



# Book of abstracts

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## **XIII-1. Bones, Bodies and Objects - Vectors of symbolic representations**

# The elephant and the handaxe: material representations in the Lower paleolithic

Ran Barkai \* <sup>1</sup>

<sup>1</sup> Tel Aviv University [Tel Aviv] – P.O. Box 39040, Tel Aviv 6997801, Israel

Early humans in the Old World were producing handaxes and consuming elephants and mammoth (most probably by using stone handaxes) over very long time periods during the Middle Pleistocene. One of the most interesting hallmarks of these early human groups is the production of "replicas" of the stone handaxes from elephant bones. This phenomenon was mostly overlooked in the past, or simply interpreted as either reflecting shortage in stone or as the production of non-utilitarian items for an unknown reason. Following our recent discussion and interpretation of the significance of the use of elephant remains for the production of the iconic handaxes (Zutovski and Barkai 2016), I would like to push the argument forward and to put it within the framework of current anthropological thinking and some perspectives adopted from studies of human-animal interaction spheres. Shortly put, I will argue here that the production of these extraordinary non-utilitarian objects made of selected animal bones, usually perceived as tokens of "art" or "symbolism", could actually be viewed as reflecting the ontology and cosmology of Paleolithic hunter-Gatherers groups sharing the world with *other-than-human-persons* and acting under the premise of *the-gift-of-the-animal* worldview. More specifically, and mostly based on the theory of perspectivism and Amerindian and Polar ontologies, I will suggest that the special relationships between early humans and elephant are reflected in the production of handaxes from elephant bones and provides us with a window into the nature of the interactions between early humans and the world they lived in.

**Keywords:** ontology, cosmology, elephant, handaxe, perspectivism

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\*Speaker



# Vegetal and zoomorphic decorations on hard animal materials in the Iberian Iron age

false \* , Marta Blasco-Martín \* † <sup>1</sup>, Consuelo Mata-Parreño <sup>1</sup>, Lucía Soria-Combadiera <sup>2</sup>, Mercedes Fuentes-Albero <sup>1</sup>, Eva Collado-Mataix <sup>1</sup>

<sup>1</sup> Departament de Prehistòria, Arqueologia i Història Antiga, Universitat de València (Depaha UV) – Spain

<sup>2</sup> Departamento de Historia, Universidad de Castilla la Mancha – Spain

Research of vegetal and zoomorphic decorative motifs documented on artefacts made on hard animal materials in the Iberian Culture (s. VI – s. I BC).

Within the industry on hard animal materials stand out the objects without decoration over the decorated ones and, in this second group, we can highlight the geometrical motifs. However, there are a series of artefacts that present figurative motifs, overall, hairpins with bird-shape or canine-shape head and combs and plates of bone and ivory with different vegetal and zoomorphic decorations.

On the other side, the Iberian anthropomorphic decorations are almost non-existent, contrary to what it has been documented in other periods and cultures (for example: hard animal materials industry in Roman times). In some way, the most *human* representations that we find on this kind of objects are epigraphic inscriptions and nevertheless we only know three of these artefacts: two bone hairpins, one from la Peña de las Majadas (El Toro, Castellón) and other from Alto Chacón (Teruel), and one box or small container made of antler from El Puntal dels Llops (Olocau, Valencia).

Consequently, in this investigation we want to think about the presence and absence of figurative motifs represented on these objects made on hard animal materials in the Iberian culture, pretending to answer several questions: Can it be documented a chronological evolution? Do the same motifs appear represented on bone, antler and ivory artefacts as they do in the objects made in other raw materials like clay, metal or stone? Are they singular pieces with other meanings the ones that are decorated with these motifs? Are they objects and decorations typical Iberian or are we talking about artefacts with influences from other Mediterranean cultures, or brought to Iberian Peninsula through trading exchanges?

**Keywords:** Bone industry, Ivory, Decorative motifs, epigraphy, Iron Age, Iberian culture

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\*Speaker

†Corresponding author: marta.blasco@uv.es

# Tracking symbols of death and afterlife: overview of burial customs of the Late Stone Age Russian Plain hunters-gatherers-fishers.

