)  
Stahlschmidt, Mareike (Institute for Archaeological Sciences, University of Tübingen) [mareike.stahlschmidt@uni-tuebingen.de](mailto:mareike.stahlschmidt@uni-tuebingen.de)

Mentzer, Susan (Institute for Archaeological Sciences, University of Tübingen) [susan.mentzer@uni-tuebingen.de](mailto:susan.mentzer@uni-tuebingen.de)

The use, control and production of fire represent crucial steps in the behavioral and biological evolution of humans. Fire provided warmth, light and protection, and was essential for the development of technological innovations including the modification of raw materials and cooking. Because of the central and daily role that fire plays in modern hunter-gatherer societies, many archaeologists assume that the control of fire was a prerequisite for demographic expansions out of Africa into colder regions of the world, including Northern Europe. Despite the significance afforded fire in the evolution of humans, there is little consensus among archaeologists about the timing and nature of its emergence. Some researchers suggest that fire was an essential part of human adaptation beginning in the Lower Paleolithic, whereas others suggest humans did not fully control fire until the beginning of the Upper Paleolithic. Adding to the ambiguity surrounding the debate on the origins of pyrotechnology is the nature of the archaeological evidence for fire use. Archaeologists usually rely on qualitative macroscopic characteristics, such as color, to determine if materials have been heated. The evidence is usually reported as combustion residues, such as charcoal and ash, or burnt bone, and heated rocks or sediment. However, numerous studies have shown that the qualitative characteristics that archaeologists commonly associate with heating can be produced by other non-anthropogenic processes, such as manganese staining and freezing. Even if the

presence of burnt materials can be firmly established at an archaeological site, its mere presence alone is not sufficient to demonstrate that humans were using or producing fire, since natural fires produce burnt and heated materials that can be deposited at an archaeological site without human intervention. Here we look at the nature of different lines of archaeological evidence for fire use, production and control and discuss its reliability for evaluating different hypotheses about the timing and nature of the emergence of pyrotechnology in the Pleistocene. We argue that the current discussion should move away from simple debates about presence or absence of evidence for fire. Rather, we should look at the variety of evidence in the archaeological record to investigate possible diachronic variation in fire-related behaviors.

ORAL

## 2. METHODS INTEGRATION IN THE STUDY OF PALEOLITHIC COMBUSTION FEATURES: PROMISES, PITFALLS AND PRESENTATION OF LARGE DATASETS

Mentzer, Susan M. (Institute for Archaeological Sciences, University of Tuebingen) [susan.mentzer@ifu.uni-tuebingen.de](mailto:susan.mentzer@ifu.uni-tuebingen.de)

Although micromorphology is now considered a standard approach in the identification of ancient combustion features, the technique is increasingly supplemented by a variety of complementary elemental, isotopic, and mineralogical analyses. Several of these analyses can be conducted directly on petrographic thin sections or resin-impregnated sediment blocks, which, in theory, enables the analyst to easily integrate results.

Here, a series of Paleolithic-age combustion features from a variety of sites will be investigated using a combination of high-resolution microarchaeological methods. Methods will include: (1) micromorphology, (2) stable carbon and oxygen isotopic analyses on loose sediments or materials drilled from resin-impregnated blocks, (3) Fourier transform infrared (FTIR) analyses on loose sediments and micro-FTIR measurements on thin sections and resin-impregnated blocks, (5) micro-X-ray fluorescence (XRF) measurements on resin-impregnated blocks, and (6) cathodoluminescence and/or scanning electron microscopy.

Under the best circumstances, this combination of methods can be used to identify burned materials and their spatial relationships within the broader "feature," to determine temperatures of heating of bones

and sediment, to identify calcareous and siliceous components of ashes in various states of preservation, and to reconstruct the past chemical environment at the site. In reality, this combination of methods can produce contradictory results that may or may not support for the hypothesis that human-controlled fire was present at an archaeological site. Nevertheless, researchers should be encouraged to integrate a wide variety of analytical methods and present complete datasets to the broader archaeological community.

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ORAL

### 3. GESHER BENOT YA-AQOV: THE EARLIEST EVIDENCE FOR THE USE OF FIRE IN EURASIA

*Alperson-Afil, Nira (Bar-Ilan University) [alperson@mscc.huji.ac.il](mailto:alperson@mscc.huji.ac.il)*

*Goren-Inbar, Naama (Hebrew University Jerusalem) [goren@cc.huji.ac.il](mailto:goren@cc.huji.ac.il)*

The Acheulian site of Gesher Benot Ya'aqov (GBY) is located on the shores of the paleo-Lake Hula in the Levantine Corridor. A 34 m depositional sequence was exposed in the study area, documenting an oscillating paleo-lake and considered to reflect global climatic changes assigned to OIS 18-20.

Embedded within the sequence are some 13 archaeological horizons indicating that Acheulian hominids repeatedly occupied the lake margins, where they processed meat, extracted marrow, quarried and transported different kinds of rock, skillfully produced stone tools, and gathered a vast range of plant foods.

The presence of fire at GBY is documented by burned flint artifacts, charcoal fragments, burned wood, and burned seeds, all recorded along the entire stratigraphic sequence. The identification of burned flint is based on macroscopic signs of heat alteration, which is confirmed by thermoluminescence (TL) analyses.

The fact that fire at GBY was controlled and used throughout the long cultural sequence is documented by the repeated occurrence of clusters of burned flint microartifacts, considered to be phantom hearths.

Spatial analyses further suggest that these hearths were focal points for a variety of activities such as stone knapping, tool use and modification, consumption of aquatic resources, and nut cracking. The spatial association between these activities and the hearths is

an indicator of the expansion of the human diet resulting from the use of fire.

GBY is an open-air site that preserves a long stratigraphic sequence of sealed multiple strata without pronounced postdepositional processes. The occurrence of phantom hearths and their associated activities in this unique setting provides the earliest evidence of controlled fire use in Eurasia.

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ORAL

### 4. EVIDENCE OF EARLY PALAEO-LITHIC FIRE AT THE LATE EARLY PLEISTOCENE SITE OF CUEVA NEGRA DEL ESTRECHO DEL RÍO QUIPAR (CARAVACA DE LA CRUZ, MURCIA, SPAIN).

*Walker, Michael J (Dept of Zoology and Physical Anthropology, Biology Faculty, Murcia University, Espinardo Campus Edificio 20, 30100 Murcia, Spain. Tel: 0034-620-267104) [mjwalke@gmail.com](mailto:mjwalke@gmail.com)*

*Angelucci, Diego E. (B.Bagolini Laboratory for Prehistoric and Mediaeval Archaeology and Historical Geography, Department of Humanities, Trento University, via T. Gar 14, I-38122 Trento, Italy) [diego.angelucci@unitn.it](mailto:diego.angelucci@unitn.it)*

*Anesin, Daniela (B.Bagolini Laboratory for Prehistoric and Mediaeval Archaeology and Historical Geography, Department of Humanities, Trento University, via T. Gar 14, I-38122 Trento, Italy) [diego.angelucci@unitn.it](mailto:diego.angelucci@unitn.it)*

*Fernández-Jalvo, Yolanda (Dept of Palaeobiology, National Museum of Natural Sciences of the Spanish National Research Council, Calle José Gutiérrez Abascal 2, 28006 Madrid, Spain) [yfj@mncn.csic.es](mailto:yfj@mncn.csic.es)*

*Haber-Uriarte, María (Dept of Prehistory, Archaeology, Ancient and Mediaeval History and Historiographical Techniques and Science, Calle Santo Cristo 1, 30001 Murcia, Spain.) [mariahaber@pi-ma.es](mailto:mariahaber@pi-ma.es)*

*López-Martínez, Mariano (Calle Pintor Joaquín 10-4º-I, 30009 Murcia, Spain (MUPANTQUAT Murcian Ass. for Study of Palaeoanthropology and Quaternary) [marianolopez@hotmail.com](mailto:marianolopez@hotmail.com)*

*López-Jiménez, Antonio (Dept of Zoology and Physical Anthropology, Biology Faculty, Murcia University, Espinardo Campus Edificio 20, 30100 Murcia, Spain.) [aljsilver@gmail.com](mailto:aljsilver@gmail.com)*

*Rhodes, Sara (Dept of Anthropology, Faculty of Arts and Sciences, University of Toronto St. George Campus, 172 St. George Street, Toronto, Ontario, ON M5R 0A3, Canada) [sara.rhodes@utoronto.ca](mailto:sara.rhodes@utoronto.ca)*

*Rodríguez-Estrella, Tomás (Dept of Mining Engineering, Geology and Cartography, Cartagena Polytechnic University, Plaza Cronista Isidoro Valverde, Edificio La Milagrosa, 30202*

Cartagena, Murcia, Spain) [tomas.rodriguez@upct.es](mailto:tomas.rodriguez@upct.es)  
Schwenninger, Jean-Luc (Oxford University Research Laboratory for Archaeology and the History of Art, Dyson Perrins Building, South Parks Road, Oxford OX1 3QY, United Kingdom) [jean-luc.schwenninger@rlaha.ox.ac.uk](mailto:jean-luc.schwenninger@rlaha.ox.ac.uk)  
Skinner, Anne R (Dept of Chemistry, Williams College, 880 Main Street, Williamstown, Massachusetts, MA 01267, USA) [anne.skinner@williams.edu](mailto:anne.skinner@williams.edu)  
Berna, Francesco (Dept of Archaeology, Simon Fraser University, 888 University Drive, Burnaby, British Columbia, BC V5A 1S6, Canada.) [fberna@sfu.ca](mailto:fberna@sfu.ca)

Evidence suggesting fire was tended inside this large rock-shelter occurs deep in sediments magnetostratigraphically dated to >0.78 Ma (Scott and Gibert, 2009, *Nature* 461: 82-5). Biostratigraphical findings indicate 0.7 Ma (Walker *et al.*, 2013, *Quaternary International* 294: 135-159). The Palaeolithic assemblage includes *Homo cf. heidelbergensis* teeth, a limestone hand-axe, numerous small retouched chert artifacts, including flakes struck by repetitive centripetal flaking of small cores, and knapping débris (*ibidem*); the chert came from nearby conglomerates and gravels (Zack *et al.*, 2013, *Quartär* 60: 7-28).

Excavation of 2 m<sup>2</sup>, 5 m behind the entrance, of a deposit -4.5 m below the top of the sedimentary sequence, uncovered evidence that fire may well have affected bone and Palaeolithic chert artifacts (in "unit VI", the lowest: Walker *et al.*, 2013, *loc. cit.*; equivalent to "complex 3-2": Angelucci *et al.*, 2013, *Quaternary Science Reviews* 89: 195-199). Burnt bone is analyzed by electron spin resonance and Fourier Transform infrared spectroscopy, burnt chert by thermoluminescence, and sediment by thin-section micromorphology and mineral analysis.

Excavation (A.L-J., M.L-M., M.H-U., M.J.W.) revealed both charred bone and numerous white calcined bone fragments, including some with conjoined lengthwise long-bone spalling typical of circumferential shrinkage after thermal volatilization of organic components (cf. D.H.Uberlaker, 1999 [2004], *Human Skeletal Remains*. Washington DC, Taraxacum, 35-38). Thermally-altered lustreless chert fragments abound. They include a nodule cracked open by heat revealing both a pot-lid fracture and many small razor-sharp splinters still in place, like petals of a flower, and an artificially-struck flake likewise cracked open by thermal shock with sharp conjoinable fragments still in place; following thermal alteration those two pieces can hardly have undergone displacement of more than a few centimetres without greater separation of their fragments occurring. Thermoluminescence analysis is underway (J-L.S.). Geoarchaeological evidence

(A.D.E., A.D.) may be consistent with combustion (Angelucci *et al.*, 2013, *Quaternary Science Reviews* 80: 195-9). Sediment minerals were investigated using X-ray fluorescence, X-ray diffraction, and thermogravimetric analysis with mass spectrometry (T.R-E). Taphonomical analysis (S.E.R.) and scanning electron microscopy and energy dispersive X-ray spectrometry of bone (S.E.R., Y.F-J.) attribute discolouration to burning, not to post-depositional mineral staining, and both Fourier Transform infrared spectroscopy (F.B.) and electron spin resonance analysis (A.S.) imply firing temperatures ca. 550-600° C.

Evidence suggests high temperature reached inside Cueva Negra may have been due to fire tended within it. Conjecturally, hominins might have taken inside smouldering brands, left behind outside by a forest fire, in order to *establish* and *tend* a fire where rain or wind would not extinguish it. They may have been less afraid of fire outside than other animals they saw fleeing before it, which could have led them to play with fire in order to drive animals towards natural death-traps (e.g. swamps, cliffs) followed by butchery and roasting. This hardly means they could *reproduce* or *control* fire at 0.8 Ma: that probably was attained only *after* 0.5 Ma when evidence of fire-pits or constructed hearths start appearing. Evolutionary consequences for human physiology and cognition are considered.

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ORAL

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**5. MINERAL MAGNETISM AS A TOOL TO STUDY A POSSIBLE FIRE AT THE LATE MIDDLE PLEISTOCENE TE19 LEVEL OF SIMA DEL ELEFANTE SITE (SIERRA DE ATAPUERCA, BURGOS).**

Carrancho Alonso, Ángel (Área de Prehistoria, Dept. Ciencias Históricas y Geografía, Universidad de Burgos, Edificio D+I, Plaza Misael Bañuelos s/n, 09001 Burgos, Spain) [acarrancho@ubu.es](mailto:acarrancho@ubu.es)

Villalain, Juan José (Dpto. Física, Universidad de Burgos, Escuela Politécnica Superior, Avda. Cantabria s/n, 09006 Burgos, Spain) [villa@ubu.es](mailto:villa@ubu.es)

Vallverdú, Josep (IPHES, Institut Català de Paleoecologia Humana i Evolució Social, C/Marcel·lí Domingo s/n, Campus Sescelades (Edifici W3), 43007 Tarragona, Spain / Área de Prehistoria, Universitat Rovira i Virgili (URV), Avinguda de Catalunya 35, 43002 Tarragona, Spain) [jvallverdu@iphes.cat](mailto:jvallverdu@iphes.cat)  
Carbonell, Eudald (IPHES, Institut Català de Paleoecologia Humana i Evolució Social, C/Marcel·lí Domingo s/n, Campus Sescelades (Edifici W3), 43007 Tarragona, Spain / Área de Prehistoria, Universitat Rovira i Virgili (URV), Avinguda de Catalunya 35, 43002 Tarragona, Spain) [eudald.carbonell@](mailto:eudald.carbonell@)

*urv.cat*

Unequivocal identification of fire in palaeolithic sites is problematic since evidences use to be few, ambiguous and generally bad preserved. These normally manifest as rufed substrates, cracked pebbles with characteristic colours, charcoals or in the best case, the presence of ashes. Here we report a mineral magnetic study carried out at the TE19 level (~ 200 ky BP) of Sima del Elefante site (Sierra de Atapuerca, Burgos), where in the 2001 field season appeared charcoal remains in close association with bones possibly burnt. The main goal of this study is to characterize the magnetic properties of these samples potentially heated and compare them with the unburnt adjacent sediment in order to verify burning activities. Analyses initially comprised the systematic measurement of low-field magnetic susceptibility (MS) of almost 100 bulk samples from the whole panel (TE19). Afterwards, partial thermomagnetic curves (magnetization vs. temperature) were performed in 50 °C incremental steps from 200 °C to 700 °C in air. These were carried out on a sample from the potential hearth and another from the nearby unburnt area, in order to study their thermomagnetic reversibility. All measurements were carried out at the Laboratory of Palaeomagnetism of Burgos University (Spain).

The obtained MS values oscillate between  $3.25 \times 10^{-6}$  and  $6.71 \times 10^{-7} \text{ m}^3\text{kg}^{-1}$ , with mean values of  $\sim 1.95 \times 10^{-6} \text{ m}^3\text{kg}^{-1}$  for the samples from the potential hearth, indicating that the concentration of ferromagnetic minerals (*s.l.*) is not particularly high. The most striking feature is that the degree of thermomagnetic reversibility in the sample out of the potential hearth is even higher than the sample from it. Taking into account the similarity in the magnetic mineralogy of all studied samples (magnetite as main carrier) and that the intensity of magnetization is similar both in samples out and within the potential hearth, we cannot unequivocally conclude that burning activities took place here but neither reject them. What it should be expected, as shown by experimental recreations of prehistoric fires in clayish substrates under controlled field and temperature conditions, is an enhancement in concentration-dependent magnetic parameters as a consequence of the creation of new ferrimagnetic minerals. It is not excludable, however, that syn and/or post-depositional process might be responsible of the homogenization of the observed magnetic properties.

ORAL

## 6. MIS 5 COMBUSTION STRUCTURES AT ABRIC DEL PASTOR, ALCOY, SPAIN

*Mallo, Carolina (Universidad de La Laguna) cmallol@ull.es*  
*Hernández, Cristo (Universidad de La Laguna) chergomw@gmail.com*

*Cabanes, Dan (Universidad de Barcelona) dancabanes@ub.edu*  
*Machado, Jorge (Universidad de La Laguna) jorgemachado85@gmail.com*

*Rodríguez, Ágata (Universidad de Barcelona) agata.roci@gmail.com*

*Galván, Bertila (Universidad de La Laguna) bgalvan@ull.es*

We report a series of 12 combustion structures recovered from a MIS 5 archaeo-sedimentary deposit at Abric del Pastor, Alcoy, Spain. The site is a small rockshelter under current large surface excavation. So far, it has yielded a 1.60 meter-thick stratified sequence of alternating blocky and sandy layers bound by sharp contacts. Ongoing integrated interdisciplinary, multi-technique investigations at the site involve: a study of the lithic record based on RMUs, zooarchaeology including the microfaunal record, archaeostratigraphy using GIS, paleochronology using TL dating and amino acid racemization, anthracology including GIS and microstratigraphic geoarchaeology using micromorphology, FTIR, GC/MS and phytolith analysis. This research is complemented by experiments to investigate fire making on blocky substrates. Preliminary results have brought to light evidence of a series of brief human occupations older than 75,000 years ago. Here we present an overview of the combustion record. The combustion features are consistently found at the interfaces between layers.

They show discrete circular morphologies, diameters ranging between 60 and 115 cm and no macroscopically visible ash. In accordance with the nature of their sedimentary substrates their expression in the field is twofold: 1) blackened and reddened cobbles in blocky layers and 2) reddened or blackened patches in sandy layers. These are stratigraphically associated with thermally altered material (flint flakes, bone fragments and small stones). Micromorphology and FTIR analyses have revealed presence of relict wood ash and thermally altered sedimentary substrates. Our experiments on blocky substrates have shown that ash can be readily infiltrated in between loosely packed blocks through gravity and rain. Also, the experimental blocks were blackened and reddened in the same way as those found at the site. In sum, our preliminary results show that the

combustion features from Abric del Pastor represent *in situ* hearths and suggest that fire was an important element of hominin lifestyles in the Alcoy region as far back as 100 ka.

*Sorensen, Andrew (Leiden University) a.c.sorensen@arch.leidenuniv.nl*

*Rots, Veerle (University of Liège) veerle.rots@ulg.ac.be*

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ORAL

## 7. THE COMPLEXITY OF MAKING FIRE

*Scheffele, Sebastian (Institut für Ur- und Frühgeschichte und Archäologie des Mittelalters, Dept. Ältere Urgeschichte und Quartärökologie, University of Tübingen, Germany) Sebastian\_Scheffele@gmx.de*

*Haidle, Miriam Noël (Research Project The Role of Culture in Early Expansions of Humans ROCEEH, Senckenberg Research Institute and University of Tübingen, Germany) miriam.haidle@uni-tuebingen.de*

While Paleolithic evidence on the control and technical application of fire is increasing, the organizational elements for its maintenance and production have not been examined in a systematic way. Here, a comparative analysis of maintenance and production of fire with different tool kits will be presented.

The studies are based on ethnographic literature and experiments. The reconstructed processes are coded in cognigrams and effective chains, showing the different attention foci (raw materials, tools), actions, and effects of foci on other foci.

Maintaining a burning fire on a spot can be regarded as a simple process. However, the maintenance of fire out of a piece of ember requires already the ability to cope with the concept of composite tools. The production of fire, no matter by which method, can be mastered only with the competence to create and use complementary tool sets.

It can be shown that the control of fire is not a simple question of absence/presence, but represents sequences of development in knowledge and skill, conceptual understanding, and cognition.

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ORAL

## 8. TESTING THE 'EXPEDIENT STRIKE-A-LIGHT MODEL': AN EXPERIMENTAL ASSESSMENT BASED ON THE FIRST IDENTIFIED MIDDLE PALAEOOLITHIC FIRE-MAKER FROM BETTENCOURT (FRANCE)

The use of fire by Neandertals and their predecessors is currently a hot-button issue in the realms of Palaeolithic Archaeology and Palaeoanthropology. By and large, research within this vein focuses on the origins of "habitual" fire use, inferred from morphological changes within the human lineage observed in the fossil record, or from discerning the presence of possible anthropogenic fire features on increasingly older sites. Our research, on the other hand, focuses on identifying direct evidence of fire *production* in the Palaeolithic record by looking for tools used to make fire, namely "strike-a-lights" made from flint or other siliceous material used in conjunction with sulphur- and iron-bearing minerals (e.g. pyrite and marcasite) to make sparks. While strike-a-lights have been regularly identified from the late Upper Palaeolithic onwards, this is not the case for the Middle Palaeolithic. In this light, the "expedient strike-a-light model" has been proposed, which asserts early fire-making tools were likely used on an ad hoc basis for only a short period of time prior to being discarded. This stands in stark contrast to the more "classic" curated strike-a-lights recovered from Neolithic and Bronze Age contexts that show very heavy use traces, indicative of multiple episodes of use. It implies that the traces on Middle Palaeolithic strike-a-lights may be less easily detected in the archaeological record and perhaps the gestures used differed from those in later periods. We present the results of an experimental program that was performed to test this model as well as preliminary results of our evaluation of microwear traces, interpreted as resulting from use as a strike-a-light, observed on the lateral edge of an atypical Levallois point from the Middle Palaeolithic site of Bettencourt (75/85,000 BP; TL-IRSL/ESR) in northern France. To our knowledge, this is the only tool predating the late Upper Palaeolithic that has been described in the literature as bearing fire-making traces after undergoing modern microwear analysis. The traces, as previously described, consist of moderately heavy edge damage (i.e. edge-removals and crushing), minor rounding, polish and striations consistent with short-term application against mineral material, as well as prehension "gloss" from handling the tool in the presence of mineral dust, characteristic of "dirty" tasks like fire making. A tool exhibiting this suite of traces would lend support to the "expedient strike-a-light model". Until now, systematic testing of the veracity of the interpretation of the Bettencourt piece as a strike-a-light against experimental data has not been performed. Thus, we report the results of a battery of new fire-making and non-fire-making experiments conducted in

an effort to replicate the microwear traces observed on the Bettencourt piece.