Anastasia Khramtsova \* <sup>1</sup>

<sup>1</sup> the Graduate School "Human Development in Landscapes" at Christian-Albrechts-University – Kiel, Leibnizstrasse 3, Germany

People represent essential information that needs to be either preserved or transferred – through symbols. The possibility to code the immense amount of information and to embody ideas in such a concise way let people use symbols efficiently as a foundation for ritual performance. Since mortuary practices as all ritual activities always consist of many steps and signs, we also may track symbols and try to explain them on the material of burial sites' excavations, even though symbols' interpretation might have a large number of possible meanings (e.g., Genep 1909).

The current report is dedicated to first study results of Late Stone Age hunter-gatherer burial sites located in the central part of Russian Plain, where the so-called Volosovo archaeological culture existed during 3500-2700 cal BC. Large and arguably long temporal Volosovo pit-houses, as well as numerous necropolises with complicated structure, are archaeologically well-known nowadays. Within this communication, burial sites Sakhtysh II, VIII, Chyornaya Gora, and Panfilovo were studied. The collection in focus comes from the Volodary site (Nizhniy Novgorod district, excavated in 1946-1947, 1970-1973 and kept in the State Historical Museum, Moscow). The material is mostly unknown to western specialists and may represent essential parallels to hunter-gatherer burial sites from Baltic and Eastern Europe (e.g. Zvejnieki, Tamula, Sope).

During previous studies of Volosovo burial sites, scholars characterized burial assemblages and tracked the sites' evolution using the typological approach. However, nowadays it became necessary to pose qualitatively new questions related to ritual's nature.

In my opinion, the following elements might be considered as symbols due to archaeological context, the recurrence of these features and the existence of reasonably close ethnographical parallels:

1. Body's orientation with a head to the water source.
2. Manipulations with the body (intentional disarticulation, ritual murder, ritual physical abuses).
3. Remains of specific animals in graves – a guide to the afterlife or a social group's totem

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\*Speaker

(Propp 2000).

4. Dog burials nearby graves as a possible symbol of an afterlife guard.
  5. The burial sites' location at the spots of abandoned Volosovo settlements as a symbol of afterlife household.
  6. The fire and the use of ochre as a symbol of transformation and purification.
  7. Ritual 'hoards' as symbols of memory, care for deceased people, and worship.
- Having observed these symbols, we will get a little closer to the understanding of both ritual's nature and the underlying ideas of burial performances.

**Keywords:** mortuary archaeology, archaeology of ritual, ritual life of huntergatherers, Late Stone Age, burial sites, interpretation of burial objects, archaeology of Russian Plain

# Zoomorphic sculptured images and stylized figures of the Paleolithic ensemble of the Malta excavation site

Lipnina Ekaterina \* 1,2

<sup>1</sup> Irkutsk State University (ISU) – st. K. Marxa 1, Irkutsk, 664003, Russia

<sup>2</sup> Institute of Archaeology and Ethnography SB RAS (IAEt SB RAS) – 17, Acad. Lavrentiev avenue, Novosibirsk, 63009, Russia

The general register includes 23 sculptured figures, with their morphology determining portraits affiliation to the groups or even genus of the animal kingdom: the engraving of mammoth on the tusk plate and five objects of various degrees of stylization. The main volume of the zoomorphic figurines is the images of the water birds in a flying condition. They are named in the literature as the "flying birds". The total amount of Flying Birds is 19. They are made by one technical manner and have the basic morphological unity. The flying birds of the 23,000-20,000 B.C. period probably are the techno-figurative and techno-production standards of that time, and therefore constitute a representative number of the examples in the Malta collection of the artifacts' assembly. Except of the flying birds of classical Malta zoomorphic sculpture collection there are also individual portraits of the representatives of the Pleistocene avifauna of the Belsko-Taiturskiy watershed. There are only three figures. Three statuettes of the Paleolithic sculpture made out of mammoth tusk are not standard, they are "examples-of-innovation". The following five objects of the zoomorphic images were conditionally included in the list. The object of a beautiful form and original ornamentation, found with the necklace of a child burial in 1929, can be defined as conventional. The "Flying Bird" or "flying owl" is the researchers' vision, although with a certain imagination, one could find a similarity with the polar owl, as if it's frozen in the silent gliding. The necklace and the "flying owl" can be seen as the amulets, that hunters of the Arctic territories passed to their newborn babies immediately after their birth.

The ancient Malta people of the Pleistocene world had their own life and loved hunting, they professed the backbone faith to "operate" people and animals by using their images and the objects, as the analogues of friends and enemies. Geese, swans, loons, ravens, of course, were friends of people, as they were "friends" with the deer. The Raven had to be in a special position among the ancient Malta hunters, because even now the population of the Arctic treats this bird as the universal messenger. As soon as the bird flock appeared in the sky, the herd of deer appeared on the ground. It happened in spring after a long and difficult winter, when all the stocks of food had gone; and it also happened in late autumn, when it was required to prepare a proper stock of meat for winter. The white birds could have been asked to "hurry" with the arrival, laying out their statuettes from a mammoth tusk in the appropriate place and pointing their heads in the direction in which they were supposed to fly: to the North in the spring time, to the South in the fall. Birds, accepting the request would arrive earlier. Their "friends – deer", hearing the trumpet calls of the feathered friends, would also hurry to meet them. Of course,

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\*Speaker

the guesses and versions dear to the researchers' hearts have been taken from the ethnographic objects of the recent past. A huge amount of other sketches from Arctic hunting life could be introduced today, as the most similar material to show the supposed life of the Malta people.

**Keywords:** Zoomorphic sculptured, Paleolithic ensemble, Malta site, Siberia

# Clothing and necklaces of shell and human and canine mandibles in Teotihuacan (México)

Marta Blasco-Martín <sup>\*† 1</sup>, Gilberto Pérez-Roldán <sup>2</sup>, Rubén Cabrera-Castro <sup>3</sup>, Raúl Valadez-Azúa <sup>4</sup>

<sup>1</sup> Departament de Prehistòria, Arqueologia i Història Antiga, Universitat de València (Depaha UV) – Spain

<sup>2</sup> Laboratorio de Arqueozoología, Universidad Autónoma de San Luis Potosí (Lab. Arqueozoología UASLP) – Spain

<sup>3</sup> Zona Arqueológica de Teotihuacan, Instituto Nacional de Antropología e Historia (Zona Arqueológica de Teotihuacan, INAH) – Mexico

<sup>4</sup> Instituto de Investigaciones Antropológicas, Universidad Nacional Autónoma de México (Instituto de Investigaciones Antropológicas, UNAM) – Mexico

The prehispanic native of Ancient Mexico has a narrow relation with the environment and the exploitation of fauna is a reflect of this relation. The most useful bone remains to elaborate artefacts were flat bones (scapula or parietal), long bones (tibia, femur, radius or metacarpus) or irregular bones (mandible). Both animal and human bones were used: human bones could be manipulated because they were the biggest bones in Mexico before the contact with the Hispanic world, but also because of different symbolic aspects.

In the city of Teotihuacan (dated from 1st century BC to 5th century AD) several archaeological findings related to the work of bone have been documented. In the Temple of Quetzalcoatl (Temple of Feathered Serpent), during the archaeological works of 1988 and 1989, directed by Ruben Cabrera, Saburo Sugiyama and George Cowgill, a series of burials were found being part of an offering. This offering contained eighty burials (individuals and multiples) located symmetrically to the fourth cardinal points, inside and outside the temple. It has been interpreted as an offering deposited in honour of the temple.

Likewise, during the archaeological works, mandibles of human and canines (dogs and coyotes) associated to the burials G4 and G5 were discovered. They were placed as clothing accompanied by beads with human teeth shape made on seashells. In this study we want to focus on the importance of their manufacture and the symbolism of teeth, mandibles and maxillae for Teotihuacan people.