ORAL

### 9. FIRE USE FOR EARLY TRANSFORMATIVE TECHNOLOGY: THE EARLIEST KNOWN HEAT TREATMENT OF SILCRETE

*Schmidt, Patrick (University of Tübingen, Department of Prehistory and Quaternary Ecology, Germany) patrick.schmidt@uni-tuebingen.de*

*Porraz, Guillaume (CNRS, USR 3336, UMIFRE 25 and Evolutionary Studies Institute, University of the Witwatersrand, SA) guillaume.porraz@mae.u-paris10.fr*

Since its discovery, fire fulfilled a series of purposes and was used in a variety of processes. Some of the most creative early applications of fire are transformative technologies like the heating of adhesives for composite tools or the heat treatment of stone prior to tool production. South Africa has in recent years gained increasing importance for understanding such fire-related transformative technologies because one of the key elements in the suite of 'modern behaviours' that appeared during the southern African Middle Stone Age (MSA) was heat treatment of silcrete. Until now, there has been no direct archaeological evidence for the exact procedure used for the heat treatment of silcrete and the implications of this process for understanding the investment and actions of its MSA instigators remain unclear.

Conducting mineralogical and crystallographic analyses aiming to understand the parameters necessary for heat treatment of South African silcrete, we found out that this material is particularly undemanding regarding heating speed and temperature and thus, can be heat-treated with most techniques known from ethnographic observations. This is because of its particularly low 'water' content and its large pore space allowing rapid evacuation of steam that otherwise would lead to overheating.

In a second step, we tried to find direct archaeological proof to highlight some of the parameters of MSA heat treatment by conduction a series of experiments aiming to reproduce possible procedures requiring the least investment in time and resources. We found that, when silcrete is heated in direct contact with the glowing embers of a domestic fire, a particular residue may be produced on its surface, a tempering residue, which results from the distillation of plant exudations in

anoxic conditions within the ember-pile. We observed and chemically characterized an identical residue on the surfaces of heat-treated silcrete from Diepkloof Rock Shelter, indicating that the procedure used for heat treatment in the MSA involved such heating in embers. Regular domestic fires, as they are known from many sites dating from the South African Middle Stone Age, can be used for this relatively fast and highly efficient procedure. Our low-investment model of silcrete heat treatment opens for the first time the possibility to discuss the insertion of this technique in the *chaîne opératoire*, the time and resources needed for its realisation and its place in the suite of modern behaviours that appeared during the MSA in South Africa.

# B54 Genetic analysis of modern and ancient samples

Organiser: Jaime Lira Garrido and Juan Luis Arsuaga

Thursday, 4th (09:00 to 14:30)  
A11 Meeting room



2014 burgos  
1-7 sept.

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XVII World UISPP Congress  
XVIIe Congrès Mondial de l'UISPP  
XVII Congreso Mundial de UISPP

ORAL CONTRIBUTION

WELCOME AND PRESENTATION

ORAL

**1. A GENETIC CHARACTERIZATION OF THE FOSSILS FROM SIMA DE LOS HUESOS**

Meyer, Matthias (Department of Evolutionary Genetics, Max Planck Institute for Evolutionary Anthropology. Deutscher Platz 6, 04103 Leipzig, Germany) mmeyer@eva.mpg.de

Arsuaga, Juan Luis (Centro Mixto, Universidad Complutense de Madrid Instituto de Salud Carlos III de Evolución y Comportamiento Humanos.) jlarsuaga@isciii.es

Martínez, Ignacio (Centro de Investigación Sobre la Evolución y Comportamiento Humanos, Universidad Complutense de Madrid Instituto de Salud Carlos III, 28029 Madrid, Spain) ignacio.martinezm@uah.es

García, Nuria (Centro de Investigación Sobre la Evolución y Comportamiento Humanos, Universidad Complutense de Madrid Instituto de Salud Carlos III, 28029 Madrid, Spain) ngarcia@isciii.es

Gracia, Ana (Centro de Investigación Sobre la Evolución y Comportamiento Humanos, Universidad Complutense de Madrid Instituto de Salud Carlos III, 28029 Madrid, Spain) agracia@isciii.es

Bermúdez de Castro, José María (Centro Nacional de Investigación sobre la Evolución Humana, Paseo Sierra de Atapuerca, 09002 Burgos, Spain) jm.ber@cenieh.es

Carbonell, Eudald (Institut Català de Paleoecologia Humana i Evolució Social, C/Marcel·lí Domingo s/n (Edifici W3), Campus Sescelades, 43007 Tarragona, Spain) ecarbonell@iphes.cat

Valdiosera, Cristina (Centro de Investigación Sobre la Evolución y Comportamiento Humanos, Universidad Complutense de Madrid Instituto de Salud Carlos III, 28029 Madrid, Spain) cvaldiosera@isciii.es

Knapp, Michael (Molecular Ecology and Fisheries Genetics Laboratory, School of Biological Sciences, Bangor University. Deiniol Road, Bangor, Gwynedd LL57 2UW UK) m.knapp@bangor.ac.uk

Dabney, Jesse (Department of Evolutionary Genetics, Max Planck Institute for Evolutionary Anthropology. Deutscher Platz 6, 04103 Leipzig, Germany) jesse\_dabney@eva.mpg.de

Qiaomei Fu (Department of Evolutionary Genetics, Max Planck Institute for Evolutionary Anthropology. Deutscher Platz 6, 04103 Leipzig, Germany)

Aximu-Petri, Ayinuer (Department of Evolutionary Genetics, Max Planck Institute for Evolutionary Anthropology. Deutscher Platz 6, 04103 Leipzig, Germany)

Glocke, Isabelle (Department of Evolutionary Genetics, Max

Planck Institute for Evolutionary Anthropology. Deutscher Platz 6, 04103 Leipzig, Germany)

Gansauge, Marie-Theres (Department of Evolutionary Genetics, Max Planck Institute for Evolutionary Anthropology. Deutscher Platz 6, 04103 Leipzig, Germany)

Weihmann, Antje (Department of Evolutionary Genetics, Max Planck Institute for Evolutionary Anthropology. Deutscher Platz 6, 04103 Leipzig, Germany)

Nickel, Birgit (Department of Evolutionary Genetics, Max Planck Institute for Evolutionary Anthropology. Deutscher Platz 6, 04103 Leipzig, Germany)

Pääbo, Svante (Department of Evolutionary Genetics, Max Planck Institute for Evolutionary Anthropology. Deutscher Platz 6, 04103 Leipzig, Germany) paabo@eva.mpg.de

Improvements to ancient DNA extraction and library preparation techniques have enabled the reconstruction of genome sequences from Late Pleistocene hominins at an unprecedented level of resolution. High quality genome sequences are now available from early modern humans as well as Neanderthals and Denisovans. The latter is an Asian sister group to Neanderthals that was discovered only a few years ago by genetic analysis. Despite these advances, genetic analysis of hominin remains until recently seemed limited to the Late Pleistocene period due to constraints on DNA preservation. Interestingly, in 2006 Valdiosera and colleagues proposed DNA preservation in bear bones (*U. deningeri*) excavated from the site of Sima de los Huesos in the Atapuerca archeological complex. We reasoned that the more advanced current analytical techniques might allow for the recovery of phylogenetic informative DNA sequences from the bear, and possibly also the hominin remains of the site.

To explore whether DNA sequences can be obtained from the Sima de los Huesos fossils, we first sampled bear bones that were found in a layer together with hominin remains. After DNA preservation was confirmed for the bear bones, we also drilled small holes into pre-existing fractures of a hominin femur. DNA was isolated using a novel silica-based extraction procedure developed to optimize retrieval of strongly degraded ancient DNA. The DNA was then converted into libraries for sequencing using a highly sensitive technique, where each DNA strand can independently become integrated in the library. Libraries were enriched for bear and hominin mitochondrial DNA and sequenced.

We were able to recover nearly complete mitochondrial genome sequences from the bear and the hominin bones. The mitochondrial sequences were assembled from DNA fragments between 30 and 50 base pairs,



shorter than those used in any previous ancient DNA study. From the missing mutations in the two genomes we obtain molecular age estimates for the fossils that are close to 400,000 years, broadly in line with geological dates. The mitochondrial genome of Sima de los Huesos cave bear (*Ursus deningeri*) shows that it is a sister lineage to Late Pleistocene cave bears (*U. spelaeus*). The hominin mitochondrial sequence unexpectedly shows a closer relationship to the ancestors of the mitochondrial genomes of Denisovans than to those of Neanderthals or modern humans.

Our work opens the prospect of genetic studies on Middle Pleistocene hominins. We are currently focusing on recovering nuclear DNA sequences from the Sima de los Huesos hominins. Such data are needed to more accurately determine their genetic relationship to other hominins, for example with regard to Denisovans for which almost no morphological information exist. New sequencing and analysis strategies are currently tested to overcome the technical problems imposed by the extreme state of DNA degradation in the fossils and the presence of human and microbial contamination.

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ORAL

## 2. VALIDATING DIFFERENT DIAGNOSTIC CRITERIA FOR THE IDENTIFICATION OF CAPRA PYRENAICA AND CAPRA HIRCUS THROUGH ANCIENT DNA ANALYSIS.

*Galindo Pellicena, María Angeles (Centro Mixto UCM-ISCIID de Evolución y Comportamiento Humanos. Avenida Monforte de Lemos, 5, 28029 Madrid (Spain) / Departamento de Paleontología, Facultad de Geología. Universidad Complutense de Madrid. C/José Antonio Novais, 2, 28040 Madrid (Spain) mariangape79@hotmail.com*

*Ureña, Irene (Centro Mixto, Universidad Complutense de Madrid Instituto de Salud Carlos III de Evolución y Comportamiento Humanos.) iurena@isciii.es*

*Valdiosera, Cristina (Centro de Investigación Sobre la Evolución y Comportamiento Humanos, Universidad Complutense de Madrid Instituto de Salud Carlos III, 28029 Madrid, Spain) cvaldiosera@isciii.es*

*Arsuaga, Juan Luis (Centro Mixto, Universidad Complutense de Madrid Instituto de Salud Carlos III de Evolución y Comportamiento Humanos.) jlarsuaga@isciii.es*

Appropriate identification of goat remains at an archaeological site provides important information about the structure and behaviour (subsistence strategies) of ancient human societies. Traditionally,

Iberian wild goats (*Capra pyrenaica*) and domestic goats (*Capra hircus*) have been differentiated using biometric criteria whereas morphological identification of these species has remained poorly studied.

We tested the biometric and morphological criteria for goat species identification in a set of 35 anatomical elements. From these, 20 bones belonged to modern domestic goats obtained from comparative anatomical collections of the Zinman Institute of Archaeology of the University of Haifa, the National Natural History Collections of the Hebrew University of Jerusalem, and the Department of Archaeology of the University of Sheffield. The remaining 15 bones correspond to fossil material of wild and domestic goat from Paleolithic and Neolithic levels from the site of Chaves in Huesca, Spain.

We used mitochondrial DNA markers to genetically identify the fossil remains through ancient DNA analysis in order to verify the criteria used to differentiate wild from domestic goats with non-genetic analysis. Thus, the genetic results of the ancient material were furthered contrasted to those of modern goats obtained with biometric and morphological analyses.

The identification of modern goats using morphological and biometrical criteria show highly similar results. In the fossil data set we observed a positive correlation between the genetic species assignation and the morphological and biometrical identification.

We observed little discrepancy between the morphological criteria used in this study for the identification of wild and domestic goats and the DNA results. However, the reliability of the identification criteria for some anatomical elements was not clear, particularly for mandibles and metacarpals. This is a pilot study and therefore we are still working in increasing our sample size in terms of individuals but also in terms of the anatomical elements to be analysed.

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ORAL

## 3. RECONSTRUCTING EUROPEAN LYNX HISTORY USING ANCIENT DNA.

*Rodríguez Varela, Ricardo (Centro Mixto, Universidad Complutense de Madrid Instituto de Salud Carlos III de Evolución y Comportamiento Humanos.) ricardo\_eyre@yahoo.es*

*Tagliacozzo, Antonio (oprintendenza al Museo*

Nazionale Preistorico Etnografico L. Pigorini, Sezione di Paleontologia del Quaternario e Archeozoologia) antonio.tagliacozzantonio.tagliacozzo@beniculturali.it  
Ureña, Irene (Centro Mixto, Universidad Complutense de Madrid Instituto de Salud Carlos III de Evolución y Comportamiento Humanos.) iurena@isciii.es  
García, Nuria (Centro Mixto, Universidad Complutense de Madrid Instituto de Salud Carlos III de Evolución y Comportamiento Humanos.) ngarcia@isciii.es  
Crégut-Bonnoure, Evelyne (Muséum Requiem Avignon, France) evelyne.cregut@mairie-avignon.com  
Mannino, Marcello A (Department of Human Evolution, Max Planck Institute for Evolutionary Anthropology, Leipzig, Germany) marcello.mannino@eva.mpg.de  
Nores, Carlos (University of Oviedo, Campus de Mieres) cnores@uniovi.es  
Arsuaga, Juan Luis (Centro Mixto, Universidad Complutense de Madrid Instituto de Salud Carlos III de Evolución y Comportamiento Humanos.) jlarsuaga@isciii.es  
Valdiosera, Cristina (La Trobe University | Melbourne) C.Valdiosera@latrobe.edu.au

The Iberian lynx is critically endangered and considered to be the next most likely to go extinct of the feline species. It is the most threatened carnivore in Europe and endemic to the Iberian Peninsula. During the past two centuries, the Iberian lynx has seen a dramatic decrease in habitat. Widely distributed in the Iberian Peninsula during the Pleistocene and Holocene it is now confined to two small populations in southern Spain. Delineating the past geographic distribution of a species has important consequences for conservation strategies and it is necessary to understand its history and evolution. Due to the difficulty of a confident morphological distinction between different lynx species from postcranial remains, there is the possibility for potential misidentification between the Iberian, the Eurasian and the cave lynx.

We analysed ancient mtDNA extracted from a series of bone and teeth remains of lynx species assigned to *Lynx lynx*, *Lynx pardinus*, *Lynx pardinus spelaeus* and *Lynx sp.*, from different Pleistocene and Holocene sites in Spain, France, Denmark and Italy. We compared the genetic identification of the remains analysed to their morphological species assignment in order to test if the traditional palaeontological past distribution of the different lynx species is supported by the molecular data.

Our results have changed the historic distribution of European lynx species confirming that only genetic analysis can provide an accurate lynx species identification from postcranial remains. Furthermore we

resolve the phylogenetic position of the extinct cave lynx, *Lynx pardinus spelaeus*.

ORAL

#### 4. EVIDENCE OF MTDNA "T" HAPLOGROUP IN A NORTHERN IBERIAN OLD NEOLITHIC BOS SP. SAMPLE FROM MENDANDIA ROCK SHELTER (TREVIÑO, SPAIN): IMPLICATIONS FOR CATTLE DOMESTICATION.

Lira, Jaime (Centro Mixto UCM-ISCIII de Evolución y Comportamiento Humanos. Avenida Monforte de Lemos, 5, 28029 Madrid (Spain) jaime.e.lira@gmail.com  
Alday, Alfonso (Departamento de Geografía, Prehistoria y Arqueología, Universidad del País Vasco, C/ Tomás y Vicente s/n, 01006 Vitoria, Spain.) a.alday@ehu.es  
Carretero, José-Miguel (Laboratorio de Evolución Humana, Departamento de Ciencias Históricas y Geografía, Universidad de Burgos, Edificio I+D+i, Plaza de Misael de Bañuelos s/n, 09001 Burgos, Spain.) jmcarre@ubu.es  
Anderung, Cia (Department of Ecology and Genetics, Uppsala University. Norbyvägen 18D, SE-752 36 Uppsala, Sweden.) cecilia.anderung@ebc.uu.se  
Bouwman, Abigail (Molecular Group Centre for Evolutionary Medicine. Institute of Anatomy, University of Zurich Y-42-J-48, Winterthurerstrasse 190, CH-8057 Zurich, Switzerland) abigail.bouwman@uzh.ch  
Götherström, Anders (Department of Evolutionary Biology, Evolutionary Biology Centre, Uppsala University, Norbyvägen 18D, SE-752 36 Uppsala, Sweden.) anders.gotherstrom@ebc.uu.se  
Arsuaga, Juan Luis (Centro Mixto UCM-ISCIII de Evolución y Comportamiento Humanos. Avenida Monforte de Lemos, 5, 28029 Madrid (Spain) / Departamento de Paleontología, Facultad de Geología. Universidad Complutense de Madrid. 28040 Madrid (Spain) jlarsuaga@isciii.es

Hypotheses on the Near-East origin of European cattle were mainly based on the lack of evidence of *Bos taurus* T mitochondrial DNA haplotypes in European *Bos primigenius*. This was challenged when analyses of mitochondrial DNA from pre-Neolithic Italian auroch specimens fell within the variation found in modern European cattle. Here we carry out further investigation in order to determine the presence of T haplotypes in the Iberian Peninsula before any domestication evidence.

Twenty four samples were selected from the Mendandia site (Treviño, Spain), in the North of the Iberian Peninsula. The site is a rock shelter seasonally used by humans to big game during the Mesolithic (c. 7500 and c. 6450

cal. BC) and Early Neolithic times (c. 6100 and c. 5350 cal. BC). Archaeozoological analyses associated the Mendandia faunal remains with wild taxa, with a high proportion of auroch remains. Some *Bos* sp. and *Sus* sp. remains recovered only from the Level I (Early Neolithic) could be tentatively attributed to domestic animals. Mitochondrial DNA extraction and amplification were performed according to previously published ancient DNA protocols. Modern and ancient *Bos taurus* sequences as well as *Bos primigenius* sequences were used as a comparative sample in a network analysis.

Furthermore, biometrical analyses of a *Bos* sp. second phalanx (MD1 sample) were performed in detail. MD1 Maximum Length (GL), Proximal Breadth (Bp) and Distal Breadth (Bd) measurements were compared with an extended *Bos taurus* and *Bos primigenius* collection in order to better support its wild or domestic adscription. These comparative samples spend a timeframe from Mesolithic to Middle Ages. In total, at least 394 samples were used for comparative.

Seven samples yielded control region mtDNA results. When compare with the comparative collection, 6 samples from Mesolithic and Neolithic levels were identified as *Bos primigenius*, but one (MD1) were associated with the T haplogroup. MD1 appeared in the Neolithic Upper Level III, stratigraphically dated between 6200 - 6100 cal. BC. Moreover, the MD1 sample were directly dated, obtaining a similar age ( $7265 \pm 70$  BP; 6280 - 6000 cal. BC, Ua-34366).

Univariate comparative analysis shows that MD1 is very length and broad for the European *Bos taurus* standards. These results locate MD1 with European (Iberian included) auroch, or with Anatolian populations with similar sizes found on auroch specimens.

The GL/Bp and GL/Bd values show MD1 falling outside the range of variation of the European (Iberian included) *Bos taurus*, but within the range of variation displayed by *Bos primigenius* (from Iberia and Europe) as well as within the variation found for Çatalhöyük remains.

Regarding on its wild or domestic status, MD1 offer two interpretations of quite different consequences. If being from the wild, is no longer possible to use the absence of T haplotypes in European aurochs to rule out a more complex domestication process of taurine cattle. But if being from a domestic animal, the MD1 sample would be the first evidence for productive economy in the Iberian Peninsula.

COFFEE BREAK AND POSTER PRESENTATIONS  
POSTERS (PRESENTATION DURING THE COFFEE BREAK)

POSTER

**5. GENETIC STUDIES FOR THE ESTABLISHMENT OF THE ORIGIN OF THE CANARIAN ABORIGINAL POPULATIONS.**

*Calderón Ordóñez, Alejandra (Universidad de La Laguna)*  
*alejacalderono@gmail.com*

*Trujillo Mederos, Aioze (Universidad de La Laguna)*  
*aiozetm@gmail.com*

*Fregel Lorenzo, Rosa (Stanford University)*  
*rfregel@gmail.com*

*Arnay de la Rosa, Matilde (Universidad de La Laguna)*  
*matarnay@gmail.com*

DNA studies in ancient remains have become an essential tool when trying to find out the geographic origin of a certain population. Population genetics has traditionally based its studies in present populations, which has allowed them to reconstruct the history of the different human groups that inhabit the earth. Despite of this, and as a consequence of the complex historical processes that have shaped the different populations, sometimes it is very difficult to establish the specific origin of the diverse population contributions to each group. That would be the case of North Africa and the Canary Archipelago.

Genetic studies performed in present and archaeological northafrican populations allow us to establish comparisons with the results obtained for the canarian populations. The objective of this review is therefore to present the genetic results from both geographic areas and analyse them in the light of the hypothesis proposed by other disciplines like archaeology or linguistics.

The results of the analysis of the autosomal and uniparental markers, mtDNA and the Y chromosome, of a large, recent and archaeological, population series from the Canary Archipelago are presented. These results are compared with those obtained for North Africa.

The genetic analysis in the Canary Islands have led the researchers to propose the presence of several founding lineages: H1-16260, U6b1, U6c1, 2c y H-CRS. Among them, the U6b1 lineage is very important because up to now it has only been found in canarian populations, and it is a subgroup of the U6 lineage that was originated in North Africa some 30.000 years ago. The study of the different genetic markers has shed light on the processes of conquest and colonisation of the

islands, detecting the existence of a sexual asymmetry in the genetic composition of the present canarian populations, as the maternal lineages are mainly northafrican. The characterisation of these markers has also confirmed the Berber northafrican origin of these populations, being in accordance with the results obtained within other disciplines as archaeology or linguistics.