**Keywords:** Bone industry, seashells, human bones, Teotihuacan, offering

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\*Speaker

†Corresponding author: marta.blasco@uv.es

# Whale bone within and without: Subsistence and symbolism of whales in a Birnik dwelling, northwest Alaska

Lauren Norman \* <sup>1</sup>, Owen Mason <sup>2,3</sup>, Claire Alix <sup>4,5</sup>

<sup>1</sup> University of Kansas – Lawrence, KS, USA, United States

<sup>2</sup> Institute of Arctic and Alpine Research (INSTAAR) – United States

<sup>3</sup> University of Colorado Boulder Boulder – United States

<sup>4</sup> Archéologie des Amériques (ArchAm) – Université Panthéon-Sorbonne, Centre National de la Recherche Scientifique : UMR8096 – 21 Allée de l'université 92023 NANTERRE CEDEX, France

<sup>5</sup> Université Panthéon-Sorbonne (UP1) – Université Panthéon-Sorbonne – 12 place du Panthéon - 75231 Paris Cedex 05, France

Baleen whale hunting is one of the most chronicled activities in the Alaskan Arctic ethnohistoric record. Ethnography recounts whale hunting preparations, the hunt, the sharing and uses of whales, and associated symbolic rituals. Whaling among modern Inuit is attended with cultural valuation, so discerning prehistoric whaling has important political resonances. Archaeologists have projected social, ritual, and symbolic dimensions to past archaeological assemblages with whaling archaeofaunas. Inferences from whale bone taphonomy, paleoecology, and paleodemography by Savelle, McCartney, and others, allow researchers to distinguish between hunted and scavenged whales, and to identify past whaling locations. Sample size is critical in substantiating whaling; at sites with small whale bone accumulations it is difficult to unequivocally confirm active whaling. The Birnik Rising Whale site, KTZ-304, at Cape Espenberg on the southern Kotzebue Sound does not yet offer unequivocal evidence for whaling during the 11th to 12th centuries AD. Whale hunting does not occur presently in the vicinity, although oral history and ethnohistoric accounts refer to past whaling and a now extinct subpopulation of bowheads. Whale products occur in abundance in the Birnik dwelling. On the floor, worked and unworked baleen pieces comprise 10% of the artefact assemblage, in contrast to later Thule dwellings on the same dune and the adjacent, younger, dune. Fifteen baleen whale elements, minimally 3 individuals, were placed atop, beside, and within the house. Artifacts in the Birnik structure may provide evidence of whaling: a large ivory harpoon head preform and large slate end blades, one inset into a large socket. Since AD 1000, the Cape Espenberg spit has shallowed, as sand accumulated offshore. Changes in the extent or distribution of sea ice may have fostered whaling in the past. Although Birnik people at Cape Espenberg did not likely procure whales as a focal resource, they did acquire whale products, especially baleen, in great amounts. Whale bones were incorporated into the house and likely displayed on the roof. We argue that to Birnik people, whale bones served as vectors, possessing multiple dimensions, significances, and meanings. These whaling vectors were such an essential part of their identity that they expended valuable effort to acquire and display them. Minimally, the presence of whale products indicates the active participation and self-identification of Birnik people in regional social networks of symbolic expression and identity, possibly even as whalers with other communities.

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\*Speaker

**Keywords:** Arctic, Birnirk, whaling, identity



# Une technologie liée au symbolisme, cause du changement industriel mésolithique nordique ?

éva David \* <sup>1</sup>

<sup>1</sup> Archéologies et Sciences de l'Antiquité (ArScAn) – Université Panthéon-Sorbonne, Université Paris Nanterre, Ministère de la Culture et de la Communication, Centre National de la Recherche Scientifique : UMR7041 – Maison René Ginouvès Boîte 3 21, allée de l'université 92023 NANTERRE CEDEX, France

À la fin du VIII<sup>e</sup> millénaire avant J.-C., l'Europe scandinave vit un bouleversement majeur du point de vue technologique : l'arrivée du débitage par pression (Sørensen 2012). Inconnu auparavant sur le territoire, notamment en Sjælland, l'adoption de celui-ci pose la question des conditions de son adoption : innovation, transfert de technologie ou mouvement démique (Sørensen et al. 2013). Quel que soit le scénario, l'appropriation de cette nouvelle technologie dans le lithique, comme elle aura permis l'obtention de supports plus standardisés, amène une autre transformation industrielle sur le long terme au cours du Mésolithique moyen et final : les armatures en os qui étaient traditionnellement simples ou à barbelures sont partout remplacées par des pointes à lamelles, dont le fût est en os ou même en bois végétal. En quelques décennies, la culture matérielle précédente disparaît ainsi complètement. De surcroît, l'enregistrement des plus anciens aspects de ces pointes à lamelles sur le territoire voit la venue de formes foncièrement nouvelles –les sagaies- par rapport aux engins de chasse et de pêche alors en usage. On s'interrogera donc sur la portée de ces transformations en termes industriels et dans le rapport entrevu entre les prémisses de l'adoption d'une nouvelle technologie et la valeur symbolique qu'elle aura pu recevoir, non seulement en tant que phénomène technique mais aussi dans le type de chasse où même dans l'espèce animale chassée elle-même auquel elle aura pu renvoyer de façon nouvelle.

A technology linked to symbolism, the cause for Nordic Mesolithic industrial change?

At the end of the eighth millennium BC, Scandinavian Europe experienced a major technological change: the arrival of pressure debitage (Sørensen 2012). Unknown previously on the territory, especially in Zealand, the adoption of this one raises the question of the conditions of its adoption: innovation, transfer of technology or demic move (Sørensen et al., 2013). Whatever the scenario, the appropriation of this new technology in the lithic, as it will have allowed the obtaining of more standardized supports, brings another industrial transformation on the long term during the middle and final Mesolithic: the bone points which were traditionally simple or barbed are everywhere replaced by slotted points, whose stem is made of bone or even of vegetal wood. In a few decades, the previous material culture disappears completely, so. In addition, the recording of the oldest aspects of these slotted points in the territory sees the arrival of fundamentally new forms - the spearheads made of bone – in comparison to the hunting and fishing gear then in use. We will therefore question the scope of these transformations in industrial

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\*Speaker

terms and in the relationship glimpsed between the premises of the adoption of a new technology and the symbolic value that it may have received, not only as a technical phenomenon but also in the type of hunting or even in the hunted animal species itself to which it could have returned in a new way.

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Sørensen, M., Rankama, T., Kankaanpää, J., Knutsson, K., Knutsson, H., Melvold, S., Eriksen, B.V., Glørstad, H., 2013. The first eastern migrations of people and knowledge into Scandinavia: evidence from studies of Mesolithic technology, 9th-8th millennium BC. *Norwegian Archaeological Review* 46 (1), 19-56.

**Keywords:** Technology, symbolism, bone, equipment

# Personhood of objects. Artefacts made from animal remains and animal representations in the Mesolithic of Northern Europe

Maja Pasaric \* <sup>1</sup>

<sup>1</sup> University College Dublin [Dublin] (UCD) – Belfield, Dublin 4, Ireland

Unmodified animal remains, artefacts made from animal remains (tooth, bone, antler) as well as animal representations found in Mesolithic burials of Northern Europe have so far received a significant amount of attention. Generally, these finds have most often been interpreted as raw materials to be used by humans in the afterlife, sacrificial gifts, symbols of particular worldviews, indicators of social statuses or as personal adornments and amulets - as in the case of tooth pendants and similar ornaments. This contribution sets to explore options for broadening our understandings of such finds. With the help of ethnographic literature about near-contemporary eastern Siberian hunting and gathering communities and by exploring different notions of agency the paper seeks possibilities for viewing them as affective animated things and defining their personhood.

**Keywords:** animals, personhood, objects, agency, Mesolithic, hunter, gatherers

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\*Speaker

# The spirit in the object – insights from Inuit and Pre-Inuit contexts.

Ulla Odgaard \* <sup>1</sup>, Claire Houmard \* <sup>†</sup>

<sup>1</sup> National Museum of Denmark – Frederiksholms Kanal 12, DK-1220, Copenhagen, Denmark

In the pre-modern circumpolar world, animals were the key resources both for food, clothing and tool kits. Animals were also active partners, assisting the hunter in getting supplies and also in communicating with the spiritual world. This paper will, based on ethnographic analogies, present tools, amulets and figurines from the Inuit and Pre-Inuit cultures, which we will argue refer to the concept of "Inua" in the past.