The present state of the investigations does not allow us to be more accurate regarding the place of origin of the canarian populations, but it does let us conclude that it was a northafrican peopling and that it was not due to an island-by-island independent maritime colonisation from the continent without secondary contacts. Furthermore this process seems to have had more than one colonisation event, without any strong founding effects and with secondary migrations between islands.

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## POSTER

### 6. NEANDERTAL GENETIC DIVERSITY

*Hajdinjak, Mateja (Department of Evolutionary Genetics, Max Planck Institute for Evolutionary Anthropology, Leipzig, Germany) mateja\_hajdinjak@eva.mpg.de*

*Korlevic, Petra (Department of Evolutionary Genetics, Max Planck Institute for Evolutionary Anthropology, Leipzig, Germany) petra\_korlevic@eva.mpg.de*

*Gansauge, Marie-Theres (Department of Evolutionary Genetics, Max Planck Institute for Evolutionary Anthropology, Leipzig, Germany) marie\_gansauge@eva.mpg.de*

*Dabney, Jesse (Department of Evolutionary Genetics, Max Planck Institute for Evolutionary Anthropology, Leipzig, Germany) jesse\_dabney@eva.mpg.de*

*Slon, Viviane (Department of Evolutionary Genetics, Max Planck Institute for Evolutionary Anthropology, Leipzig, Germany) viviane\_slon@eva.mpg.de*

*Glocke, Isabelle (Department of Evolutionary Genetics, Max Planck Institute for Evolutionary Anthropology, Leipzig, Germany) isabelle\_glocke@eva.mpg.de*

*Sawyer, Susanna (Department of Evolutionary Genetics, Max Planck Institute for Evolutionary Anthropology, Leipzig, Germany) susanna\_sawyer@eva.mpg.de*

*Nickel, Birgit (Department of Evolutionary Genetics, Max Planck Institute for Evolutionary Anthropology, Leipzig, Germany) nickel@eva.mpg.de*

*Nagel, Sarah (Department of Evolutionary Genetics, Max Planck Institute for Evolutionary Anthropology, Leipzig, Germany) sarah\_nagel@eva.mpg.de*

*Gerber, Tobias (Department of Evolutionary Genetics, Max*

*Planck Institute for Evolutionary Anthropology, Leipzig, Germany) tobias\_gerber@eva.mpg.de*

*Hopfe, Charlotte (Department of Evolutionary Genetics, Max Planck Institute for Evolutionary Anthropology, Leipzig, Germany) charlotte\_hopfe@eva.mpg.de*

*Stenzel, Udo (Department of Evolutionary Genetics, Max Planck Institute for Evolutionary Anthropology, Leipzig, Germany) udo\_stenzel@eva.mpg.de*

*Renaud, Gabriel (Department of Evolutionary Genetics, Max Planck Institute for Evolutionary Anthropology, Leipzig, Germany) gabriel\_renaud@eva.mpg.de*

*Andrés, Aida (Department of Evolutionary Genetics, Max Planck Institute for Evolutionary Anthropology, Leipzig, Germany) aida\_andres@eva.mpg.de*

*Castellano, Sergi (Department of Evolutionary Genetics, Max Planck Institute for Evolutionary Anthropology, Leipzig, Germany) sergi\_castellano@eva.mpg.de*

*Kelso, Janet (Department of Evolutionary Genetics, Max Planck Institute for Evolutionary Anthropology, Leipzig, Germany) kelso@eva.mpg.de*

*Prüfer, Kay (Department of Evolutionary Genetics, Max Planck Institute for Evolutionary Anthropology, Leipzig, Germany) pruefer@eva.mpg.de*

*Meyer, Matthias (Department of Evolutionary Genetics, Max Planck Institute for Evolutionary Anthropology, Leipzig, Germany) mmeyer@eva.mpg.de*

*Pääbo, Svante (Department of Evolutionary Genetics, Max Planck Institute for Evolutionary Anthropology, Leipzig, Germany) paabo@eva.mpg.de*

From the Middle Paleolithic until their disappearance in the early Upper Paleolithic, Neandertals occupied a large geographical area, ranging from northwestern Europe to southwestern Asia. Neandertals thus lived over a long time and in diverse environments that fluctuated between warm and cold periods, which may have shaped their population dynamics. Recent improvements in ancient DNA extraction and sequencing methodology have made it possible to retrieve large amounts of DNA sequence data from ancient remains. This has allowed, for example, the generation of high-quality genome sequences from Neandertal individual as well as from a Denisovan individual, an Asian population related to Neandertals, which both come from a cave site in southern Siberia. Analyses of these genomes have shown that these archaic groups carried less than half of the genetic diversity seen in present-day Europeans. It has also shown that the parents of the Neandertal individual were related at the level of half-siblings and that breeding between close relatives had also occurred in previous generations. This presentation summarizes our effort to study genetic diversity and reconstruct the population history, particularly of late Neandertals,

by retrieving DNA from Neandertal individuals from across their geographical range, including sites in Russia, Croatia and Spain.

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POSTER

**7. LATE PLEISTOCENE EQUUS HYDRUNTINUS MITOCHONDRIAL DNA FROM IBERIAN PENINSULA: PHYLOGENETIC RELATIONSHIPS**

Lira, Jaime (Centro Mixto UCM-ISCIII de Evolución y Comportamiento Humanos. Avenida Monforte de Lemos, 5, 28029 Madrid (Spain) [jaime.e.lira@gmail.com](mailto:jaime.e.lira@gmail.com)

Alcázar de Velasco, Almudena (Centro Mixto UCM-ISCIII de Evolución y Comportamiento Humanos. Avenida Monforte de Lemos, 5, 28029 Madrid (Spain) [huellasdelaetoli@yahoo.es](mailto:huellasdelaetoli@yahoo.es)

Bonmatí, Alejandro (Centro Mixto UCM-ISCIII de Evolución y Comportamiento Humanos. Avenida Monforte de Lemos, 5, 28029 Madrid (Spain) / Departamento de Paleontología, Facultad de Geología. Universidad Complutense de Madrid. 28040 Madrid (Spain) [abonmati@isciii.es](mailto:abonmati@isciii.es)

Martínez Pillado, Virginia (Departamento de Mineralogía y Petrología, Facultad de Ciencia y Tecnología, Universidad del País Vasco, 48940 Leioa, Bizkaia (Spain) / ARANZADI Geo-Q, b/ Kortasenebarri s/n, 48940 Leioa, Bizkaia (Spain) [vmpillado@gmail.com](mailto:vmpillado@gmail.com)

Ortega Martínez, Ana Isabel (Centro Nacional de Investigación sobre la Evolución Humana (CENIEH). C/ Paseo Sierra de Atapuerca 3, 09002 Burgos, Spain / Grupo Espeleológico Edelweiss, Ecma. Diputación Provincial. C/ Paseo del Espolón s/n, 09071 Burgos, Spain) [anisabel.ortega60@gmail.com](mailto:anisabel.ortega60@gmail.com)

Cuenca Bescós, Gloria (Aragosaurus IUCA,EIA, DCCTT, Universidad de Zaragoza, 50009 Zaragoza (Spain) [cuenca@unizar.es](mailto:cuenca@unizar.es)

Lorenzo Merino, Carlos (Area de Prehistòria, Universitat Rovira i Virgili, Avinguda Catalunya 35, 43002 Tarragona (Spain) / IPHES, Institut Català de Paleoecologia Humana i Evolució Social, Marcel·lí Domingo s/n, 43007 Tarragona (Spain) [carlos.lorenzo@urv.cat](mailto:carlos.lorenzo@urv.cat)

Aranburu, Arantza (Department of Mineralogy & Petrology. Facultad de Ciencia y Tecnología. University of Basque Country Ap. 644-48080, Bilbao (Spain) [arantza.aranburu@ehu.es](mailto:arantza.aranburu@ehu.es)

Arzuaga, Juan Luis (Centro Mixto UCM-ISCIII de Evolución y Comportamiento Humanos. Avenida Monforte de Lemos, 5, 28029 Madrid (Spain) / Departamento de Paleontología, Facultad de Geología. Universidad Complutense de Madrid. 28040 Madrid (Spain) [jlarsuaga@isciii.es](mailto:jlarsuaga@isciii.es)

The European ass (*Equus hydruntinus*) appeared in the fossil record around 350.000 years ago, and got extinct during the Holocene in Eurasia. Cranial and limb bone

measurements have closely related *Equus hydruntinus* with the extant hemionus. This evidence is also supported by partial mtDNA sequences.

Although *Equus hydruntinus* has been described in Iberian sites, most descriptions are mainly based on size proportions and dental morphology.

Here we present for the first time a mtDNA HVR-I analysis of a tooth from a Late Pleistocene Iberian equid, tentatively attributed to *Equus hydruntinus*.

An equid third lower right molar (AT-GE-189) was recovered from Galería de las Estatuas site, Cueva Mayor karst system (sierra de Atapuerca, Burgos, Northern Spain). This fossil was found in the Level 3, Sector 1 and it was directly radiocarbon dated.

DNA extraction was performed in the ancient DNA laboratory at Centro Mixto UCM-ISCIII (Madrid, Spain) using silica spin columns. Four primer pairs were used to amplify a mtDNA HVR-I fragment. In order to study the evolutionary relationships of this tooth with other equids, a sample of extant and extinct *Equus* sp. sequences from caballine and non caballine lineages were collected, with special attention to the subgenus *Hemionus*.

The Galería de las Estatuas sample radiocarbon dating revealed an age of 44.000 ± 1900 years BP. The 4 overlapping primer pairs yielded positive results, obtaining partial mitochondrial DNA sequence (np. 15444 – 15946, according to the new *Equus caballus* Reference Sequence, JN398377). The sample AT-GE-189 displayed the 28 bp deletion previously described in other mtDNA HVR-I *Equus hydruntinus* sequences as well as from *Equus kiang*, *Equus hemionus onager* and *Equus hemionus kulan*. Moreover, the phylogenetic analyses showed that our Galería de las Estatuas sample clusters with the *Equus hydruntinus* sample from Scladina (Belgium), dated in around 40.000 years BP.

We report a mtDNA sequence from an Iberian *Equus hydruntinus* and, due to the relationships with the other *Equus hydruntinus* sequences, we suggest the existence of an *Equus hydruntinus* group during the Late Pleistocene in Western Europe.

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POSTER

**8. CHALCOLITHIC MITOCHONDRIAL DNA DIVERSITY IN IBERIAN HORSES FROM EL PORTALÓN SITE (ATAPUERCA, BURGOS): INSIGHTS INTO HORSE DOMESTICATION**

*Lira, Jaime (Centro Mixto UCM-ISCIII de Evolución y Comportamiento Humanos. Avenida Monforte de Lemos, 5, 28029 Madrid (Spain) jaime.e.lira@gmail.com*

*Galindo Pellicena, María Angeles (Centro Mixto UCM-ISCIII de Evolución y Comportamiento Humanos. Avenida Monforte de Lemos, 5, 28029 Madrid (Spain) / Departamento de Paleontología, Facultad de Geología. Universidad Complutense de Madrid. C/José Antonio Novais, 2, 28040 Madrid (Spain) mariangape79@hotmail.com*

*Arsuaga, Juan Luis (Centro Mixto UCM-ISCIII de Evolución y Comportamiento Humanos. Avenida Monforte de Lemos, 5, 28029 Madrid (Spain) / Departamento de Paleontología, Facultad de Geología. Universidad Complutense de Madrid. 28040 Madrid (Spain) jlarsuaga@isciii.es*

Horse domestication was a complex process with a principal episode in the Eurasian steppes around 5.000 years BP, enriched with recurrent introgression events from local wild populations through Eurasia. Archaeological studies as well as genetic analyses with modern samples have pinpointed the Iberian Peninsula as an important area involved in the horse domestication process. Mitochondrial DNA analyses with horse ancient remains have supported this hypothesis. In this context, a Bronze Age sample sequences from El Portalón site (sierra de Atapuerca, Burgos), showed the significance of a specific maternal lineage among others, a lineage currently found exclusively on Iberian horse populations and horses from Iberian origin.

With the aim to know in detail the presence and diversity of this Iberian lineage in Iberian Peninsula in earlier times, in this study we analyse the mitochondrial DNA from 22 Chalcolithic and Early Bronze Age horse remains recovered from El Portalón site. Furthermore, we study their relationships with the 19 Iberian Bronze Age Portalón samples previously published, and the persistence of their maternal lineages in the Iberian populations through the time.

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#### ORAL

### 9. ANALYSIS OF GENETIC POLYMORPHISM IN WOMEN IN BRAZILIAN PRE-HISTORY

*Nóbrega, Judas Tadeu (UFG/PUC Goiás) jtadeunn@gmail.com*

*Nóbrega, Viviane (PUC Goiás) recantovita@gmail.com*

*Verolla, Katia Karina (PUC Goiás) katiakarinar@yahoo.com.br*

Knowing that women, since pre-history, play an important role both in the numerical growth and in the expansion movements of a population, this paper

intends to discuss the influence of endometriosis in women in Brazilian pre-history.

Endometriosis is defined by focus of ectopic implantation of endometrial tissue, identical to the uterine cavity, which, besides the exaggerated presence of strogen receptors, would show defects in the progesterone receptor. Such abnormalities, strogenic or progestational, would be related to alterations that promote endometriosis. Conceptualized as an estrogen-dependent disease, affects pelvic organs, causing debilitating pain and infertility. Relatively common, it reaches 18% of women of reproductive age, and 87% when considering the pelvic pain and infertility.

To assist in the genetic understanding of this mechanism, it is important to identify some polymorphisms such as ARG, rated by their polymorphic repair function in different types of cancer; Phase I CYP1A1 genes encode enzymes involved in the detoxification of estrogen metabolism; GST's xenobiotic substrates, genetically susceptible to endometriosis, highlighting the GSTM1 and important in detoxification of products of oxidative stress GSTT1; GSTs xenobiotic substrates, genetically susceptible to endometriosis, highlighting the GSTM1 and GSTT1, important in detoxification of products of oxidative stress; PROGINS allele, that in women presents an increased risk of developing pathologies in tissues where exposure to progesterone has a protective effect, as in the ovary and the endometrium; and p53, tumor suppressor gene, which controls the regulation of cell growth and cell cycle regulation.

With the analysis of genetic polymorphisms ARG, CYP1A1, GSTM1, GSTT1, PROGINS, and p53, we can elucidate the presence of endometriosis in the prehistoric female population

To do so, you must first extract the DNA from this population.

Due to the peculiarities of soil composition, great difficulties are found in projects which aim the extraction and amplification of DNA from human skeletal material exhumed from the archaeological sites, especially the Brazilian Cerrado. However, as noted, there are bone materials, arising from collections of sites under guard of academic institutions, which are in the condition to extract DNA.

From the analysis of these and other collections, the goal is to collect bone samples and extracting DNA (mtDNA) in the laboratory MGENE / PUC-GO, using a protocol

developed and attested to the characteristics of the Cerrado; separation of the female genetics population from the male; application of primers for polymorphisms of the proposed research; analysis of laboratory results; and evaluation of the results.

As results we have, the ones came from DNA extractions of Burials Prehistoric Project: an alternative protocol for DNA extraction from ancient bones in the Cerrado of Central Brazil, which will guide the procedures with new samples.

It is expected that this genetics analysis of the presence of polymorphisms in DNA (mtDNA), extracted from ancient bone material, and the identification, or not, of the existence of endometriosis in that population, can serve to support the research, both in Archeology and Anthropology, Human Genetics and Medicine, that take into account their disabling consequences.

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ORAL

## 10. HORSES IN IBERIA AND NORTH AFRICA: NEW INSIGHTS ON THE DOMESTICATION PROCESS.

*Matoso Silva, Raquel (CBA, faculdade de ciências da Universidade de Lisboa, Potrugal) raquel.smas@gmail.com*

*Bower, Mim (McDonald institute for archaeological research, university of cambridge, united kingdom)*

*Detry, Cleia (UNIARQ, centro de arqueologia da Universidade de Lisboa, faculdade de letras, Potrugal)*

*Aboim, Maria Ana (CBA, faculdade de ciências da Universidade de Lisboa, Potrugal)*

*do Mar Oom, Maria (CBA, faculdade de ciências da Universidade de Lisboa, Potrugal)*

*Davis, Simon (IGESPAR, laboratório de arqueociências, Lisboa, Potrugal)*

*Ginja, Catarina (CBA, faculdade de ciências da Universidade de Lisboa, Potrugal)*

*Pires, Ana Elisabete (CBA, faculdade de ciências da Universidade de Lisboa, Potrugal; instituto nacional de investigação agrária e veterinária, i.p., oeiras, Potrugal)*

*Arruda, Ana (UNIARQ, centro de arqueologia da Universidade de Lisboa, faculdade de letras, Potrugal)*

*Fernández-Rodríguez, Carlos (Departamento de historia, facultad de filosofía y letras, Universidad de león, Spain)*

*Varela Gomes, Mário (Departamento de história, FCSH, Universidade nova de Lisboa, Potrugal)*

*Riquelme Cantal, José António (Departamento de prehistoria y arqueologia, Universidad de Granada, Spain)*

*Valenzuela, Silvia (Department of archaeology, university of sheffield, nited kingdom)*

*Yasmina Chaïd-Saoudi (Institute of archaeology, university of algiers 2, Algeria; LGBSO, USTHB, algeria)*

*Ouragh, Lahousinne (LAGEV, institut agronomique et ve?terinaire hassan II, rabat, morocco)*

*Guedaoura, Sonya (Faculté des sciences de la nature et de la vie, université d'el-tarf, algeria; faculté de pharmacie, université laval, québec, canada)*

*Landosi, Faouzi (Ecole nationale de médecine vétérinaire, sidi thabet, tunisie)*

*Álvarez Lao, Diego (Departamento de geología, Universidad de oviedo, oviedo, Spain)*

*Camino Mayor, Jorge (Museo arqueológico de asturias, Asturias, Spain)*

*Ramalho, Miguel (Museu geológico, LNEG, Potrugal)*

*Amani, Fethi (Institut national des sciences de l'archéologie et du patrimoine, rabat, morocco)*

*Raziq Kakar, Abdul (Lasbella university of agriculture, water and marine sciences, pakistan)*

*Luís, Cristina (CBA, faculdade de ciências da Universidade de Lisboa, Potrugal; CIUHCT, faculdade de ciências da Universidade de Lisboa, Potrugal; MUHNAC, Universidade de Lisboa, Potrugal) cmluis@fc.ul.pt*

*Stranger, Yves-Marie (Po Box 409 27, Addis Ababa, Ethiopia)*

The iberian peninsula was a refugium for plant and animal species during the last glacial maximum and microsatellite data indicate that horse were among these. It has been suggested that iberia is a potential region for an independent horse domestication event; that the genetic types that proliferated following the retreat of the ice sheets were taken into the domestic genepool and spread throughout europe and beyond in prehistoric and later historic periods. However, the archaeological record in iberia is discontinuous, and evidence for early horse domestication in iberia that is based on rock art, is difficult to date accurately. Genetic research has been inconclusive, with the number of archaeological samples from iberia analysed at molecular level very low, particularly from the south, where horses are thought to have persisted. This has left population genetics patterns difficult to interpret, as they could be a result of modern and historic population movements. The influence of the wider mediterranean area within horse domestication is unknown even though the mediterranean was a major route for the spread of domestic species from the middle east. Furthermore, data from north africa is minimal and completely absent from any ancient dna study so far, therefore the genetic influence of north africa on horse populations from iberia or anywhere is completely unknown. This is the first comprehensive study of horse domestication in iberia and north africa that includes the ancient dna analysis of horses from a broad time

span, from the paleolithic to the present day, including pre and early domestication periods. The inclusion of ancient north african data is unique and gives us great new insights into these regions.

Ancient dna analysis: from all the sites sampled we successfully extracted dna from samples belonging to 10 different sites from iberia [ $n_{north}=7$ ,  $n_{south}=5$ ] and north africa: algeria [ $n=3$ ] and tunisia [ $n=4$ ]. The dna analysis followed previously published protocols and used a pcr based re-sequencing approach of the mitochondrial d-loop in order to allow the screening of a large number of individuals. Appropriate contamination control and authentication methods were followed. Modern dna analysis: mitochondrial d-loop was re-sequenced in a total of 200 living horses from iberia and na (morocco, algeria, tunisia) following previously published methods.

Phylogeny and biogeography: haplotypes were defined using bayesian mcmc clade credibility trees. A bayesian skyline was constructed from the combined trees in TRACER1.5. A continuous tree was constructed from the maximum credibility tree in SPREAD 1.0.4 and analysed in google earth. Population statistics were calculated and AMOVA performed using ARLEQUIN 3.11.

Here, we present the preliminary data resulting from the molecular analysis of archaeological and living horse populations. We compare iberian and north african populations with an extensive data set of eurasian horses that facilitate the integration of these results in a broad overview. We provide new insights into the potential founder populations of extant horses, the relationship of archaeological and present day genetic types and shed light on the process of horse domestication.