In the Inuit language "inua" can mean "the spirit in the object". Traditionally this concept in the daily life was used in hunting, when – in order to communicate with the game – special attributes were designed on the hunting weapons. It could be schematic or exact reproductions of animal parts, which would make the hunted prey able to "recognize" the weapon as a friend. Beautifully made hunting tools were considered to show respect for the game and to be more effective.

Also the use of amulets can be understood in the light of Inua, when animal attributes could spiritually give their strength and abilities to humans. Inua played an active part in the shaping and designing of objects, and we suggest that this way of thinking is not confined to the Inuit world, but could inspire the study of other prehistoric materials.

**Keywords:** Inuit, Pre, Inuit, Inua, hunting tools, amulets

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\*Speaker

<sup>†</sup>Corresponding author: [clairehoumard@yahoo.fr](mailto:clairehoumard@yahoo.fr)

# The represented and the hunted : a material culture and zooarchaeological approach to explore the symbolic role of animals at the Nunalleq site (15-17th c. AD), Western Alaska.

Edouard Masson-Maclean <sup>\*†</sup> , Claire Houmard <sup>\*</sup>

<sup>1</sup>, Richard Knecht , Isabelle Sidéra , Kate Britton

<sup>1</sup> Laboratoire Préhistoire et technologie (CNRS UMR 7055) – Université Paris X - Paris Ouest Nanterre La Défense : EA020, CNRS : UMR7055 – 21 allée de l’Université. F-92023 NANTERRE Cedex, France

Animals were central to the lifeways of northern prehistoric hunter-gatherers providing food and raw materials for clothing and making tools and objects, but they also possessed a high symbolic value. There are numerous examples from around the world which highlight the important socio-cultural role played by animals in prehistoric societies. However, little is known of the non-utilitarian role of animals in pre-contact Yup’ik society (of the Western Thule culture), due to the lack of archaeological research in Western Alaska and the Y.-K. Delta in particular, but also because most studies have focused on the economic role of animals. The rich ethnographic record available for the region may provide valuable insights into the spiritual world of the historic and modern Yup’ik but some caution is necessary as the indigenous populations were exposed to the fur trade and Christianity relatively early. As a result, the manner in which this aspect of human-animal relationships materialised itself prior to European contact is unknown. This study will address this knowledge gap by analysing the material culture and faunal remains from the well-preserved coastal site of Nunalleq (15th-17th AD) which offers a unique opportunity to explore the symbolic nature of human-animal relationships in pre-contact Yup’ik society. In particular, this study benefited from the possibility of confronting symbolic representations, on various types of objects and materials, of real and imaginary animals from the site with well-preserved faunal remains and a rich ethnographic record. Discrepancies between the faunal record and animal representation in pre-contact Yup’ik art appear to demonstrate that animals with a high utilitarian value may not necessarily hold a similar status in the spiritual world of people at the site. This study has the possibility to enlighten us on pre-contact Yup’ik belief systems and socio-cultural values, elements critical to the understanding of, not only pre-contact Yupik society, but also Western Thule and northern prehistoric societies as a whole.

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\*Speaker

†Corresponding author: edouard.masson-maclean@abdn.ac.uk

**Keywords:** Arctic, Alaska, Yup'ik, symbolic representation, zooarchaeology, bone technology

## XIII-2. Prehistoric Personal Adornment in Social and Economic Context

# Metal Jewelry of the Southern Levant and its Western Neighbors: Surprising Results Concerning Cross-Cultural Influences during the Early Iron Age