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## ORAL

### 11. TRACING THE GENETIC HISTORY OF FARMING POPULATIONS OF EL PORTALÓN CAVE IN THE SIERRA DE ATAPUERCA, SPAIN.

*Valdiosera, Cristina (La Trobe University, Uppsala University) cvaldioser@gmail.com*

*Günther, Torsten (Uppsala University) torsten.guenther@ebc.uu.se*

*Malmöström, Helena (Uppsala University) helena@jankovic.se*

*Ureña, Irene (Centro Mixto, Universidad Complutense de Madrid Instituto de Salud Carlos III de Evolución y Comportamiento Humano.) irene.u.h@gmail.com*

*Rodríguez, Ricardo (Centro Mixto, Universidad Complutense*

*de Madrid Instituto de Salud Carlos III de Evolución y Comportamiento Humano.) ricardo\_eyre@yahoo.es*

*Sverrisdóttir, Óddny (Uppsala University) oddny.sverrisdottir@ebc.uu.se*

*Daskalaki, Evangelia (Uppsala University) eva.daskalaki@ebc.uu.se*

*Skoglund, Pontus (Harvard University) pontus.skoglund@gmail.com*

*Iriarte, Eneko (Universidad de Burgos) eiriarte@ubu.es*

*Arsuaga, Juan Luis (Centro Mixto, Universidad Complutense de Madrid Instituto de Salud Carlos III de Evolución y Comportamiento Humano.) jlarsuaga@isciii.es*

*Götherström, Anders (Stockholm University) tsarapkin@googlemail.com*

*Jakobsson, Mattias (Uppsala University) mattias.jakobsson@ebc.uu.se*

One of the most important and influential changes in human behaviour has been the change from small hunter-gathering/fishing bands to sedentary agrarian societies. This transition is generally characterised by the contrast between the two subsistence strategies and the accompanying cultural, technological and behavioural changes that occurred, and can be generalised (in Eurasia) as the Mesolithic-Neolithic transition. One of the characteristic features of this transition is how quickly the agrarian lifestyle spread and its impact on the demographic patterns of Europe; however, the nature of how it was spread remains open to debate. Ancient genomics applied to human skeletal remains from well-dated contexts allow us a precise understanding of population origins, genetic variation, migrations and admixture and comparisons between populations over time. Previous studies have shown close relationships between early Scandinavian and modern-day southern Europeans, as well as strong differences between hunter-gatherers and early farmers. However, with migration routes from the south and the modern mitochondrial DNA composition on the Iberian peninsula, the population history of southwestern Europe appears to have been different.

We sampled bone remains corresponding to 10 individuals excavated from El Portalón Cave. Radiocarbon dates were obtained for each sample. DNA was isolated using a conventional silica-based extraction method. DNA extracts were further converted into multiplexing illumina libraries and shotgun sequenced on a HiSeq platform.

Five of the 10 individuals analysed have not yielded sufficient coverage for genomic analysis. We present low coverage genomic sequences (average depth



between 0.2 and 1%) of five early Iberian farmers dated to between 4,000 and 5,000 years old, from El Portalón. These individuals display a similar pattern to that observed for central and northern European farmers and all show genetic similarities to modern-day southern Europeans, particularly to Sardinians, in contrast to the recently published 7,000 year old hunter-gatherer from near-by La Brana in Spain.

Our results are important to uncover the genetic origin of farming populations in the Iberian peninsula as well as the impact on demographic patterns. Moreover, these results will contribute to the clarification of the complete demographic picture of the neolithisation in Europe. This is an on-going study and we are currently increasing genome coverage and sample numbers to obtain a higher resolution of the patterns observed.

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ORAL

## 12. UNRAVELING THE GENETIC HISTORY OF THE SPANISH WILD GOAT

*Ureña, Irene (Centro Mixto, Universidad Complutense de Madrid Instituto de Salud Carlos III de Evolución y Comportamiento Humanos.) iurena@isciii.es*

*Arsuaga, Juan Luis (Centro Mixto, Universidad Complutense de Madrid Instituto de Salud Carlos III de Evolución y Comportamiento Humanos.) jlarsuaga@isciii.es*

*Valdiosera, Cristina (Centro de Investigación Sobre la Evolución y Comportamiento Humanos, Universidad Complutense de Madrid Instituto de Salud Carlos III, 28029 Madrid, Spain) cvaldiosera@isciii.es*

The Iberian Wild goat (*Capra pyrenaica*, Schinz 1838) is an endemism of the Iberian Peninsula that has recently suffered the loss of two of its four subspecies. The taxonomic position of the genus *Capra* has opened an intense debate among researchers; this is due to the fact that its classification has been based mainly on morphological characters. It has been argued that horn morphology may not be an appropriate character for resolving its taxonomy. In addition, previous phylogenetic studies of the genus *Capra* are not in concordance with morphological studies. Based on paleontological studies, two independent migration waves of wild goats took place in Europe, the first one approximately 300 000 years ago involving the Alpine ibex followed by the Spanish ibex from the Caucasus round 80 000 years ago. However, according to molecular studies the origin of the Iberian wild goat and the Alpine ibex is the result of a single migration wave

of *Capra* into Europe followed by a vicariant speciation. Nonetheless, this hypothesis has been tested solely on modern data. Many goat species have suffered a drastic bottleneck in recent times due to exhaustive hunting and habitat fragmentation, hence it is likely that great part of their diversity has been lost. Therefore, ancient DNA studies are imperative in order to gain insight on their evolutionary genetic history.

A series of wild goat fossil remains from different sites and chronologies were sampled in Spain and southern France. We applied ancient DNA techniques in order to investigate the palaeogenetic history of the European wild goat. Firstly, we amplified 4 fragments of the cytochrome b gene that were further replicated and sequenced with standard methods in 19 samples from the site of Chaves in northern Spain. In addition, we recovered several regions of the same gene from 30 individuals by implementing an amplicon tagging method combined with high throughput sequencing. We performed phylogenetic analysis in a data set consisting on modern and ancient goat sequences. Finally, we calculated genetic diversity in samples dated from pre and post Neolithic.

Our preliminary phylogenetic analyses, based on the Sanger sequenced fragments, show a clear lack of genetic structure within the genus *Capra*, a pattern previously observed in other studies. The Iberian Wild goats and the Alpine Ibex group together showing a monophyletic origin for both species. These results are in concordance with the single wave migration theory of wild goats into Europe followed by allopatric speciation, however, more sequence data is required to confirm this observation. We report haplotypes that are not present in modern populations suggesting a higher genetic diversity in the past.

The mitochondrial genome in caprids is highly variable; therefore to increase resolution on their phylogenetic relationships, more sequencing will be needed to obtain complete genes or mitochondrial genomes. Haplotype loss is likely to have occurred with the arrival of domestic goats, habitat reduction due to expansion of human settlements and exhaustive hunting during the last century. This is an ongoing project and more data are still to be expected.

ORAL

**13. NEW APPROACHES TO THE GENETIC ANALYSIS OF ANCIENT GENOMES**

*Geigl, Eva-Maria (Institut Jacques Monod, UMR 7592 CNRS, University Paris Diderot, Paris, France) geigl.eva-maria@ijm.univ-paris-diderot.fr*

The analysis of ancient DNA preserved in archaeological remains, such as bones, teeth, and, exceptionally also hair and mummified tissue, has opened up a new dimension of archaeological research. Indeed, the analysis of single genetic markers as well as whole genomes enriches archaeology with a wealth of phylogenetic data on animals (including humans), plants and pathogens that add an enormous amount of information to the interpretation of the past. This concerns the evolution of humans, their demographic history, their pathologies, their social structures, but also the domestication of animals and plants, as well as the reconstruction of the dynamics of animal and plant populations revealing past climate changes.

The palaeogenome group of the Jacques Monod Institute develops research in most of the above mentioned areas in an attempt to enrich maximally archaeological research using both single marker and whole genome approaches. An important emphasis is put on methodological developments to push back the limits of ancient DNA research. In this talk, we shall give an overview about the research lines underway in our laboratory. In particular, we study the domestication of cattle and genotype extinct animals and past human populations.

ORAL

**14. GENETIC EVIDENCE FOR GENE FLOW AMONG LATE PLEISTOCENE HOMININS**

*Paabo, Svante (MPI-EVA) paabo@eva.mpg.de*

Over the past two decades, methods to retrieve DNA from ancient remains have progressed greatly. In cases where molecular preservation is exceptionally good and relatively small amounts of microbial DNA are present it is now possible to sequence complete genomes from Late Pleistocene hominin fossils. When whole-genome sequencing is not possible because too large amounts of microbial DNA are present, preselected parts of the genome can sometimes be isolated and sequenced. This has opened the possibility to compare genomes

not only between archaic and present-day humans but also increasingly among archaic hominins. I will review evidence that both Neandertals and a related Asian group, the Denisovans, have contributed DNA to present-day humans; that Neandertals have contributed DNA to Denisovans; and that another hominin that diverged earlier from the human lineage contributed DNA to Denisovans. I will also discuss how DNA from earlier hominins, particularly those discovered at Sima de los Huesos, may contribute to the emerging picture of the genetic interactions between different hominin groups.

FINAL DISCUSSION AND CLOSING REMARKS

# B55 Advances in Archaeological Palimpsest Dissection

*Organiser: Carolina Mallol and Cristo M. Hernández*

*Thursday, 4th (09:00 to 14:00)*



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XVII World UISPP Congress  
XVIIe Congrès Mondial de l'UISPP  
XVII Congreso Mundial de UISPP

ORAL CONTRIBUTION

ORAL

**1. DISSECTING PALIMPSESTS AT BAROZH 12: ONGOING RESEARCH AT A NEW MIDDLE PALAEO-LITHIC OPEN-AIR SITE ON THE EDGE OF THE ARARAT DEPRESSION, ARMENIA**

Glauberger, Phil (Middle East Technical University, Ankara, Turkey) [pglauber@metu.edu.tr](mailto:pglauber@metu.edu.tr)

Gasparyan, Boris (Institute of Archaeology and Ethnography, Armenian Academy of Sciences, Yerevan, Armenia)

Wilkinson, Keith (University of Winchester, Winchester, United Kingdom) [Wilkinson@winchester.ac.uk](mailto:Wilkinson@winchester.ac.uk)

Frahm, Ellery (University of Minnesota, Minneapolis MN, USA) [elleryfrahm@gmail.com](mailto:elleryfrahm@gmail.com)

Raczynski-Henk, Yannick (Ex-Situ Silex, Leiden, the Netherlands) [yannick@conserf.com](mailto:yannick@conserf.com)

Adler, Daniel (University of Connecticut, Storrs CT, USA) [daniel.adler@uconn.edu](mailto:daniel.adler@uconn.edu)

Field research at the Middle Palaeolithic site of Barozh 12 in western Armenia applies an array of integrated methods to investigate site formation processes and dissect archaeological palimpsests. On a plateau overlooking the Ararat Depression, obsidian artifacts were found densely concentrated and spread over a 100m x 200m surface area. Small scale test excavation revealed stratified, artifact rich sediments extending to a depth of roughly 1m. Preliminary stratigraphy suggests that fluvial and aeolian sedimentation and reworking, along with deflation and intermittent pedogenesis occurred amidst repeated hominin occupation of the locality. Excavation including a combination of geoarchaeological, chronometric, palaeo-environmental, and geochemical methods will be employed to investigate differential rates of sedimentation and artifact deposition, or 'time averaging', a primary mechanism of palimpsest formation. Geoarchaeological and palaeo-environmental methods will include micromorphology, mineralogy, grain-size, palynology, phytoliths, and starch grain analyses. Chronometric methods will involve optically stimulated luminescence dating of sediments, and uranium - thorium dating of pedogenic carbonates and carbonate crusts on artifacts to compare ages of sediment burial and weathering. A *terminus post quem* age will be acquired for the sequence through potassium/argon - argon/argon dating of basal tuff deposits. Results of obsidian raw material sourcing obtained using portable X-ray fluorescence (pXRF) on samples of artifacts from throughout the sequence indicate the use of local and distant sources. Alongside refitting studies, employing

pXRF as part of artifact analysis protocol will increase the resolution of on-site raw material exploitation and artifact manufacture episodes. These combined methods will assist in unraveling the palimpsests of behavioral evidence preserved at the locality.

ORAL

**2. OCCUPATIONAL EVENTS IN BOLOMOR CAVE (VALENCIA, SPAIN): ARCHEOSTRATIGRAPHIC ANALYSIS OF LEVELS I TO XII (100 - 200 KYA)**

Sañudo, Pablo (Universitat Rovira i Virgili (URV) [pablo.sañudo@bolomor.com](mailto:pablo.sañudo@bolomor.com)

Fernández Peris, Josep (Servei d'Investigació Prehistòrica (SIP) [josep.fernandez@bolomor.com](mailto:josep.fernandez@bolomor.com)

The study of human occupations in Paleolithic assemblages has an important goal in the definition of time and space in which human activities were developed.

Archaeological remains belonging to different occupational events appear normally overlapped in a same stratigraphic unit forming an occupational palimpsest. The separation of these occupational events, which can often be a challenge, is the basis for the analysis of the organizational behavior of the human groups that inhabited the site. In this sense, archeostratigraphic analysis establishes the diachronic relationship between cultural deposits by delimitating continuous sterile layers, allowing us to separate these occupational events, as first stage from establishing another complementary analysis with the aim of reconstructing the occupational patterns and social behavior of these human groups.

The site of Bolomor cave is located in the eastern Mediterranean coast of Spain, approximately 100 m above sea level, over the Valldigna Valley (Valencia, Spain). The stratigraphic sequence, with a maximum thickness of 14 m, has been dated by AAR and TL between MIS 5e and MIS 9 (100 kya to 350 kya). According to sedimentological studies, the stratigraphic sequence has been divided into seventeen levels. Human presence is practically continuous along the stratigraphic sequence of the site, originating a rich archaeological assemblage, formed by lithic and faunal material, human remains and some of the oldest evidences of fire use.

Mining labors developed in the 1930s of the 20th century destroyed the central area of the site and divide the remaining stratigraphic deposit into three areas, named

west, north and east. Archeostratigraphic analysis has been developed over the middle upper sequence, between levels I and XII (MIS 5e – 6), completely excavated in west and north areas. Both areas have been analyzed from several longitudinal and crosssectional profiles of 25 cm thickness, for searching thin sterile layers that proves the existence of inoccupation events along the archaeological sequence of the cavity.

The analysis exposed in this work reveals the existence of at least 22 occupational units along the middle upper stratigraphic sequence of Bolomor Cave (levels I to XII), that supposes the repeated use of the cave as campament for different human groups during a long period of 100 kya.

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ORAL

### 3. BETWEEN HEARTHES AND VOLCANIC ASH: THE SU 13 PALIMPSEST OF THE OSCURUSCIUTO ROCK SHELTER (GINOSA - SOUHERN ITALY): ANALYTICAL AND INTERPRETATIVE QUESTIONS

*Spagnolo, Vincenzo (Department of Physical Sciences, Earth and Environment - R.U. Prehistory and Anthropology University of Siena, Italy) orpheus.85@hotmail.it*

*Marciani, Giulia (Instituto de Pesquisas Ambientais e Tecnológicas ? IPAT - Universidade do Extremo Sul Catarinense - Santa Catarina, Brazil) giuliamarciani@hotmail.it*

*Aureli, Daniele (Department of Physical Sciences, Earth and Environment - R.U. Prehistory and Anthropology University of Siena, Italy; Université Paris Ouest Nanterre La Défense UMR 7041 - ArScAn - équipe AnTET, France) danieleaureli@gmail.com*

*Berna, Francesco (Department of Archaeology, Simon Fraser University, Burnaby, British Columbia, Canada) francesco\_berna@sfu.ca*

*Boscato, Paolo (Department of Physical Sciences, Earth and Environment - R.U. Prehistory and Anthropology University of Siena, Italy) paolo.boscato@unisi.it*

*Ranaldo, Filomena (Department of Physical Sciences, Earth and Environment - R.U. Prehistory and Anthropology University of Siena, Italy) filomenaranaldo@gmail.com*

*Ronchitelli, Annamaria (Department of Physical Sciences, Earth and Environment - R.U. Prehistory and Anthropology University of Siena, Italy) annamaria.ronchitelli@unisi.it*

The Oscurusciuto rock shelter (Ginosa - prov. of Taranto) is one of the key-sites for the study of Neanderthal groups in Southern Italy. As part of its rich sequence, the stratigraphic unit 13 is presented here together

with the hearths found therein. This SU represents the sedimentological interface between the underlying tephra layer (SU 14: almost sterile, identified with the Mount Epomeo Green Tuff, dated to about 55 kyrs BP) and the overlying sand layer (SU 11 rich in anthropic remains). The presence and location of hearths, together with the horizontal distribution of the finds, has allowed to recognize an articulated structuring of the rock shelter divided into different activity areas. At the same time, this evidence revealed the palimpsest nature of this layer, defined as the sum of natural depositional processes and of a series of depositional anthropogenic events repeated over the course of time according to a virtually constant scheme, but with slight spatial dislocations.

The integrated analysis with the GIS Science/Tools of the relationship between the Raw Material Units, the refitting/conjoint, the hearths and the above mentioned activity areas have allowed to dissect the fundamental components of this palimpsest.

Using an high-resolution temporal perspective it was possible to identify single events and to formulate hypotheses on the minimum number of occupations occurred in this SU. At the same time, this temporal perspective has allowed to identify a possible correlation between these occupations.

Therefore, the results show the importance of using integrated research methods in order to identify short anthropic occupations within each single palimpsest.

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ORAL

### 4. PALIMPSEST: FROM SITE FORMATION PROCESSES TO HUMAN BEHAVIORS.

*Martinez-Moreno, Jorge (Centre d'Estudis del Patrimoni Arqueologic de la Prehistoria ) jorge.martinez@uab.cat*

*Mora, Rafael (Centre d'Estudis del Patrimoni Arqueologic de la Prehistoria ) rafael.mora@uab.cat*

*Roda Gilabert, Xavier (Centre d'Estudis del Patrimoni Arqueologic de la Prehistoria ) javier.roda@uab.cat*

*Roy, Miquel (Centre d'Estudis del Patrimoni Arqueologic de la Prehistoria ) miquel.roy@uab.cat*

The opposition between dynamic / static has articulated the notion of palimpsest, that is the core concept to understand human activities in the past. However, despite the importance of these implications, this discussion started in the 70s, and it is not yet widely applied in Paleoanthropology.

Lastly, we assist to a growing interest to analyze site formation processes. From this perspective, we have developed theoretical and methodological approach for the study of palimpsests.

We will expose the application of geo-statistical techniques concerning on Roca dels Bous and Cova Gran de Santa Linya, as examples of palimpsests with a limited resolution. We prioritize vertical dispersion analysis against the horizontal distribution of artifacts. These simple techniques warn that these deposits are palimpsests with a limited spatio / temporal resolution. However, these techniques permit to make inferences related with site formation processes and from these results we can get essential human behaviors.

Archaeological assemblages recovered in natural deposits are affected by dynamic processes that make difficult to establish the association between artifacts. These techniques advertise that burial and conservation are complex processes. Despite these difficulties, the context allows building inferences concerning on the behavior of human groups in the past.

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ORAL

**5. ASSEMBLAGE FORMATION AT EL SALT SU X (ALICANTE, SPAIN). DEFINING TEMPORAL FRAMEWORKS FOR THE STUDY OF HUMAN BEHAVIOR CONCEALED IN MIDDLE PALAEOLITHIC PALIMPSESTS**

*Machado Gutiérrez, Jorge (Universidad de La Laguna) jorgemachado85@gmail.com*  
*Pérez Luis, Leopoldo (Universidad de La Laguna e IPHES) leoperezluis@gmail.com*

Isolating and sequencing lithic, faunal and combustion assemblages according to their corresponding depositional events is a required procedure in the dissection of Palaeolithic palimpsests in order to approach past human behavior. Such behavior may manifest a single instantaneous action or a specific set of related activities performed during one or more occupation episodes. In our view, the lack of temporal correlation among the remains we rely on to infer such activities from archaeological palimpsests represents an important methodological problem. The main effect of this problem is the inability to delimit minimal units of analysis from which to interpret behavioral dynamics of Neanderthal groups (i.e. ideally, assemblages representing a single occupation episode). With the aim

to face this problem, we present preliminary results of an empirical case of palimpsest dissection at the Middle Palaeolithic site of El Salt, Alicante, Spain. First, we isolated lithic and faunal remains and a single combustion structure corresponding to a potentially synchronic assemblage within SU X, using archaeostratigraphic methods. Then, tanking this material as our minimal unit of analysis (Archaeostratigraphic Unit 3), we explored its internal temporal dimension through a Raw Material Units (RMU) approach, lithic refitting and zooarchaeological data. Preliminary results show spatial relationships between specific areas of the site and the presence of different time-averaged technical behaviors, which suggest that Archaeostratigraphic Unit 3 was formed by the superposition of several short duration human occupation episodes.

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POSTER

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POSTER

**6. HEARTHES AND RABBIT BONES IN THE MIDDLE PALAEOLITHIC: NEW EXPERIMENTAL APPROACH TO IDENTIFY INTENTIONAL AND UNINTENTIONAL THERMAL ALTERATION OF BONE AND ITS APPLICATION TO PALIMPSEST DISSECTION**

*Pérez Luis, Leopoldo J. (Sociedades Cazadoras-Recolectoras Research group (Universidad de La Laguna, Tenerife) and Instituto Catalán de Paleoecología y Evolución Social (IPHES, Tarragona) leoperezluis@gmail.com*

Burnt bones are ubiquitous in Upper Pleistocene archaeological sites and they are usually associated to anthropogenic origin. Here we present the results of experiments that show how anthropogenic and non-anthropogenic bone can be unintentionally, postdepositionally affected by fire. Distinguishing between intentional and non-intentional alteration of bone is a key to excavate and interpret burnt faunal remains correctly, as well as constituting an aid to archaeological palimpsest dissection.

For our experiment we used only rabbit (*Oryctolagus cuniculus*) bones, whose presence in Pleistocene deposits is linked to different biogenic agents. We buried fresh and dry rabbit bones variable depths (2,5 to 7,5 cm) and made 8 simple combustion structures over them. Fire duration varied: 2 h. (2 fires), 4 h. (2 fires), 6 h. (2 fires) and 8 h. (2 fires). After cooling, all the bones was excavated and grouped according to depth. For each specimen, we describe color, structural modifications

and anatomical element type. Our experimental assemblage we compared to archaeological burnt rabbit bone stratigraphically associated with six combustion structures from Middle Palaeolithic Unit X of El Salt (Alcoi, Alicante).

We observed that rabbit bones buried at the same depth had a similar response to combustion and that their transformation was determined by their nature (fresh or dry). Fresh bone is more affected than dry bone. We also observed the occurrence of more than one color in a single bone, a feature previously interpreted as consequence of burning bone with meat attached to it. None of the buried bones calcined, while all of those in direct contact with flames were. Finally, we observed that different combustion time caused different proportion of modification in the color and structure of the bones. Short duration fire (2 h.) showed very little modification, while long duration fires (8 h.) modified practically all bones.