Josephine Verduci \* <sup>1</sup>

<sup>1</sup> University of Melbourne — Associate – Parkville VIC 3010, Australia

This paper presents the results of my PhD thesis, which examines the nature of adornment during the Early Iron Age period of the southern coastal plain of the Levant (ca. 1200–900 B.C.E.). The early stages of this period represent a departure from Late Bronze Age traditions and evidence of cross-cultural influences within the eastern Mediterranean. Metal jewelry is assessed from 29 sites in the southern Levant, the Aegean, and Cyprus, resulting in the creation of the first multiregional typology of metal jewelry for the Iron Age I–IIA eastern Mediterranean. Qualitative and quantitative analyses differentiate subtypes and regional preferences. Combined with the scoring of artifact similarity between geographic regions, these analyses demonstrate specific adornment practices that link the southern Levant to its western neighbors. This paper demonstrates that in contrast to previous assumptions, jewelry can be a useful tool in identifying cultural identity. Furthermore, I show that (contrary to expectations, perhaps), there is little to suggest a distinctly Aegean presence in the jewelry of Philistia. Statistical analysis of the data and distribution patterns indicates that the main spheres of influence on the jewelry of Philistia and Cisjordan were in fact Cyprus and Transjordan, and that these practices demonstrate strong local traditions, although there are some anomalous Aegean and Anatolian features. This conclusion supports recent suggestions that the Philistines in fact arrived from multiple origins, including the Aegean, Cyprus, Anatolia, Sicily, Sardinia, and the northern Levant, and then became intertwined with local populations in the southern Levant.

**Keywords:** Adornment, metal jewellery, Early Iron Age, southern Levant, Sea Peoples, entanglement theory, cultural identity

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\*Speaker



# A long-term perspective on personal adornments

Lars Larsson \* <sup>1</sup>

<sup>1</sup> Institute of Archaeology and Ancient History – Institute of Archaeology and Ancient History, Lund university, Lux, Se-221 00 Lund, Sweden, Sweden

The Zvejnieki site in northern Latvia includes about 330 graves covering the period 7500 until 2600 cal BC. A large number of these graves have personal ornaments. During the early use of the cemetery perforated teeth totally predominated. More than 2600 tooth beads have been analysed as to species and position on the interred. The different species are arranged according to special rules in the society that changed with time. An analysis of the trace wear of the perforation gives an interesting perspective of when a member of the society was given or was allowed to acquire new adornments. Differences in how the beads were attached to the dress can be viewed in a chronological perspective that also relates to gender. During the later use of the cemetery beads, pendants and rings made of amber became popular. A double grave provides interesting aspects of how this kind of adornment was used and how it relates to both sexes.

**Keywords:** mesolithic, the Baltic region, Latvia, adornment

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\*Speaker

# A much-desired ornament? The spread of blue fluorapatite beads in prehistoric Anatolia

Emma Baysal \* <sup>1</sup>

<sup>1</sup> Trakya University – Turkey

From around 6400 BC onwards bright blue coloured beads appear at sites around Anatolia and in the Near East. It has been established that these beads were made from fluorapatite formed from fossilized bone/ivory and treated to obtain the blue colour. These beads share a common range of forms that often differ from those seen in the assemblages with which they are associated. The beads raise questions about the nature of interactions in the Neolithic period, as well as the value attributed to, and investment made in, certain items of personal ornamentation. Several years of data collection and scientific analyses of archaeological assemblages in Anatolian sites of the later Neolithic and Chalcolithic periods has produced interesting results regarding the manufacture and use of these beads. This paper uses the assemblages from sites across the region to ask how and why these beads might have been spread across such a large area, why the colour and form might have been important and what we might be able to say about the desire for blue colour. An attempt is made, using the available stratigraphic and dating information, to reconstruct where the beads might have originated and how fast they could have travelled to their final destinations. This is then used as a tool to think about how we conceptualise time and space in relation to material culture in early periods.

**Keywords:** Beads, Neolithic, Chalcolithic, Networks, Distribution, Typology

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\*Speaker

# Un collier tardif d'imitations de craches de cerf découvert dans la nécropole de l'Age du Fer de Valea Stâinii, département d'Argeş, Roumanie

Dragoş Măndescu \* <sup>1</sup>, Mihai Constantinescu<sup>†</sup> <sup>2</sup>, Monica Mărgărit<sup>‡</sup> <sup>3</sup>

<sup>1</sup> Musée Départemental d'Argeş, Piteşti (MJA) – Str. Armand Călinescu, nr. 44, 110047 Piteşti, judeţul Argeş, Romania