This experimental allows us to say that buried unburnt bone can be thermally altered by fire made above it. Thus, not all of the burnt bone in an archaeological assemblage is unquestionably anthropogenic or associated to anthropogenic combustion activity. For this reason, studies investigating the relationship between fire and bone in Prehistory, should be accompanied by taphonomic analyses (marks from different agents) and spatial analyses (3D positions of bone element in relation to hearths). This kind of observations are fundamental towards accurate excavation and interpretation of faunal assemblages. From an interdisciplinary perspective, this type of work contributes to the dissection of archaeological palimpsests, in order to identify specific human occupations approach historical explanations our archaeological sites.

POSTER

## 7. VIRTUAL PALIMPSESTS: THE USE OF MOBILE DEVICES TO VISUALISE THE ARCHAEOLOGICAL RECORD.

*Dragos, Gheorghiu (NUA Bucharest) gheorghiu\_dragos@yahoo.com*  
*Livia, Stefan (ITC Bucharest) livia.stefan@itc.ro*

To help archaeologists and the public more easily visualize the stratigraphy of archaeological sites, we propose the use of IT and mobile devices to achieve a palimpsest dissection. Specifically, we developed a web

application for mobile devices that identifies locations of interest (LOIs) on a map and allows the visualization of the historical information, superimposed over the live image of the site and in chronological order; this, in turn, makes explicit the archaeological layers.

The approach utilized is based on the following: a) rigorous measurements of geographic positions (latitude, longitude coordinates) of the archaeological excavations; b) digital photographs of the artifacts, displaying only the contour; c) assignment of chronological values to each artifact; d) storage of the information in a database. For a user in the proximity of the LOIs, the application displays his position and the distance to the LOIs on a map.

By selecting an archaeological location, the application displays the images of each artifact, superimposed in an axonometric vertical and in chronological order, from the oldest to the newest layer of dwelling.

The application is developed with Augmented Reality and HTML5 as IT technologies and can be accessed from smartphones and Tablet PC with Android or iOS scanning a QR barcode.

We consider that the proposed application will prove useful in helping archaeologists, researchers and other interested users, discover various historical sites, as well as access and visualize the archaeological information in an intuitive and integral manner. The Augmented Reality displays the virtual information superimposed on the real view.

POSTER

## 8. IN-SITU OR REWORKED? MICROMORPHOLOGICAL EVIDENCE FOR MIXING PROCESSES IN SHELTER SEQUENCES OF THE IBERIAN PENINSULA AND NORTHERN MOROCCO

*Kehl, Martin (Institute of Geography, University of Cologne) kehl@uni-koeln.de*  
*Linstädter, Jörg (Institute of Prehistoric Archaeology) joerg.linstaedter@uni-koeln.de*  
*Weniger, Gerd-Christian (Neanderthal Museum) weniger@neanderthal.de*

The formation of palimpsests involves phases of strongly reduced sediment accumulation, partial sediment erosion or sediment mixing by bioturbation, cryoturbation, peloturbation or processes of mass

movement along a slope. Humans may also cause mixing by differential trampling, raking out of fire residues or dung and levelling of dwelling floors. Generally, mixing processes cause problems in age determination of archaeological sequences resulting in age inversion or unexpectedly young ages. Micromorphology provides an important tool to identify mixing processes and clarify site formation in order to set up more reliable (chrono-) stratigraphic frameworks of shelter deposits. In addition, the first step to identify and disentangle Palimpsests is to evaluate mixing processes.

In the framework of the CRC 806 „Our way to Europe“, we investigated several Middle to Upper Palaeolithic rock shelter sequences. We found a set of micromorphological features which indicate in-situ archaeological levels while others give strong evidence for reworking or mixing. In-situ preserved archaeological layers often show subhorizontal orientation of elongated rock fragments, an increased degree of compaction, remnants of surface seals, signs of trampling and internal layering. Reworked deposits may show rolled aggregates and concretions, a low degree of compaction and lack of surface features. Internal layering is lacking. The poster will discuss these feature sets considering case studies in cave and rock shelter sequences in Spain (Las Palomas de Teba, Ardales, Arbreda) and Northern Morocco (Ifri Oudadane, Ifri N'Ammar). Overall, it was found that micromorphology considerably improved our understanding on processes of reworking. Micro features indicating reworking should be taken as evidence for the presence of a palimpsest.

ORAL

### 9. FINDING SINGLE-PERIOD SITES TO STUDY: AVOIDING PALIMPSEST SITES IN THE RAGANELLO BASIN.

van Leusen, Martijn (Groningen Institute of Archaeology) p.m.van.leusen@rug.nl

A 'palimpsest' is a Medieval manuscript on vellum that has been erased and over-written; archaeologists use this term as a metaphor to describe archaeological sites as a composite of features and remains from several periods - later ones overlapping with and often erasing earlier ones. This is rightly presented as a problem: untangling complex chronostratigraphies and dealing with increasingly 'gappy' data as one goes back further in time is a work garnering diminishing returns. But what if the Medieval scribe had reams of paper instead of a limited supply of vellum? In this paper the author, who has extensive experience in survey projects in central and

southern Italy, will argue that many problems associated with the excavation of palimpsest sites can be avoided by a two-step approach in which the selection of the site to be excavated follows on a wider (microregional) geoarchaeological survey. This approach is illustrated by examples from the author's recent 'Rural Life in Protohistoric Italy' project (2010-2015), in which single-phase and multiphase protohistoric site classes could be defined on the basis of the composition of surveyed assemblages and topographic characteristics of the site. Representative examples from these classes have been further investigated to define what a 'typical' single-period rural protohistoric site looks like; this information can then be used to reassess nearby excavated examples of multiperiod palimpsest sites. It will be argued that this research strategy, though initially more laborious, will resolve many interpretation problems that continue to plague excavators of palimpsest sites.

ORAL

### 10. ASSESSING SYNCHRONIES IN NEANDERTHAL OCCUPATIONS FROM ARCHAEO-MAGNETIC ANALYSES. A CASE STUDY OF MIDDLE PALAEO-LITHIC COMBUSTION STRUCTURES FROM LEVEL O AT ABRIC ROMANÍ ROCK-SHELTER (CAPELLADES, SPAIN).

Carrancho Alonso, Ángel (Área de Prehistoria, Dept. Ciencias Históricas y Geografía, Universidad de Burgos, Edificio+D+I, Plaza Misael Bañuelos s/n, 09001 Burgos, Spain) acarrancho@ubu.es

Villalaín, Juan José (Dpto. Física, Universidad de Burgos, Escuela Politécnica Superior, Avda. Cantabria s/n, 09006 Burgos, Spain) villa@ubu.es

Vallverdú, Josep (IPHES, Institut Català de Paleoecologia Humana i Evolució Social, C/Marcel·lí Domingo s/n, Campus Sescelades (EdificiW3), 43007 Tarragona, Spain / Área de Prehistoria, Universitat Rovira i Virgili (URV), Avinguda de Catalunya 35, 43002 Tarragona, Spain.) jvallverdu@iphes.cat  
Carbonell, Eudald (IPHES, Institut Català de Paleoecologia Humana i Evolució Social, C/Marcel·lí Domingo s/n, Campus Sescelades (EdificiW3), 43007 Tarragona, Spain / Área de Prehistoria, Universitat Rovira i Virgili (URV), Avinguda de Catalunya 35, 43002 Tarragona, Spain.) eudald.carbonell@urv.cat

The Abric Romaní (Capellades, Barcelona, NE of Spain) is a wide rock-shelter with a 20 m deep stratigraphic sequence dated by more than forty U-Series and <sup>14</sup>C (AMS) data between 39 and 70 ky BP (Bischoff *et al.*, 1988; 1994). This is a travertine deposit where thousands of lithic artefacts, bones, archaeobotanical remains, and even



wood implements (Carbonell & Castro Curiel 1992) have been recovered. However, the site is particularly known by the large number of combustion structures (hearths) documented in its stratigraphy. These are characterised by a well-preserved thermo-altered substrate beneath a charcoal-rich thin facies interpreted as hearth related archaeological assemblages. Currently, the Abric Romani is the Middle-Palaeolithic archaeological site with one of the most complete and continuous prehistoric fire record of the world. Here we report the archaeomagnetic and rock-magnetic results obtained from the study of several hearths sampled at level O (~ 55 ky BP).

The sampled combustion structures appeared exposed as a more or less continuous surface of 2-3 meters of length, black colour, irregular geometry and variable thickness. Archaeological information is unable to differentiate if they correspond to a single or multiple burning events and if so, determine if these are widely separated in time. The main goal of this study is to determine possible synchronies or diachronies among these burnt features from the analysis of their archaeomagnetic directions. The natural remanent magnetization (NRM) of 50 oriented specimens from three hearths was stepwise demagnetized by alternating field or thermal demagnetization in order to determine the characteristic remanent magnetization (ChRM) direction. All analyses were carried out at the laboratory of Palaeomagnetism of Burgos University (Spain). Three mean archaeomagnetic directions contained within the  $\alpha$ -95 (confidence angle) of the others hearths studied were obtained at level O. The mean directions obtained are statistically indistinguishable among them strongly indicating a "synchronic" record of the geomagnetic field or at least, that they were produced very close in time. These observations agree well with archaeological observations. Considering the age of these materials it is not possible to compare the obtained directions with any paleosecular variation record. However, we have interpreted the archaeomagnetic directions in terms of temporal scale of Neanderthals' occupations to evaluate if they were close in time or not. Furthermore, a complete set of rock-magnetic experiments has been performed in order to reconstruct the technological (palaeotemperatures) and environmental (kind of atmosphere) conditions undergone in the production of these combustion structures. We discuss the potential and limits of archaeomagnetism to reconstruct spatial congruence of fire use at Palaeolithic sites.

ORAL

## 11. IDENTIFICATION OF WOOD ASH IN ARCHAEOLOGICAL DEPOSITS USING SOIL MICROMORPHOLOGY AND INFRARED MICROSPECTROSCOPY.

*Thibodeau, Megan (Simon Fraser University) mthibode@sfu.ca*  
*Berna, Francesco (Simon Fraser University) francesco\_berna@sfu.ca*

Soil Micromorphology is one of the most useful and valuable tools to untangle the complicated palimpsest left behind by human activity. One important part of human behaviour is the control of fire and soil micromorphology allows for the identification of microscopic wood ash and interpretation of its depositional and taphonomic processes. However, distinguishing wood ash from other types of calcified plant materials can be challenging due to the petrographic similarities among pyrogenic, pedogenic, and geogenic micritic calcite. This paper illustrates the potential of integrating soil micromorphology and Fourier-Transform infrared microspectroscopy (FTIR-m) to identify pyrogenic calcite and characterize its context and origin at a microscopic scale.

Recent studies have demonstrated that infrared spectroscopy can distinguish between geogenic, pedogenic, and pyrogenic calcite based on the variance in atomic order in each polymorph from different formation processes. However, this approach has not been integrated with micromorphological analysis of materials in thin section. This research analyses known samples of calcite forms to determine whether the differences in formation processes are reflected in the FTIR-m spectra and applies the results to several Paleolithic contexts.

Here, we illustrate the application of this integrated analytical approach in several Paleolithic contexts. Preliminary results suggest that this combined approach has the potential to distinguish wood ash from other calcite types within the archaeological record on a microscopic scale.

Understanding the archaeological record requires both the ability to characterize its composition and interpret what processes produced, transported, and modified the materials. Soil micromorphology and FTIR-m are both powerful techniques to approach these questions.

ORAL

**12. PUZZLE OUT A PALIMPSEST: TESTING AN INTERDISCIPLINARY STUDY IN THE LEVEL O OF ABRIC ROMANÍ.**

*Bargalló, Amèlia (IPHES URV) ameliabarg@gmail.com  
Gabucio, Maria Joana (IPHES URV) mj.gabucio@gmail.com  
Rivals, Florent (ICREA IPHES) florent.rivals@icrea.es*

Cultural deposits, especially those accumulated in caves and rock shelters, are usually the result of several occupational events in the same space, forming palimpsests. In addition, the materials of these occupational events are usually deposited with remains of natural origins and may be altered, partially destroyed or reworked because of the process of superimposition. Abric Romaní (Capellades, Barcelona) is a Middle Palaeolithic archaeological site dated between 40 to 70 ka BP. The archaeological levels are excavated on a large surface (around 300 m<sup>2</sup>) and the spatial location of archaeological remains is carefully recorded. Most of the sequence is formed by precipitation of carbonates forming well-bedded travertine layers (high sedimentary rate: 0.46 mm/yr). The conservation of some archaeological evidences like hearths and wood implements in this sedimentary context is good.

The level O is dated to 54.6±0.4 kyr by U-series. The excavations from 2004 to 2012 have provided more than 40.000 remains including lithics (23.393), fauna (9.299), charcoals (3.524), wood imprints (109), and combustion structures (63). The excavated surface of level O reaches 278 m<sup>2</sup>. Here we focussed on a particular area, located in the north-eastern corner of the site. This work is based on the study of lithic and faunal remains of this area, with the aim to dissect palimpsest to the finest possible units. For this we used different methods and techniques such as the archaeostrigraphy, intra-site spatial archaeology, zooarchaeology, tooth microwear, taphonomy, lithic technology, and faunal and lithic refits.

These methods allowed to identify two archaeolevels in this area (Oa and Ob). In Oa, the area is 31 m<sup>2</sup> and there are a maximum of three accumulations, two of them related to two combustion structures. This area corresponds to a domestic area where we identified different activities: stone knapping, anthropogenical bone breakage products, cutmarks and burned bones. This domestic area is placed in the central part of this archaeolevel. All data indicate that the assemblage corresponds to a low-intensity campsite.

In Ob the area is 27 m<sup>2</sup> and we have distinguished two accumulations of archaeological remains distributed in fifteen combustion structures. The faunal remains are indicating that roasting, defleshing and bone breakage by percussion occurred *in situ*. Through the study of lithic remains we identified knapping stone tools *in situ*, and the recycling into other artefacts. All this indicates that this area corresponds to various domestic areas. The refitting of lithic and taphonomy evidence an overlapping of several successive events. One of these events was synchronic to other areas of the rock shelter, as indicated by refits (lithic and faunal remains), tooth microwear, anatomical and taxonomical identification. Our results have shown that combining different methods it is possible to obtain high resolution data for dissecting the palimpsest, but even having distinguished these finer units, we still work with palimpsest. However, the study of these finer units permits to work with time scales which are closer to the ethnographic time facilitating, therefore, our further ethno-archaeological interpretation of the Neanderthal occupations at Abric Romaní.

ORAL

**13. ARCHAEOLOGICAL STRATIGRAPHY IN LOWER PALAEOOLITHIC SITES: INTERPRETING ASSEMBLAGE FORMATION.**

*Rosana Obregón (rosana.obregon@cenieh.es)*

La aplicación del método arqueostratigráfico a yacimientos del paleolítico inferior se revela como una herramienta eficaz para poder separar los materiales acumulados durante largos periodos de tiempo en un único estrato geológico. A través de la identificación de los vacíos arqueológicos, los materiales que forman un enorme palimpsesto de pueden individualizar al menos en micropalimpsestos. Se ha aplicado esta metodología a dos yacimientos de cronología y características muy diferentes, tales como Gran Dolina nivel 10 de Atapuerca, y SHK de Olduvai, con lo que se ha podido trabajar con un patrón de acumulación en cueva y otro al aire libre. Estos estudios han demostrado que este método aporta datos importantes sobre la intensidad de los asentamientos humanos, pero también de los posteriores eventos naturales que afectaron a la definitiva acumulación de sus restos.

ORAL

**14. IS THIS YOURS? SPATIAL ANALYSIS OF TWO BURIALS FROM THE MESOLITHIC SHELLMIDDEN OF CABEÇO DA AMOREIRA (MUGE, PORTUGAL)**

*Goncalves, Celia (Universidade do Algarve) cmgoncalves@ualg.pt*  
*Cascalheira, Joao (Universidade do Algarve) jmcascalheira@ualg.pt*  
*Bicho, Nuno (Universidade do Algarve) nbicho@ualg.pt*

All over the world shellmiddens are known for their great potential in the preservation of high-resolution archaeological records. Nevertheless, site formation processes associated with shellmiddens and their inherent complexity have always been one of the major obstacles to the interpretation of the settlement dynamics that led often to the use of these sites not only as middens but also as burial and residential spaces. This complexity becomes very clear when we look at the lar matrix-to-artifact ratio of such sites. In fact, these deposits are mostly composed of cultural material (e.g. shells and fire-cracked rocks) deposited through spatially confined processes that are the source of very significant horizontal and stratigraphic variations.

New archaeological work conducted since 2008 in the mesolithic shellmidden of Cabeço da Amoreira have been providing very relevant data on site formation processes, function, and even aspects related to the social peculiarities of the last hunter-gatherer communities of Central Portugal.

This paper will focus on the analysis of spatial distribution of different categories of artifacts from the top layers of the shellmidden where two human burials were discovered. The use of GIS software was essential for the analysis of quantitative and qualitative data, allowing the establishment of intrasite spatial relationships. Distributions, densities, and correlations of artifacts to the human burials allowed an insight into the processes involved before and after the deposition of the bodies.

ORAL

**15. COMBUSTION STRUCTURES AS PALIMPSEST OF NEOLITHIC-CHALCOLITHIC OCCUPATION OF CAVES AND ROCKSHELTERS IN NORTHERN IBERIA: A MICROSTRATIGRAPHICAL APPROACH**

*Polo Díaz, Ana (Departamento de Geografía, Prehistoria y Arqueología, Euskal Herriko Unibertsitatea, Francisco Tomas y Valiente s/n, 01006 Vitoria-Gasteiz, Spain) anapolo-diaz@gmail.com*  
*Fernández Eraso, Javier (a Departamento de Geografía, Prehistoria y Arqueología, Euskal Herriko Unibertsitatea, Francisco Tomas y Valiente s/n, 01006 Vitoria-Gasteiz, Spain) javier.fernandez@ehu.es*  
*Simpson, Ian (Biological and Environmental Sciences. University of Stirling) i.a.simpson@stir.ac.uk*

Combustion residues are one of the principal indicators of anthropogenic activity during Prehistory.

Human use of caves and rockshelters during the Neolithic and Chalcolithic can be traced by the study of thermally altered detrital accumulations of animal waste, palaeobotanical residues and burial deposits preserved in the archaeological record. However, relevant questions remain unsolved regarding both the use of the space and the intensity and rhythms of the occupation patterns of these contexts and how burnt sediments can contribute to clarify these issues.

Microstratigraphy is a fundamental tool for the reconstruction of the formation processes of combustion residues from anthropogenic origin. Particularly micromorphology can provide significant information regarding fuel choice and management of burnt residues over time as indicators of activities carried out at the site and settlement patterns.

Results of micromorphological and macroscopic analysis of combusted accumulations documented in Neolithic-Chalcolithic cave and rockshelter deposits from Northern Iberia are presented. Data obtained support evidence of recurrent penning of herbivores, domestic areas and manipulation of human remains through fire.

Some key questions regarding the occupation patterns of these sites are discussed:

What is the actual correlation between the frequency of combustion structures/residues documented in penning areas within caves and rockshelters and the frequency of the sites used as a pen?

Are single combustion structures documented in burial pits, containing burnt remains of different individuals, evidence of single collective *burial and burning* episodes? or could they be the result of occasional burning events of body remains which were accumulated over hundreds of years?

Assessment of high-resolution data provided by the analysis of combustion residues from the point of view of the *palimpsest effect* allows to address the role of sedimentary parameters regarding the use and the occupation patterns of the sites studied in the analysis of social behaviours and management of natural resources of prehistoric groups in the transition to farming societies in Northern Iberia.

# B56

## Time for the tide: New perspectives on hunter-fisher-gatherer exploitation of intertidal resources in Atlantic Europe and Mediterranean regions

Organiser: David Cuenca, Javier Fernández-López de Pablo, Igor Gutiérrez-Zugasti and André Colonese

Wednesday, 3rd (09:00 to 19:30)

Meeting Room: SALON DE ACTOS FACULTAD DE ECONÓMICAS



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ORAL CONTRIBUTION

Morning 9-12:30

*A.C. Colonese, D. Cuenca-Solana, J.Fernández-López de Pablo, I. Gutiérrez-Zugasti*

**SESSION PRESENTATION**

9:00-9:10

*A.C. Colonese, D. Cuenca-Solana, J.Fernández-López de Pablo, I. Gutiérrez-Zugasti*

**SESSION PRESENTATION**

ORAL

**1. RETOUCHE TOOLS MADE OF CALLISTA CHIONE VALVE: AN ADAPTATION OF NEANDERTHALS ON THE MEDITERRANEAN SEA SHORE. THE REPRESENTATIVE CASE OF GROTTA DEL CAVALLO (SOUTHEAST ITALY).**

*Romagnoli, Francesca (Università degli Studi di Firenze) f.romagnoli2@gmail.com*

*Baena, Javier (Universidad Autónoma de Madrid) javier.baena@uam.es*

*Sarti, Lucia (Università degli Studi di Siena) lucia.sarti@unisi.it*

Neanderthal retouched tools made of marine shells have been reported in several sites in southern peninsular Europe (Italy and Greece). At present, the chronology of this evidence is inferred by environmental markers such as faunal associations and sedimentary data. The absence of absolute chronometric data does not allow proposing solid inference on contemporaneity between sites.

These tools were first identified in the late 1950s. During the last 50 years they have been the object of only a few analyses, always with a typological approach, and the literature lacks detailed descriptions.

After a general overview of these tools, we present here new data from Grotta del Cavallo. The site is located on the Ionian coast of Salento peninsula and preserves one of the most important Italian Middle Palaeolithic deposits covering a chronology from MIS 5 to MIS 3. Retouched shells were found in layer L (MIS 5a / MIS 4). The *Callista chione* assemblage is composed of 126 retouched elements, with shiny appearance and retouched cutting edges clearly readable.

We have focused the research on the reconstruction of the productive sequence, from the finding of the valve

to the discard of the tools. The approach used has been multidisciplinary, combining taxonomy, taphonomy, morphotechnical analysis, techno-functional analysis of the cutting edge and experimental archaeology.

Fishes or marine mammals were not identified in the faunal assemblage. Other marine shells were found, but only *Callista chione* were retouched. The valves were collected on the beach after the death of the mollusc and were retouched with high technical control when entire, using a stone hammer. The retouch was convex and localised on the natural edge of the valve, on the internal surface of the shell.

The results suggest that the exploitation of the shells was finalised to the production of tools and was not related to subsistence activities. They were part of the economic strategies of a group highly mobile. The experimentation and comparison between lithic and shell tools suggests that they were artefacts integrated in the cultural tradition, realised with a technical gesture that is almost the same of quina and semi-quina flint retouch.

The detailed analysis of shell tools may contribute to the understanding of the role played by shell as raw material in the European Middle Palaeolithic and to the debate on the technical behaviour and the adaptation to the environment of Neanderthals.

ORAL

**2. INVESTIGATING THE SEASONAL FACTOR IN NEANDERTHAL SHELLFISH GATHERING USING OXYGEN ISOTOPE ANALYSES OF SHELL REMAINS**

*Douka, Katerina (University of Oxford) katerina.douka@rlaha.ox.ac.uk*

A scheduled round of activities allows modern hunter-gatherers to take advantage of the seasonal appearance of resources and often their mobility patterns coincide with anticipated seasonal abundance and the presence of optimally available resources.

Most prehistorians would agree that Neanderthal subsistence strategy was equally influenced by seasonal fluctuations in prey and plant availability. The limited data of the seasonal cycle of Neanderthals come mainly from the study of mammalian teeth cementum increment, sex ratios and the seasonal growth or reproductive conditions of their prey.

In addition to terrestrial plants and animals, however, Ne-

Neanderthals exploited aquatic resources. In this contribution, we investigate in particular the role marine shellfish may have played in the seasonal procurement strategies of Neanderthals. By using oxygen isotope and growth increment analyses, the season-at-death of a number of molluscan shells from Mousterian contexts in Iberia is assessed allowing a seasonal date to be obtained for the specific Neanderthal coastal occupations.

ORAL

### 3. THE USE OF COASTAL LANDSCAPES AND THE EMERGENCE OF MODERN HUMANS IN SOUTHERN IBERIA

*Bicho, Nuno (ICArEHB - Universidade do Algarve) nunofbicho@gmail.com*

*Castela, Guilherme (FE - Universidade do Algarve) gcastela@ualg.pt*

*Gonçalves, Célia (ICArEHB - Universidade do Algarve) ceelinmag@gmail.com*

This paper focuses on the importance of prehistoric coastal adaptations for European Pleistocene human evolution. We will discuss aspects related to history, including the so-called coastal paradox and various archaeological and ethnographical biases of the study of the use of coastal resources as well the conceptual definitions of coastal adaptation, the systematic use of coastal resources, and the application of those concepts to the study of early Humans in Southern Iberia.

We also focus on coastal exploitation by hunter-gatherer-fisher human groups in Southern Iberia and the regional ecological niches. The phenomenon of Upwelling is described in detail followed by a discussion on its relation to an optimum biomass context in southern Iberia and the possible impact on the economical and dietary adaptations by Neanderthals and the first anatomically modern Humans in the region.

We will also describe some of the early sites, including Bajondillo, Nerja in Spain, Gorham's and Vanguard caves in Gibraltar, and Vale Boi, Mira Nascente and Praia Rei Cortiço in Portugal with coastal resources in the Iberian margin.

We will analyse and define variables indicating exploitation of coastal resources and will propose a model for the definition of episodic and systematic use of coastal ecological contexts, including the presence of fish, marine mammals, molluscs, maritime birds. This statistical model will help to define the earliest systematic use of

coastal resources in southern Iberia.

ORAL

### 4. TRENDS IN UPPER PALAEOLITHIC SHELLFISH EXPLOITATION IN THE EASTERN MEDITERRANEAN: ZOOARCHAEOLOGICAL AND STABLE ISOTOPE DATA FROM KSÂR AKIL (LEBANON)

*Bosch, Marjolein (MPI EVA department of Human Evolution) marjolein.bosch@eva.mpg.de*

*Mannino, Marcello (MPI EVA department of Human Evolution) marcello\_mannino@eva.mpg.de*

*Prendergast, Amy (Institute of geosciences, University of Mainz)*

*O'Connell, Tamsin (Dept of Archaeology and Anthropology, University of Cambridge) tco21@cam.ac.uk*

*Wesselingh, Frank (Naturalis biodiversity center) frank.wesselingh@naturalis.nl*

*van der Plicht, Johannes (Centre for isotope research University of Groningen)*

*Hublin, Jean-Jacques (MPI EVA department of Human Evolution) hublin.eva.mpg.de*

Shellfish are a rich source of micronutrients and habitual exploitation of these marine resources contributes to healthy balanced diets. Nutritional Ecology Theory suggests that such diets should result in healthier populations and shorter inter-birth intervals, which, in turn, should favour demographic increase (e.g. Hockett & Haws 2003, 2009). These factors may have contributed to the success of modern humans dispersing into Eurasia between 50 and 40 ka BP. Here we present new data on the mollusc assemblage from Ksâr 'Akil, which throw light on Upper Palaeolithic coastal adaptations.

Ksâr 'Akil is a key site in the eastern Mediterranean, well-known for its vast Initial/Early Upper Palaeolithic deposits associated with remains of modern humans (e.g. Ewing 1947). This site provides a unique opportunity to study the antiquity of Upper Palaeolithic shellfish exploitation, as well as trends in this subsistence practice throughout that period. In this study we combine zooarchaeological and isotopic analyses to assess the role of marine molluscs in human diets.

The intertidal rocky shore gastropods from Ksâr 'Akil (*Patella caerulea*, *Patella rustica*, *Patella ulyssiponensis*, *Phorcus turbinatus* and *Phorcus articulatus*) were collected for consumption and transported to the site by its occupants. The earliest evidence for the consumption of marine molluscs at Ksâr 'Akil comes from the Initial Upper Palaeolithic at approximately 44 ka cal BP (layer XXII). Tidal resources became a regular component of the diet

by the Early Upper Palaeolithic (around 43-41 ka cal BP), when small quantities of shellfish were habitually gathered. Oxygen isotope data suggest that the exploitation of *Phorcus turbinatus* took place throughout the year with a focus on the colder months.

In summary, our investigations indicate that although shellfish represented a minor source of protein they were a stable source of essential nutrients not readily available in terrestrial foods.

Acknowledgements: This research was funded by the Max-Planck-Society.

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### 5. LATE PLEISTOCENE TO HOLOCENE SHELLFISH EXPLOITATION AT HAUA FTEAH, LIBYA FROM THE STABLE ISOTOPE ANALYSIS OF PHORCUS TURBINATUS AND PATELLA CAERULEA SHELLS

*Prendergast, Amy (University of Mainz) aprender@uni-mainz.de*  
*Rhiannon, Stevens (University of Cambridge) res57@cam.ac.uk*  
*O'Connell, Tamsin (University of Cambridge) tco21@cam.ac.uk*  
*Barker, Graeme (University of Cambridge) gb314@cam.ac.uk*

The seasonal pattern of shellfish foraging at the archaeological site of Haua Fteah in the Gebel Akhdar, Libya was investigated from the Neolithic to the Epipalaeolithic via oxygen isotope analyses of the topshell *Phorcus turbinatus* and the limpet *Patella caerulea*. To validate both species as faithful year-round palaeoenvironmental recorders, the intra-annual variability of  $\delta^{18}\text{O}$  in modern shells and sea water were analysed and correlated with measured sea surface temperature (SST). Both species were found to be good candidates for seasonal shellfish foraging studies as they preserve a full annual SST cycle in their shell  $\delta^{18}\text{O}$  with minimal growth cessation. Analysis of the archaeological specimens showed that mollusc exploitation during the Neolithic (c. 7.7 to 6.2 ka) and Mesolithic (locally known as the Capsian c. 12.3 to 9.3 ka) was restricted to autumn and winter. Other archaeological evidence from these archaeological units show that hunting activities occurred during the warmer months. Therefore, the timing of Holocene shellfish exploitation in the Gebel Akhdar may have been influenced by the seasonal availability of other resources and possibly used as a dietary supplement when foods in the Mediterranean were less abundant. During the Epipalaeolithic (locally known as the Oranian, c. 16.1 to 13.1 ka), shellfish were foraged year-round. This compliments other evidence from the archaeological record that show that this period was more intensively occupied than previous and

subsequent units. This finding is significant as the Epipalaeolithic was the coldest and driest phase of the last glacial cycle in the Gebel Akhdar and it adds weight to the theory that the Gebel Akhdar may have served as a refugium for humans in north Africa during times of global climatic extremes.

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### 6. FOOD AND ORNAMENTS: CHANGING PATTERNS OF EXPLOITATION OF MARINE MOLLUSCAN RESOURCES AT FRANCHTHI CAVE (ARGOLID, GREECE) DURING THE UPPER PALAEO-LITHIC AND THE MESOLITHIC (36,000-9,000 BP).

*Perlès, Catherine (Université Paris Ouest) catherine.perles@mae.u-paris10.fr*

The long Upper Palaeolithic and Mesolithic sequence of Franchthi Cave is often quoted for the increasing importance through time of marine resources exploitation. Fish species characteristic of a brackish-water lagoon, such as sea bream, eel and gray were regularly captured since at least the Late Upper Palaeolithic, and fishing culminated with an episode of intense tuna fishing in the Upper Mesolithic. Marine molluscs, which will be the focus of this presentation, were collected even earlier and constitute the bulk of the ornaments ever since the Aurignacian occupations. Edible marine molluscs only appear in some quantity much later, during the Late Epigravettian (ca. 11,000 cal BC), and continue to be exploited until the end of the Mesolithic (ca 7,000 cal BC).

The progressive introduction of marine resources in the diet has been related to the growing proximity of the coast as the sea level rise, or as a compensation for the decline of large game resources. However, it will be argued here that the dietary contribution of marine resources in general, and marine molluscs in particular, remained low and very selective. Different habitats such as rocky substrates, sandy beaches and marshes or lagoons were exploited ornamental and food resources, but in both cases the range is restricted. For instance, *Cyclope neritea* was collected alive in brackish lagoons, but *Cerastoderma glaucum*, which lives in the same environment, was neglected. More generally, the edible bivalves that will be largely exploited during the Neolithic - *C. glaucum*, *Ruditapes decussatus*, *Donax trunculus*, *Donacilla cornea*, are very rare in the Palaeolithic and Mesolithic deposits. Among the gastropods, *Patella* sp. and *Osilinus* ssp. are only regularly present in the Late Palaeolithic. *Atriplex trunculus* is occasionally present in the Mesolithic. *Cerithium vulgatum* is the most abundant



gastropod, but its use as food or bait remains uncertain. Whether or not *C. vulgatum* was eaten, the number of edible marine molluscs in each unit remains in any case lower than the number of ornamental specimens, and far lower than the number of land snails. The contribution of marine molluscs to the diet during the Palaeolithic and the Mesolithic remained marginal, and, especially during the Mesolithic, ornamental species appear to have been the main focus of molluscan coastal exploitation.

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## 7. INSIGHTS INTO ROCK ART PAINTING TECHNIQUES: SHELL TOOLS FROM THE UPPER PALAEO-LITHIC OF ALTAMIRA CAVE (NORTHERN SPAIN).

*Cuenca-Solana, David (Université Rennes 1 UMR 6566-CReAAH) david.cuencasolana@univ-rennes1.fr*

*Ruiz-Redondo, Aitor (Instituto Internacional de Investigaciones Prehistóricas de Cantabria. (IIIPC) Universidad de Cantabria) aitor.ruiz@unican.es*

*Gutiérrez-Zugasti, Igor (Instituto Internacional de Investigaciones Prehistóricas de Cantabria. (IIIPC) Universidad de Cantabria) gutierfi@unican.es*

*González-Morales, Manuel Ramón (Instituto Internacional de Investigaciones Prehistóricas de Cantabria. (IIIPC) Universidad de Cantabria) manuelramon.gonzalez@unican.es*

*Setién-Marquínez, Jesús (Departamento de Ciencia e Ingeniería del terreno y de los materiales. Universidad de Cantabria) jesus.setien@unican.es*

*Ruiz-Martínez, Estela (Departamento de Ciencia e Ingeniería del terreno y de los materiales. Universidad de Cantabria) estela.ruiz@unican.es*

*Palacio-Pérez, Eduardo (Instituto Internacional de Investigaciones Prehistóricas de Cantabria. (IIIPC) Universidad de Cantabria) eduardo.palacio@unican.es*

*de las Heras-Martín, Carmen (Museo Nacional y Centro de Investigación de Altamira) investigacion.maltamira@mecd.es*  
*Lasheras-Corruchaga, José Antonio (Museo Nacional y Centro de Investigación de Altamira) direccion.maltamira@mecd.es*

Molluscs have traditionally been considered as marginal resources for Upper Palaeolithic societies. However, in recent years, new data have emerged to demonstrate that their importance for human utilization was probably greater than previously thought. The assessment of archaeological shells has generally been carried out from a nutritional or ornamental perspective, but not from the technological potential that these resources might have.

In this paper, use wear analysis combining low and high magnification microscopy, and chemical analysis using Scanning Electron Microscope (SEM), were performed

on shells from the Solutrean and Magdalenian levels of Altamira cave (northern Spain).

Results showed that 57 shells were used as tools for processing the red pigments (ochre) used in the artistic representations on the cave walls. The identification of shell tools in these levels of Altamira cave represents a new example of utilization of marine resources during the Upper Paleolithic. It also provides new perspectives regarding the painting techniques on cave walls and insights into their production by hunter-gatherers during this period.

Finally the technological use of shells demonstrates that marine resources were of greater importance to Upper Palaeolithic hunter-gatherers, and that their utility was more diverse, than previously understood.

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## 8. A SHIFT IN ECONOMY AND MOBILITY BETWEEN EPIPALAEO-LITHIC AND MESOLITHIC IN NORTH ATLANTIC IBERIA: BEAD MANUFACTURE AS A CASE STUDY

*Rigaud, Solange (Service de Préhistoire de l'Université de Liège, Bât. A1, place du 20-Août 7, 4000 Liège, Belgium) srigaud17@gmail.com*

*d'Errico, Francesco (Univ. Bordeaux, CNRS-UMR 5199 PA-CEA, Equipe Préhistoire, Paléoenvironnement, Patrimoine, avenue des Facultés, F-33405 Talence, France ; Institute for Archaeology, History, Cultural Studies and Religion, University of Bergen, 5020 Bergen, Norway) f.derrico@pacea.u-bordeaux1.fr*

*Vanhaeren, Marian (Univ. Bordeaux, CNRS-UMR 5199 PA-CEA, Equipe Préhistoire, Paléoenvironnement, Patrimoine, avenue des Facultés, F-33405 Talence, France) marian.vanhaeren@u-bordeaux1.fr*

*Peñalber, Xavier (Sociedad de Ciencias Aranzadi, San Sebastian, Spain)*

*Cuenca-Solana, David (CNRS-UMR 6566 CReAAH, Université de Rennes1, Campus Beaulieu - Bât 24 - 25, 263 avenue du Général Leclerc - CS 74 205. 35042 RENNES Cedex, France) david.cuencasolana@gmail.com*

*Gutiérrez-Zugasti, Igor (Instituto Internacional de Investigaciones Prehistóricas de Cantabria, Universidad de Cantabria, Ed. Interfacultativo, Avda. de los Castros s/n, 39005 Santander, Cantabria, Spain) igorgutierrez.zug@gmail.com*

*González-Morales, Manuel (Instituto Internacional de Investigaciones Prehistóricas de Cantabria, Universidad de Cantabria, Ed. Interfacultativo, Avda. de los Castros s/n, 39005 Santander, Cantabria, Spain) moralesm@unican.es*

The frequency of mollusks, shellfish, fish, seabirds, and marine mammal remains from archaeological sites along the Atlantic coast of Northern Spain attests to the relatively intense exploitation of marine resources during the Upper Palaeolithic, Epipalaeolithic, and Mesolithic. The main function of coastal resources seems to have been food supply for societies, although they were also used for both technical and symbolic purposes. Numerous studies show that an increased role of marine resources in human diet is associated with low residential mobility and limited home ranges (Kelly 1995; Binford 2001). Our investigation aims to investigate if such changes in diet and mobility correlate with changes in the exploitation of marine resources for symbolic purposes, in particular marine shell bead manufacture.

We performed a diachronic analysis of shell accumulations from an Epipalaeolithic (Praileaitz I) and two Mesolithic (El Mazo, El Toral III) sites located in the Vasco-Cantabrian and Asturian regions.

Following a method based on taphonomic, morphometric, and microscopic analyses of modern and archaeological shell reference collections, we identified shell bead taxonomic diversity and reconstructed the way in which shells were accumulated, transformed into beads and used.

Results show that the shell accumulation at the Epipalaeolithic site of Praileaitz I represents discarded raw material considered unsuitable for the manufacture of personal ornaments. The lack of other archaeological remains associated with the shells supports a brief occupation of the cave and the existence of highly specialized task-specific sites connected to bead manufacture during the Epipalaeolithic. Exportation of raw material suitable to be transformed into beads outside the cave also shows the segmentation of the bead manufacturing in both time and space.

In contrast, analysis of shell beads at the two Mesolithic sites (El Mazo, El Toral III) indicates that all the stages of bead manufacture are represented in the accumulation: unmodified raw material, beads broken by manufacturing process and finished beads. This indicates that shells were collected, sorted and transformed into beads at these sites. Use-wear on some of the shell beads shows that part of them were re-introduced in the sites and accidentally lost by the inhabitants of the cave.

The variety of remains associated with the beads, including shells for consumption, lithic and faunal remains and hearths/ash lenses, indicates a relatively long term oc-

cupation of the sites where various activities related to technical, economic and symbolic purposes were conducted.

We conclude that the observed differences may reflect a switch from a logistic mobility to a more residential mobility with the onset of the Holocene, which involved a change in the way and location in which shell beads were sorted, modified and assembled. Future research will have to determine if the absence of short-time task-specific sites in archaeological contexts with intense exploitation of marine resources is significant or depends on the low archaeological visibility of short-lived occupations.

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ORAL

### **9.DOES THE DIVERSITY OF THE FAUNAL REMAINS MAKE THE DURATION OF MESOLITHIC SHELL-MIDDENS?**

*Dupont, Catherine (CNRS CReAAH UMR6566) catherine.dupont@univ-rennes1.fr*

The Late Mesolithic is clearly marked, on an Atlantic scale, by a more important preservation of shell middens than it was during the previous periods. This visible increase of archaeological sites is widely dependent on geomorphologic contexts in which one sites formed. The consequence of this fact means that the actual distribution of archaeological sites is widely linked to the nearby marine environments that were present during the functioning of the prehistoric settlements. The stabilization of the coastline is not irrelevant to the increase of the archaeological witnesses. In spite of this multiplication, certain Atlantic zones of the facade are sterile in Mesolithic shell middens. Are these hiatuses connected to zones of desertification of the coastline by Mesolithic? Furthermore, the community of the European archaeologists also focused on this final phase of the Mesolithic because it can be the beginning of the stabilization of the residence of human groups.

The data of the old excavations coupled with those of new searches allow to discuss hiatuses in the distribution of archaeological sites. Thanks to a database which lists all the faunal components Mesolithic shell middens, we can think, at the same time, about the geographical distribution of these sites where shells and other wild resources were consumed on the European Atlantic facade scale. This database also allows to work on the diversity of consumed animals by the populations which spent a lot of

time on the coastline. Furthermore, the development of new disciplines, such as the archaeomalacology makes possible to dissect in detail the exploited resources, to confront them with the available environments but also to try to reconstitute the human behavior through the selected species, their biotopes and their sizes.

If global phenomena are observed on the European Atlantic facade scale, the return to case studies can turn out precious to understand better the diversity of the human behavior. So, from study of French and Portuguese cases we wish to discuss the diversity of the faunal remains discovered on Mesolithic sites. Is this diversity proportional to the volumes of the shell middens and to the times of residence of the coastal populations? In spite of the numerous biases connected at the same time to the degrees of preservation of archaeological sites, to the diversity of the techniques of excavation, to the existence of specialists capable of taking into account artefacts we shall try to know what hides behind the variability of the diversity of the faunal remains exploited by coastal Mesolithic people.

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#### 10. EL COLLADO SHELL MIDDEN AND THE EXPLOITATION PATTERNS OF LITTORAL RESOURCES DURING THE MESOLITHIC IN EASTERN IBERIAN PENINSULA

*Fernández-López de Pablo, Javier (Institut Català de Paleocologia Humana i Evolució Social (IPHES) jfernandez@iphes.cat  
Gabriel, Sonia (Laboratório de Arqueociências, Direcção Geral de Património Cultural (Lisbon, Portugal) gabriel.sonia@gmail.com*

The 1980s excavations by J. Aparicio in the El Collado, a large open air Mesolithic site on the coast of Eastern Spain, revealed a sequence of human occupations consisting on a large shell midden and 14 human burials dated during the Mesolithic period.

Human palaeodietary reconstructions based on bone collagen  $\delta^{13}\text{C}$  and  $\delta^{15}\text{N}$  isotope ratios, identified a variable contribution of marine proteins, ranging from fully terrestrial diets to a maximum input of 25% (García-Guixé et al., 2006). Most subsequent research on Mediterranean coastal and dietary adaptations refers to the site's funerary record and palaeodietary study, but the composition and chronology of its shell midden has remained unstudied. This work reports the first series of AMS radiocarbon dates on the shell midden stratigraphy along the

systematic taphonomic study, taxonomic identification and quantification and morphometric analyses of shellfish and fish bone assemblages.

Results indicate mixed marine-terrestrial molluscs composition of the shell midden. The edible land snail *Sphincterochila candidissima* and the marine bivalve *Cerastoderma glaucum* are the best represented species throughout the archaeological sequence. The pattern of intertidal resource exploitation is clearly dominated by coastal lagoon as well as inhabiting mud and sand flats bivalves (*C. glaucum*, *Glycymeris violacescens*, *Ruditapes decussatus*) and gastropods (*Cerithium vulgatum*, *Hexaplex trunculus*). The presence of rocky shore intertidal species is minimal, mostly related with the manufacture of *Columbella rustica* pierced shell ornaments. On the other hand, fish bone assemblages are overwhelmingly dominated by the gilthead sea bream (*Sparus aurata*) which often occurs in brackish water coastal lagoons.

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#### 11. SHELLFISH PROCUREMENT PATTERNS AND ENVIRONMENTAL CONDITIONS DERIVED FROM OXYGEN STABLE ISOTOPES ON PHORCUS LINEATUS FROM THE MESOLITHIC SHELL MIDDEN SITE OF EL MAZO (ASTURIAS, NORTHERN SPAIN).

*Gutiérrez-Zugasti, Igor (IIIPC-Universidad de Cantabria) igorgutierrez.zugasti@gmail.com*

*García-Escárzaga, Asier (IIIPC-Universidad de Cantabria) asierge@hotmail.com*

*Martín-Chivelet, Javier (Universidad Complutense de Madrid) martinch@uclm.es*

*González Morales, Manuel R. (IIIPC-Universidad de Cantabria) moralesm@unican.es*

One of the main features of the Mesolithic on the Atlantic facade is the significant procurement of coastal resources. Among these, intertidal resources played an important role in the last hunter-fisher-gatherer societies as it is showed by the formation of huge middens containing large amounts of molluscs, echinoderms and crustaceans. A crucial issue for the interpretation of these deposits is to determine the chronological significance of foraging, as it can provide important information on subsistence strategies and settlement patterns. Previous research on mollusc carbonate shells has shown that oxygen isotope ratios ( $\delta^{18}\text{O}$ ) are mainly dependent on

sea surface temperature (SST), allowing the determination of past environmental conditions and the season of capture of the shells. However, calibration of the past isotopic data and its variability must be performed through the study of modern samples.

The topshell *Phorcus lineatus* daCosta, 1778 is one of the most abundant species in Mesolithic shell middens in northern Spain. Oxygen isotope ratios were analyzed on carbonate samples from modern *P. lineatus* shells collected fortnightly at Langre beach and also on water samples collected with the same periodicity and at the same location. Then, sequential samples from archaeological shells were analyzed to determine environmental conditions and the seasonal patterns of resource procurement at the initial occupations (c. 9 ka) of El Mazo shell midden site (Asturias, northern Spain).

Results showed a high correlation between  $\delta^{18}\text{O}$  values from modern shells and instrumental data on sea surface temperatures. The analysis of growth patterns also showed minimum growth cessation through the year. Data on  $\delta^{18}\text{O}$  from water samples helped to corroborate that the shells grew in fully marine conditions, with no significant influence of freshwater. Archaeological samples exhibited a seasonal pattern of exploitation with collection focused in late autumn and winter, while sea surface temperatures inferred from  $\delta^{18}\text{O}$  values were found to be similar to today.

Oxygen isotope ratios showed that *P. lineatus* provide accurate data on past sea surface temperatures in northern Spain and also on the season of capture of the shells. Collection of *P. lineatus* at El Mazo shell midden site was carried out seasonally (late autumn and winter), in agreement with data from previous research in the area but in contrast with seasonal information coming from studies on *Patella* at other Mesolithic sites, which showed collection throughout the year. Sea surface temperatures derived from isotopic data and information from other palaeoenvironmental proxies revealed that early Holocene environmental conditions at the region were similar to current conditions.

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## 12. EARLY-MIDDLE HOLOCENE COASTAL EXPLOITATION IN CENTRAL MEDITERRANEAN: A NEW INSIGHT FROM GROTTA D'ORIENTE AND CALA MANCINA

*Colonese, Andre (BioArCh, Department of Archaeology, University of York (UK) andre@palaeo.eu*

*Landini, Walter (Dipartimento di Scienze della Terra, Università di Pisa (Italy) landini@dst.unipi.it*

*Lo Vetto, Domenico (Dipartimento di Storia, Archeologia, Geografia, Arte e Spettacolo, Università degli Studi di Firenze (Italy) domenico.lovetto@unifi.it.*

*Martini, Fabio (Dipartimento di Storia, Archeologia, Geografia, Arte e Spettacolo, Università degli Studi di Firenze (Italy) fabio.martini@unifi.it*

The Mediterranean Sea has one of the most nutrient-poor surface waters in the world, which is thought to have imposed ecological limits to the exploitation of marine organisms by hunter-gatherers. Recent archaeological excavations at Grotta d'Oriente (Favignana Island, Trapani) and Cala Mancina (San Vito lo Capo, Trapani) have provided new archaeozoological evidence of fishing and shellfish harvesting during the Mesolithic, offering a novel insight into the role of marine resources to human groups in central Mediterranean at the beginning of the Holocene.

We performed archaeozoological and morphometric analysis on intertidal faunal remains (mollusc, fish) from Mesolithic deposits of Grotta d'Oriente (Favignana Island, Trapani) and Cala Mancina (San Vito lo Capo, Trapani). Results were compared with available data from other coastal sites in Sicily and Southern Italy

Results indicate that at both Grotta d'Oriente and Cala Mancina Mesolithic peoples exploited prevalent species inhabiting the intertidal rocky shore. Species inhabiting mud and sandflats as well as coastal lagoons and large shallow inlets and bays (*Cerithium vulgatum*, *Bittium* cf. *reticulatum*, *Potamides conicus*, *Truncatella subcylindrica*) were also found at Grotta d'Oriente. Some of these species (*Bittium* cf. *reticulatum*, *Potamides conicus*) had their shells fragmented or eroded, suggesting that they may have been transported to the deposit accidentally. Mesolithic coastal exploitation at Grotta d'Oriente and Cala Mancina appears to have been influenced by rising sea levels between ~10 and ~7 cal ka BP.

ORAL

**13. WAITING FOR THE TIDE. HUMAN USE OF MARINE BIVALVES IN A MICROTIDAL RANGE AREA DURING THE UPPER PLEISTOCENE AND THE EARLY HOLOCENE: THE CASE OF NERJA CAVE (MALAGA, SPAIN)**

*Jordá Pardo, Jesús F. (Laboratorio de Estudios Paleolíticos. Departamento de Prehistoria y Arqueología. Facultad de Geografía e Historia. Universidad Nacional de Educación a Distancia.) jjorda@geo.uned.es*

*Aura Tortosa, J. Emili (Departament de Prehistòria i Arqueologia. Universitat de València.) emili.aura@uv.es*

*Avezuela Aristu, Bárbara (Laboratorio de Estudios Paleolíticos. Departamento de Prehistoria y Arqueología. Facultad de Geografía e Historia. Universidad Nacional de Educación a Distancia.) barbara@bec.uned.es*

*Álvarez-Fernández, Esteban (Departamento de Prehistoria, Historia Antigua y Arqueología, Facultad de Geografía e Historia, Universidad de Salamanca.) epanik@usal.es.*

*García Pérez, Alfonso (Departamento de Estadística, Investigación Operativa y Cálculo Numérico. Facultad de Ciencias. Universidad Nacional de Educación a Distancia.) agarper@ccia.uned.es.*

In this paper we present the preliminary results obtained from the study of the bivalves recovered during the archaeological excavations in Vestíbulo chamber of Nerja Cave (Málaga, South of Spain) made by Professor Francisco Jordá Cerdá between 1983 and 1987, excluding the materials already published of the C-4 test unit, which were studied using a different methodology. These excavations recovered the archaeological record of the sequence from the Gravettian to the Neolithic. The molluscs remains of the Vestíbulo of Nerja Cave record constitute an extraordinary collection, composed of more than 136.000 specimens that corresponding to more than 78 kg weight. In this work we only study the marine bivalves (Jordá et al. 2010).

The studied material was recovered directly during the excavation and from screened sediments. To identify the molluscs to species, as well as for information on habitat and distribution, we consulted a variety of bibliographic references on both marine molluscs and continental ones. We followed also the online systems such as the Check List of European Marine Mollusca (CLEMAM), NatureServe, Hardy's Internet Guide to Marine Gastropods and Fauna Ibérica. All the data were recorded in a database containing the following fields: location data, list of taxa recognized in every excavation unit, recognized elements of every taxon and ecological characteristics of

every taxon. The malacological collection of Vestíbulo is placed in the Provincial Museum of Malaga.

The bivalve remains of the Vestíbulo of Nerja Cave are more than 124.000 specimens that corresponding to more than 65 kg weight. More than 115.000 of these specimens (59 kg) derived from the Epimagdalenian shell midden (Jordá et al. 2011). 36 taxa of bivalve were identified which can be highlighted *Glycymeris glycymeris*, *Mitylus edulis*, *Lithophaga lithophaga*, *Modiolus adriaticus*, *M. barbatus*, *Chlamys varia*, *Pecten maximus*, *P. jacobus*, *Spondylus* sp., *Ostrea edulis*, *Bornia sebetia*, *Acanthocardia tuberculata*, *Cerastoderma edule*, *C. glaucum*, *Laevicardium norvegicum*, *Cardidae* indet., *Macra stultorum*, *Solen marginatus*, *Venus verrucosa* and *Tapes decussatus*.

The archaeological record of Nerja Cave is distinguished by the abundant presence of human gathered marine and continental molluscs with a high presence of bivalves. Marine bivalves were consumed from Solutrean and Magdalenian-Epimagdalenian through Mesolithic and Ancient Neolithic, with development during the Younger Dryas of an important shell midden. Besides, some taxa were introduced in the cave accidentally.

POSTER

POSTER

**14. SIEVING AND SORTING: HOW POST-EXCAVATION STRATEGIES CAN INFLUENCE RESULTS.**

*Juanola, Laura (Universitat Autònoma de Barcelona) laura\_333333@hotmail.com*

*Franch, Anna (Universitat Autònoma de Barcelona) Anna.FranchB@e-campus.uab.cat*

*Hardy, Karen (ICREA at Universitat Autònoma de Barcelona) khardy@icrea.cat*

Post-excavation can be considered as the poor relation of archaeological work. Repetitive, slow and often dull, it is arguably at its most challenging when it involves shell middens. Here, after wet sieving, everything needs to be sifted out from the predominant background of minute fragments of broken shell which normally represent over 99% of all remaining material.

During the course of post-excavation of material from two multi-period shell middens from the Isle of Skye, Scotland, a range of different sieve sizes and long-term sorting strategies, were used to compare retrieval of minute material, principally, very small fish bone.

Here, we highlight the methods used, and the results of the relative proportions and types of material recovered, as well as the difference outlooks for the future understanding of food procurement strategies at these sites, in the different time periods.

There was significant diversity in the quantity of small material recovered.

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POSTER

**15. MAARITIME: AMINO ACID RACEMISATION DATING OF THE MEDITERRANEAN RIM**

*Demarchi, Beatrice (University of York) [beatrice@palaeo.eu](mailto:beatrice@palaeo.eu)  
Penkman, Kirsty (University of York) [kirsty.penkman@york.ac.uk](mailto:kirsty.penkman@york.ac.uk)*

Amino acid racemisation (AAR) geochronology is one of the few techniques which combine great temporal depth with the ability to directly date archaeological shell remains. As these represent the direct evidence of activities carried out by humans in the past (e.g. the early exploitation of marine resources), establishing an accurate geochronology for archaeological molluscs and other biominerals is an important step for our understanding of human evolution.

Here we present results from the project mAARiTIME, which focuses on key Mediterranean sites spanning the last 100 ka and beyond. By applying a closed-system method of AAR dating, we are building stratigraphic frameworks, which combined with new independent geochronology aim to provide reliable dating control for the Mediterranean. Closed-system tests are performed to assess the suitability of different marine taxa, and then the AAR data from sub-fossil shells used to build pilot chronological frameworks for southern Europe and northern Africa.

# B57

## Reconsidering the significance of the Acheulian in Human Evolution

Organiser: Sheila Mishra, Neetu Agrawal and Claire Gaillard

Friday, 5th (09:00 to 19:30)



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ORAL CONTRIBUTION

ORAL

**1. A NOTE ON THE TECHNOLOGICAL STRATEGIES OF BLANK PRODUCTION ADOPTED BY THE MIDDLE PLEISTOCENE HOMINIDS OF CHAMBAL BASIN, INDIA**

*Abbas, Riza (Indian Rock Art Research Centre) rizaabbas@yahoo.co.in*

Based on large cutting tool (LCT) technology of Early Acheulian, new ingenious techniques of predetermined blank production such as Levallois and Kombewa method was introduced and perfected during the Late Acheulian period. These technological shifts were acquired globally and possibly points towards changes in behavioral and cognitive patterns of Hominids. In India, such technological changes and strategies have been noticed in number of Middle Pleistocene assemblages. Recently, various Late Acheulian assemblages of the Chambal basin have given evidences of use multiple blank production strategies such as Levallois, Kombewa and incipient blade technology by the Middle Pleistocene hominids of the Basin

ORAL

**2. FORMATION PROCESSES AT THE ACHEULEAN SITE OF LALITPUR, NORTH CENTRAL INDIA**

*Agarwal, Neetu (Universitat Rovira i Virgili, Tarragona, Spain) neetu1501@gmail.com*  
*Mishra, Sheila (Deccan College Postgraduate & Research Institute, Pune) sheila.mishra@gmail.com*

Lalitpur is an important Acheulean site in the Bundelkhand Gneissic Complex on the margins of the Peninsular craton and the Gangetic alluvial plains discovered and excavated in the late 1950s and early 1960s (Singh 1965, IAR 1961-62, 1962-63).

During recent restudy of the site it was realized that an understanding of the formation processes is critical to enable interpretations of hominin behavior particularly for surface and near surface sites belonging to Lower to Middle Pleistocene. Therefore, geoarchaeological investigations were undertaken in the region around the Acheulean site of Lalitpur to understand the geomorphic processes shaping the past landscape. Sedimentological nature of the deposits, site stratigraphy, coarse clast

analysis and taphonomic condition of the artefacts was used to assess the depositional and post-depositional history of the site and understand the context of occurrence. GIS was also used as a tool to understand the fluvial dynamics and geotectonic context.

The work has helped to establish that it is not a surface site, but that the artefacts are only recently getting eroded from a previously buried context. Moreover, the site has not been subject to any fluvial dynamics. The major processes active at the site are low energy erosional processes like weathering and small scale slope processes like surface wash, thereby establishing good context and integrity of the assemblage. Artefact taphonomy also rules out long term exposure and repeated or multiple occupation. This work highlights the importance of studying formation processes and it also suggests that 'surface sites' can be quite informative and should not be ignored.

ORAL

**3. THE ACHEULEAN IN THE UPPER JIRA RIVER, WESTERN ODISHA, INDIA.**

*Behera, Pradeep (Sambalpur University) pkbehra@rediffmail.com*  
*Behera, Neena (Sambalpur University) neenat1@gmail.com*

The Acheulean, characterised by the appearance of *Homo erectus* with increased cognitive and adaptive abilities, standardized tool-making by employing large-flake blanks and first migration of human population out of Africa, is often regarded as representing technological stasis and homogeneity over a huge geographical domain spreading across Africa and Eurasia. It also represents the longest lasting (~1.7 Ma – 250 K) cultural phase in human history. Cultural remains of this phase are fairly widespread in South Asia and have been reported from diverse physiographic regions. Our understanding of various aspects of this cultural stage has greatly expanded during the last twenty years. Not only several new sites in primary/semi-primary contexts have been brought to light and excavated, but research problems have shifted and the quality of information gathered has also improved. Recent dates obtained from the Acheulean levels at Attirampakkam by palaeomagnetic measurements and cosmogenic nuclide dating methods have pushed back the antiquity of this cultural stage in India to about 1.5 Ma. Although Acheulean artefacts have been reported from a large number of localities in the state of Odisha since the forties of the last century, majority of these are from



secondary contexts. Our recent investigations in the upper course of the river Jira, a tributary of the river Mahanadi, in the district Baragarh, western Odisha, have brought to light a number of localities bearing Acheulean artefacts in semi-primary/primary contexts, away from fluvial network. The assemblages recovered from this region include varying proportion of handaxes, cleavers, cores, spheroids, polyhedrons and a variety of tools made on flakes. While a couple of sites bear unmistakable evidence for quarry activities and production of large-flake blanks, at most of the localities large-flake blanks and/or semi-finished as well as finished bifaces were procured from the nearby raw material sources for use. Trial pits taken at one of the localities revealed sub-angular/sub-rounded pebbly-cobbly gravel in a lateritic matrix as the sedimentary context of the surface Acheulean assemblages. Technomorphologically, most of these assemblages exhibit Late Acheulean character, while presence of an earlier phase cannot be ruled out. The present paper is an attempt to highlight the results of our recent investigations in the upper Jira river valley of Odisha.

#### ORAL

#### 4. MIDDLE PLEISTOCENE ACHEULEAN IN THE GUADALQUIVIR RIVER: ARCHAEOLOGICAL SITES WITH ABSOLUTE CHRONOLOGY BETWEEN 400-100 KY BP

*Caro Gómez, José Antonio (Universidad de Córdoba) jacaro@uco.es*

*Díaz del Olmo, Fernando (Universidad de Sevilla) delolmo@us.es*

*Borja Barrera, César (Universidad de Sevilla) cesarborja@us.es*

*Recio Espejo, José Manuel (Universidad de Córdoba) bv1reesj@uco.es*

The Low Guadalquivir sequence, with a wide chronological development (>1,5 My), has a system of 14 alluvial terrace levels (from T1 at +210-200 m. to T14 +8-6 m.).

From T5 (+139-130 m.) to T13 (+14-13 m.) there are Palaeolithic records, that is, from the early Middle Pleistocene to Upper Pleistocene.

The aim of this paper is to analyze the called "Regional Full Acheulean" from the archaeological sites in Guadalquivir River's alluvial terrace levels which have absolute dating: T9 (+75-73 m.), T10 (+55-45 m.), T11 (+40-35 m.) and T12 (+29-26 m.).

It is used a geoarchaeological methodology carrying out the following techniques: prospection and archaeological excavation, geomorphological, sedimentological, stratigraphical and technotopological for lithic industries. From the point of view of the geochronological analysis they have been applied two dating of sediments techniques: Optically Stimulated Luminescence (OSL) to a polymineral of fine-grained (2-10 microns) and U/Th to carbonated facies ( $^{234}\text{U}/^{238}\text{U}$  according to the isotopic rapport  $^{230}\text{Th}/^{234}\text{U}$  age dating).

The Acheulean sequence of the Guadalquivir River is defined by the introduction of the earlier macrolithic elements in high terraces complex (T6 to T9). where will be configured the technological model of industrial series. In the final (T-9) sequence it is taken place a technological change with the increase and a better technical making of macrolithic set, as well as a shy standardization of tools on flake. In the archaeological site of Graneros (T9) it is obtained a chronology of >350 ky (U/Th) for the older sediments (carbonated) and 224 ky and 126 ky (OSL) for sandy channel bars, in their higher levels.

On T10 and T11 levels the "Regional Full Acheulean" culminates, being an increase of handaxes index and a diversity of lithic types. In Tarazona III (T11) archaeological site it is found a chronology from 138-104 ky (OSL) with Acheulean industries at the bottom levels and Middle Palaeolithic ones on the top. On T12 lowest levels the Acheulean series show rounded pieces, although in the highest, they are without rounded and even with more evolutionary characteristics. The stratigraphical sandy profile of Algabarrilla (T12) archaeological site provides a chronology between 206 ky and 170 ky (OSL).

According to technological and geochronological aspects, the Palaeolithic evolutionary process in the Guadalquivir River is defined by:

- 1) From T5, undefined industries
- 2) An homogeneous technological complex of Acheulean character in highest alluvial terraces (T6 to T9), chronologically before to 300 ky, which will keep a constant basic features (T9 to T11) (Full Acheulean), gradually varying in the time.
- 3) At the end of Middle Pleistocene (under 120 ky) turned up into lately lithic sets called "Transitional Final Acheulean" and Middle Palaeolithic technocomplexes.

**Acknowledgement:** GeoCroQ Project (HAR2011-23798).

ORAL

**5. GEOMORPHOLOGICAL INVESTIGATIONS OF DENSE CLUSTERS OF ACHEULIAN ARTEFACTS AT TIKODA, DISTRICT NARWAR, MADHYA PRADESH, INDIA**

*Deo, Sushama (Department Of Archaeology, Deccan College, Pune) sushamadeo@yahoo.co.in*  
*Ota, Simadri (Archaeological Survey Of India, Bhopal) simadriota@gmail.com*

Raisen hill complex is reported to be one of the richest concentration of Acheulian artefacts (Jacobson 1975) and described as surface sites. On the contrary our recent investigations of the Acheulian localities near Tikoda village confirm that Acheulian artefacts are eroding out of more than 10 meter thick sedimentary context. Large numbers of Acheulian artefacts were found in clusters within a 2 sq km area forming a definite geographical unit.

Geologically, the area is covered by Protorozoic Vindhyan sandstone and Cretaceous-Eocene Deccan Trap rocks. Geomorphologically, the Narwar hill complex forms a water divide between two major river systems the Betwa (a tributary of the Chambal river that joins the river Yamuna) to the north and the Narmada to the south. The 'V' shaped valley is a distinctive feature of the study area. It is enclosed by low-lying Narwar-Tikoda ridge on one side; the other side opens into a broad river valley. The 'V' shaped valley floor has preserved a thick sedimentary deposit and gives appearance of badland topography. The average elevation of this valley floor ranges from 465 to 440 m ASL. Seasonal streamlets drain the valley and erode the thick sediments.

Our detailed field investigation has shown following salient features:

Regolith consists of ferricretes, Vertisols, locally derived ferruginous gravel, silty-sandy loess-like sediments.

The area is characterized by locally developed landscape on pediment surface with depressions.

These depressions are filled with fluvio-lacustral and fluvial deposit.

On the whole there is no major break in deposition as indicated by absence of distinct fossil soils.

Low energy river system prevailed during the Acheulian times.

ORAL

**6. ADAPTATION, DETERMINISM, INNOVATION, DIFFUSION, CONVERGENCE? ACHEULIAN VARIABILITY AND MINERAL ENVIRONMENT**

*Gaillard, Claire (Muséum national d'Histoire naturelle, UMR 7194, Paris) gaillacl@mnhn.fr*  
*Agarwal, Neetu (University Rovira i Virgili, Tarragona) neetu1501@gmail.com*  
*Mishra, Sheila (Deccan College, Pune) sheila.m, ishraq@gmail.com*

The link between raw material and shape of the Acheulian bifacial tools has been abundantly discussed. In the western Europe morphological variations of the large cutting tools (LCTs) have been related either to raw material, to resharpening / reshaping or to cultural constraints. Besides, the production of large flake in many of the African and Asian Acheulian sites has been shown not to depend on the nature and shape of the raw material. However the shape of handaxes is used to propose models of cultural diffusion and human population dispersal.

Comparison of assemblages from different geological frameworks, focussing on those where LCTs are rather simply shaped and apparently not much resharpened nor reshaped, will help assessing the variability of Acheulian assemblages, up to East Asia, in relation to their mineral context.

Away from the Cretaceous and Paleogene basins of western Europe, where flint is necessarily preferred, the variety of knappable rocks offers a large range of possibilities. The selection of a particular rock type depends on its quality, shape, accessibility, etc. but it is also contingent upon the knapper's requirement, energy, mental template, technical habits and possible social constraints.

In Asia and Africa most of the knappable rocks available to the Acheulian craftsmen are to be cut from outcrops or collected from screes in the form of slabs or chunks or from rivers as cobbles and pebbles. Right from the first evidence of stone tool manufacture it is clear that the raw material is carefully selected. This improves in the Acheulian when compared to the Oldowan as it is admitted that transportation of raw materials as well as finished tools increases.

Depending on the investment in shaping the bifacial tools, the mode of blank procurement and the

selection of particular forms will influence the final tool morphology to various degrees. The balance between "large flake based" and nodule based tools in relation to the available raw material allows assessing the weight of the tradition versus that of adaptation to the mineral environment.

The technical behaviour answers to survival need according to cultural traditions and raw material contingences. The latter imply adaptation and reactivity in case of change and the former require stability for the consistency of human groups. To understand this behaviour, its evolution and its implication for Acheulian populations demands to consider at least the mineral environment together with the finished products.

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ORAL

## 7. DISCOID TECHNOLOGY: A KEY TO TRACE THE EMERGENCE OF THE ACHEULEAN AT MELKA KUNTURE (UPPER AWASH, ETHIOPIA)

*Gallotti, Rosalia (Université Bordeaux 1, UMR 5199 PACEA-PPP) rosaliagallotti@yahoo.it*

*Mussi, Margherita (Università di Roma Sapienza - Dipartimento di Scienze dell'Antichità) margherita.mussi@uniroma1.it*

In 1971, Mary Leakey established at Olduvai the distinctive characters of the Oldowan and Acheulean industries, introducing the terminology and descriptive criteria needed to define them. Following the methodological approach developed in Europe by F. Bordes, she used a typological classification of lithic assemblages. Notably, she defined "discoids" as bifacially flaked tools with a working edge along the whole circumference. Over more than 30 years, Leakey's typological definition was retained as the reference one when dealing with the earliest archaeological record of East Africa.

Since 1971, however, after that discoid technology was recognized in late Pliocene/Lower Pleistocene complexes, Leakey's "discoids" were silently moved into the category of cores. Notwithstanding much attention devoted in recent years to the technical criteria employed in small débitage in East African complexes, descriptions of discoid flaking procedure(s) generally lack in technical definition. Furthermore, the technological analysis does not take into account the theoretical discussion and analytical details developed in the last 20 years in the study of European Middle Paleolithic assemblages.

The aim of this paper is to present a systematic techno-economic account of the discoid débitage in the Lower and Middle Pleistocene industries (1.7-1.0 Ma) of the Melka Kunture region. This includes a systematic survey of raw material composition in the (paleo)channel system, to define volcanic facies, size and shape of the original matrixes in coarse alluviums.

Our analysis shows that 1) since 1.5 Ma discoid technology was used in the Ethiopian highlands both for small-medium flake production and for the extraction of large flakes to be turned into large cutting tools (LCTs); 2) in older sites the centripetal exploitation does not document a full management of the débitage convexities and of the core volume, but aims at the proper solution in the exploitation of (sub)spherical cobbles; 3) the knappers were able both to transform the original matrix shape and to select morphologically ideal cobbles in order to apply criteria required by discoid débitage; 4) discoid small débitage is based on reduction sequences longer than those documented for other methods; 5) discoid débitage coexists with unifacial centripetal prepared exploitation (UCPE), both in small débitage and in LCT chaînes opératoires. UCPE bears some of the technical criteria successively developed by the Levallois technology, suggesting that the co-existence of discoid and Levallois technologies in more recent contexts could come from these Lower Pleistocene assemblages; 6) discoid small débitage becomes dominant in the middle Acheulean and is replaced by Kombewa method for LCT production.

These technical behaviours are shared by other penecontemporaneous East African assemblages, with our without LCTs. This common background is relevant in cultural terms and notably provides a key to trace the emergence of the Acheulean in East Africa.

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ORAL

## 8. AN ACHEULEAN LANDSCAPE IN THE ARABIAN DESERT

*Groucutt, Huw (University of Oxford) huw.groucutt@rlaha.ox.ac.uk*

*Shipton, Ceri (University of Queensland) c.shipton@uq.edu.au*

*Jennings, Richard (University of Oxford) richard.jennings@rlaha.ox.ac.uk*

*Petraglia, Michael (University of Oxford) michael.petraglia@rlaha.ox.ac.uk*

The Lower Palaeolithic record of Arabia is poorly known, but available insights hint at its importance for understanding hominin behaviour and dispersals.

Our recent survey in the Dawadmi area of central Saudi Arabia has revealed a rich Lower Palaeolithic record, with sites distributed across a large area. In part of the area we surveyed there is an extensive landscape of Acheulean localities. This landscape is stable with very little sediment aggradation, slope movement, or channel migration. Acheulean artefacts are thus in primary contexts allowing for reconstructions of landscape-use. Systematic surveys over an 8 x 5 km area around the site of 206-76 were undertaken in January and February 2014.

Three main locality types were identified: workshop sites at the base of andesite dykes; off-sites where individual isolated artefacts occurred across the landscape; and sites alongside fluvial channels (wadis), to which artefacts were imported. Analysis of artefact typology indicates that bifaces were preferentially transported away from workshop sites and discarded either at off-sites or wadi sites. Excavation at the site of 206-76 revealed a ~2m deep Acheulean sequence with an occupation floor at the base. This demonstrates the potential for stratified Lower Palaeolithic sites in Arabia. Technological analysis of the Dawadmi material indicates a preference for the use of the bifacial concept in all aspects of lithic reduction and tool production.

Our findings demonstrate the major potential of the Arabian archaeological record to cast light on the Lower Palaeolithic in various ways, including the landscape and excavated site contexts described in this paper.

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ORAL

## 9. EAST ASIAN ACHEULEAN: TOWARD A SYNTHESIS OF ITS ATTRIBUTE AND EMERGENCE

*Hao Li (University of the Witwatersrand) wits\_ivpp@hotmail.com*

*Kuman, Kathleen (University of the Witwatersrand) Kathleen.Kuman@wits.ac.za*

The presence of Acheulean tool types (e.g. handaxes, cleavers) in East Asia has recently attracted considerable attention. They challenge the long lasting concept that the Early Palaeolithic in East Asia is characterized only by Mode 1 technology, and they reflect the diversity and complexity of Palaeolithic culture in this stage.

However, there is no consensus on how to explain this technological phenomenon. Do they represent a true Acheulean technology in East Asia, or are they merely Acheulean-like? Did they arise from indigenous development of Mode 1 types or did they result from the migration of new cultural groups into East Asia? Owing to the extensive variability observed in the Western Acheulean, the authors consider that the emergence of an East Asian Acheulean and its attributes should be multifactorial and complex, and it requires an in-depth understanding of the interrelated aspects and feedback loops during the process.

We propose a synthetically hypothetical framework to answer questions of East Asian Acheulean. This refers to a detailed study of the technological, behavioral, cognitive, biological, palaeoecological, chronological, etc. evidence available for the East Asian LCT sites. In addition, a scientific-realistic logic will be used in the study to verify or reject the hypotheses proposed earlier. For better demonstrating the approach, we will present a case study of LCT sites in Danjiangkou Reservoir Region (central China), which is not yet well known to Western scholars.

The research into LCT sites in Danjiangkou Reservoir Region would in fact support the existence of the true Acheulean techno-complex in East Asia, which explicitly shows the diversity and complexity of the Early Palaeolithic in this vast region. However, because of the relatively limited materials available, the authors suggest that it is still premature to decide on the original mechanism of East Asian Acheulean.

The synthetical hypothetical framework constructed here is a system-based solution that tries to present the most holistic view (combining technology, behavior, cognition, ecology, biology, chronology, etc.) to answer the emergence of East Asian Acheulean and its attributes.

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ORAL

## 10. EXPERIMENTAL STUDIES IN REPLICATING EARLY PLEISTOCENE ACHEULIAN TECHNOLOGY AT ATTIRAMPAKKAM, INDIA

*Kumar, Akhilesh (Sharma Centre for Heritage Education) akhilarchaeo@gmail.com*

*Pappu, Shanti (Sharma Centre for Heritage Education and Deccan College) pappu.shanti@gmail.com*

Excavations at the site of Attirampakkam, along the southeast coast of India, resulted in estimating the

chronology of Acheulian assemblages (Layers 6 to 8) to range in age from >1.07 Ma to around 1.8 Ma (weighted mean age estimate at around  $1.51 \pm 0.07$  Ma). Here, we examine the Early Pleistocene Acheulian *chaîne opératoire* at this site, based on both analysis of the assemblage as also experimental knapping. Experimental studies were initiated using quartzites, in order to investigate diverse technological strategies used in the manufacture of bifaces and other large and small tools. We discuss here, results of these studies in terms of: a) diversity of core reduction strategies; b) techniques used in the manufacture of handaxes and cleavers; c) issues related to retouch and resharpening of tools; d) nature of the waste products produced. We situate results in the context of analysis of the Early Pleistocene Acheulian assemblage from various trenches excavated at the site. We discuss implications in terms of hominin cognition and behaviour. Finally, we situate results in the light of studies conducted by us elsewhere in the Kortallaiyar and Arani river basins in this region, and from published literature.

ORAL

## 11. THE ACHEULIAN IN THE INDIAN SUBCONTINENT: REMOVING MISUNDERSTANDINGS ROOTED IN THE MOVIUS LINE PARADIGM

*Mishra, Sheila (Deccan College) sheila.mishra@gmail.com*

The Indian Acheulian played an important role in the Movius Line paradigm of two contemporary Lower Palaeolithic cultures, representing separate evolutionary trajectories in the Lower Pleistocene (Movius, 1948). This paradigm has long been superseded in Africa and Europe but still plays an important role in sidelining the Asian Palaeolithic record, including the Indian subcontinent, from any important role in human evolutionary developments. In this presentation continuing misunderstandings of the Indian Palaeolithic record rooted in the outdated Movius line paradigm are outlined and the role of the Indian Subcontinent in crucial developments in hominin evolution suggested. The major new findings are:--

The Indian representative of the Chopper-chopping tool tradition, the Soanian, actually dates to the Late Pleistocene and does not belong to the Lower Palaeolithic at all. It is more closely related to similar late Pleistocene "pebble tool" assemblages of SE Asia. It is contemporary to the Indian microblade technology and not the Indian Acheulian

Acheulian artefacts found in over a dozen localities in areas where Late Siwalik sediments outcrop in India, Nepal and Pakistan, most probably derive from them therefore belong to the Lower Pleistocene

Artefacts from the Indonesian site of Ngebung can be attributed to the Acheulian and *Homo erectus* in Java most probably had Acheulian technology

The only Lower Palaeolithic stone tool technology in the Indian Subcontinent and adjacent Sundaland was Acheulian

The Indian Acheulian is comparable in age to the African Acheulian

ORAL

## 12. EVOLUTION AND CULTURAL IMPLICATIONS OF ACHEULEAN FLAKE CLEAVERS

*Mourre, Vincent (Inrap, UMR 5608) vincent.mourre@inrap.fr*

Flake cleavers are massive stone tools made from large flakes and characterized by wide and unretouched cutting-edges. The cutting-edges result frequently from the intersection of the flakes lower surface and one or more previous flake negatives but sometimes the upper surface of the cutting-edge can be natural. Flake cleavers were recognized since the end of the 19<sup>th</sup> century as typically Acheulean tools. Cleavers were identified in 1928 by M.C. Burkitt in Southern Africa a few years after their European counterpart were named "*hachereaux*" by H. Breuil. In 1956, thanks to the study of more than 600 North African flake cleavers, J. Tixier proposed an analysis and a typology which remain valid until today.

This contribution will expose the results of a systematic technological analysis of flake cleavers series from Sub-Saharan Africa, North Africa and southern Europe. This study and an overview of the related literature demonstrate that environmental constraints are insufficient to explain the realization of flake cleavers during Acheulean times and that cultural factors are therefore involved. Flake cleavers analysis also highlights the evolution of predetermination within the Lower and Middle Pleistocene industries and thus enhances the definition of Acheulean itself.

ORAL

**13. IN SMALL THINGS REMEMBERED: ACHEULIAN SMALL TOOL ASSEMBLAGES AT SHISHAN MARSH (JORDAN)**

*Nowell, April (University of Victoria) anowell@uvic.ca*  
*Stueber, Daniel (University of Victoria) dstuber@aol.com*  
*Ames, Christopher (UC Berkeley) cjhames@google.com*  
*Cordova, Carlos (Oklahoma State University) carlos.cordova@okstate.edu*  
*Pokines, James (Boston University) jamespokines@gmail.com*

In his classic book *In Small Things Forgotten*, American archaeologist James Deetz reminds us that the past can be understood most fully by studying the small things so often forgotten or overlooked by archaeologists. While Deetz was referring to the historic past, his observations are equally applicable to prehistory in general and the Acheulian, in particular. Over the past century, prehistorians studying Acheulian assemblages have focused their energies largely on the now iconic handaxe arguing that its highly recognizable, symmetrical, tear drop shape can be a window onto the origins and evolution of modern cognition, sociality, language, teaching, skill acquisition, and even symbolic behavior. This focus on the handaxe, and by extension big game hunting, has been at the expense of Acheulian small tool and microlithic assemblages and their associated tasks. These assemblages, comprised of utilized flakes, tools and cores less than 2-3 cm in length, are known from sites in many parts of the world including Poland, Germany, Hungary, Israel, the Czech Republic, Slovakia, China, East and South Africa and now Jordan. A comprehensive study of the assemblages may challenge our definitions of what constitutes the "Acheulian" and alter our understanding of Lower Paleolithic subsistence practices, craft production and technical knowledge. In this paper, we present a detailed study of the small tool and microlithic assemblages from the Shishan Marsh site, a newly excavated Acheulian paleomarch site in Azraq, northeast Jordan and explore the role these assemblages played in hominin survival in a shifting paleodesert environment.

ORAL

**14. ACHEULIAN CULTURE OF JONK RIVER BASIN, IN HIGHLAND OF ODISHA AND CHHATTISGARH**

*Padhan, Tosabanta (Deccan College Post Graduate & Research Institute, Pune, India) tpadhan@gmail.com*

The research was carried out in the Jonk river basin, one of the major tributaries of the upper Mahanadi in the western highland of Odisha and eastern Chhattisgarh of India. Field investigations over five seasons (2007-2012) resulted discovery of 15 Acheulian sites in different geological context. The stone tool assemblages from all the sites have been studied in detail including their dimensions and technological attributes. Besides this attempt also been made for the reconstruction of lithic reduction sequence, raw material procurement strategy and settlement pattern and site formation processes. The Acheulian tools types in Jonk comprise of handaxes, cleavers, scrapers, cores, giant cores, polyhedrons, pointed flakes, irregularly flaked pebbles, and a variety of hammer stones. The distribution of Acheulian sites in the region illustrates colonisations of upland area and most of the sites were found on the foothills and few are found close to river bank. Uses of five different kinds of locally available raw materials have been observed for the manufacturing Acheulian tools in the study area. This study has helped to understand the regional archaeological structures, prehistoric strategies and their adaptation to the local Quaternary landscapes after observing the different types of lithic assemblages and associated sedimentary contexts.

ORAL

**15. THE ACHEULIAN AND BEGINNINGS OF HUMAN CULTURIFICATION**

*Paddayya, Katragadda (Deccan College, Pune) k.paddayya@gmail.com*

Tylorian definition of culture encompasses the whole range of products, tangible or otherwise, emanating from man's mental and corporeal activity.. This paper pleads that we need to rise above the oft-repeated definition of the Acheulian as a mere technological tradition. Surely, the use of natural flakes with sharp edges and then purposely knocking of such flakes from raw blocks of stone was a major departure, and archaeologists are yet to track down the record of this stage. Sooner or later, flaking a part of the periphery of rounded or angular blocks from one or both sides came up, leading to production of half-tools we commonly call choppers. But it is in the Acheulian that true culturification of natural objects takes place, and bifaces comprising both handaxes and cleavers have now moved from the fold of nature into the realm of culture. Their manufacturing processes and shapes are now firmly entrapped in human minds,

as suggested by the phrase mental templates.. As pointed out by the anthropologist Thomas Wynn, this has been facilitated by the emergence of Piagetian cognitive operations like symmetry of space, reversibility, whole-part relations, etc. Humankind indeed set itself on the path of creating artifacts.

Add to this innovative field the Acheulian groups' tendency to occupy carefully chosen basin-like landscape settings and restrict their nomadism within these confines, careful selection of raw materials for making stone artifacts, and adapt their foraging in tune with the seasonally shifting water sources and plant and animal foods. Noteworthy too are the use of wood and bone for shaping tools and weapons and use of natural ochres for application on body. Sociality, group living and transmission of skills to the younger ones are some of the other dimensions of this culturification, whose understanding has been sidelined by our long-standing preoccupation with stone tool collections.

ORAL

## 16. ACHEULIAN LANDSCAPES ALONG THE SOUTH-EAST COAST OF INDIA

*Pappu, Shanti (Deccan College & Sharma Centre for Heritage Education) pappu.shanti@gmail.com*  
*Akhilesh, Kumar (Sharma Centre for Heritage Education) akhilarchaeo@gmail.com*

Northern Tamil Nadu, along the southeast coast of India, is well known since 1863, for its Acheulian site complexes. Research by the Sharma Centre for Heritage Education, has resulted in the study of more than 40 Acheulian site complexes, details of which are presented here. Of these, Attirampakkam, was excavated, producing an Early Pleistocene age ranging from >1.07 Ma to around 1.8 Ma (weighted mean age estimate at around  $1.51 \pm 0.07$  Ma), for horizons in Layers 6 to 8. We present here an overview of the nature of Acheulian sites in this region, focusing on the chronology, stratigraphic context, and lithic assemblages. We discuss in detail the Early Pleistocene Acheulian *chaîne opératoire* at Attirampakkam, situate this site in the regional Acheulian context, and address issues related to long term stasis and change within the Acheulian. We situate these studies in the perspective of debates on Acheulian cognition, long-term technological and behavioural changes, and issues related to dispersals both in India and elsewhere in the world. We question prevalent notions on technological

and typological criteria for defining Early versus Late Acheulian in the Indian context, and examine the validity of current terminology in the study of Acheulian lithics.

ORAL

## 17. ACHEULEAN INDUSTRIES IN THE UPPER JIRA RIVER VALLEY, DISTRICT BARGARH, ODISHA: A PRELIMINARY REPORT ON RECENT INVESTIGATIONS

*Thakur, Neena (P.G. Department Of History, Sambalpur University, Burla, Odisha) neena1662@rediffmail.com*  
*Behera, Pradeep (P.G. Department Of History, Sambalpur University, Burla, Odisha) pkbehra@rediffmail.com*

The Acheulean, characterised by the appearance of *Homo erectus* with increased cognitive and adaptive abilities, standardized tool-making by employing large-flake blanks and first migration of human population out of Africa, is often regarded as representing technological stasis and homogeneity over a huge geographical domain spreading across Africa and Eurasia. It also represents the longest lasting (~1.7 My – 250 Ky) cultural phase in human history. Cultural remains of this phase are fairly widespread in South Asia in general and India in particular. Recent dates obtained from the Acheulean levels at Attirampakkam by palaeomagnetic measurements and cosmogenic nuclide dating methods have pushed back the antiquity of this cultural stage in India to about 1.5 My. Although Acheulean artefacts have been reported from a large number of localities in the state of Odisha since the forties of the last century, majority of these are from secondary contexts and mostly includes sporadic finds.

We conducted investigations in the upper course of the river Jira, a tributary of the river Mahanadi, in the district Bargarh, western Odisha. These investigations have brought to light a number of localities bearing Acheulean artefacts in semi-primary/primary contexts, away from fluvial network. At some localities trial pits were taken to understand the sedimentary context.

The assemblages were studied using a combination of *chaîne opératoire* approach and attribute analysis which helped reveal technological characteristics of the assemblage.

The assemblages recovered from this region include varying proportion of handaxes, cleavers, cores, spheroids, polyhedrons and a variety of tools made on flakes. While a couple of sites bear unmistakable evidence for quarry

activities and production of large-flake blanks, at most of the localities large-flake blanks and/or semi-finished as well as finished bifaces were procured from the nearby raw material sources for use. Trial pits taken at one of the localities revealed sub-angular/sub-rounded pebbly-cobbly gravel in a lateritic matrix as the sedimentary context of the surface Acheulean assemblages.

Techno-morphologically, most of the assemblages exhibit Late Acheulean character, while presence of an earlier phase cannot be ruled out. The present paper is an attempt to highlight the results of our recent investigations in the upper Jira river valley of Odisha.



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