<sup>2</sup> Institute d'Anthropologie Francisc Rainer", Bucarest – Romania

<sup>3</sup> Université Valahia, Târgovişte – Romania

Les colliers de craches de cerf assemblées sont connus depuis Paléolithique supérieur comme des markers symboliques du statut, de l'autorité et du prestige du possesseur. Probablement le plus spectaculaire de ces colliers est celui énéolithique du dépôt de Brad (département de Bacău, Roumanie), formé d'environ 200 craches de cerf et imitations en os percées. A mesure que le temps passe, ces colliers deviennent de plus en plus rares, parmi les plus tardifs connus jusqu'à présent étant un exemplaire documenté dans l'Europe Centrale-Est à l'aube de l'Age du Fer, à savoir le collier de sept craches de cerf percées de la tombe 31 de F'uzesabony-Kett'oshalom" (département Heves, Hongrie). Une seule crache percée a été signalée aussi dans une tombe "d'époque scythique" de Tiszal'ok (département Szabolcs-Szatmár-Bereg, Hongrie). Une découverte récente (saison 2015) faite dans la nécropole d'incinération de Valea Stâinii (département d'Argeş, Roumanie), cimetière qui appartient au groupe culturel Ferigile (VIIème-Vème siècle av. J. Chr.), a fourni probablement le plus tardif collier de ce type. Celui-ci faisait partie de l'inventaire funéraire de la tombe principale du tumulus 4. Le respectif ensemble clos a étalé quelques traits distinctifs et incitants. Tout d'abord c'était un tombeau double où ont été déposées les uns à côté des autres deux groupes distincts d'os incinérés appartenant à une femme adulte et à un individu subadulte de sexe non identifié. Avec les os de la femme ont été trouvés, pour la première fois à l'intérieur du groupe Ferigile, quelques centaines de perles miniaturées en caolin, pièces fréquentes dans d'autres milieux culturels voisins et contemporaines, par exemple à l'intérieur du groupe Ciurbrud de Transylvanie. Parmi les os incinérés du subadulte ont été trouvés 16 pendeloques imitant les craches de cerf et à côté d'eux quelques armes en fer. Les imitations des craches de cerf réalisées minutieusement ayant le bois de cervidé pour matière première, soulignent une fois de plus leur grande valeur symbolique, mais également la difficulté de procurer les pièces authentiques pour satisfaire les rigueurs de la tradition et d'expression du statut social. Très probablement, les perles ont été cousus sur les vêtements. Le défunt/les défunts avaient sans doute un grand prestige dans leur communauté, étant donnée la quantité impressionnante de céramique récoltée de cette tombe, qui est la plus grande de la nécropole. Les imitations de craches de cerf au-delà de leur valeur esthétique comme pièces de parure

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\*Speaker

<sup>†</sup>Corresponding author: mihaic2005@yahoo.com

<sup>‡</sup>Corresponding author: monicamargarit@yahoo.com

rare et valeureuse constitue un témoignage certain qui prouve la transmission des traditions préhistoriques liées au statut, au prestige, à la représentation et au symbole au long de quelques millénaires de l'Paléolithique supérieur et jusqu'à la fin de la Première Âge du Fer dans l'Est de l'Europe.

**Keywords:** Première Âge du Fer, Roumanie, rituels funéraires, pendeloques en crache de cerf, imitations

# Stone age companions: human-animal relationship expressions and animal teeth pendants from hunter-gatherer cemeteries at Sakhtysh complex (central Russia)

Aija Macane \* <sup>1</sup>

<sup>1</sup> Department of Historical Studies, University of Gothenburg – Sweden

The hunter-gatherer cemeteries around the Baltic Sea reveal complex burial practices. Abundance of animal remains, particularly animal teeth (mainly incisors and canines) have been used as personal adornments. However, other body parts, like jaws, phalanx, astragalus, antlers, claws have also been found within hunter-gatherer burials. This presentation focus on new analysis of animal teeth pendants discovered in hunter-gatherer burials at Sakhtysh cemeteries in the Upper Volga region of central Russia. The combination of animal species, animal body parts used for personal adornments and new C14 datings form the ground for the investigation. Although, mainly carnivore teeth have been used to make pendants, an interesting example comes from burial 24 at Sakhtysh IIa cemetery where marmot (*Marmota Bobak*) teeth were discovered. This is unusual find at Sakhtysh indicating long distance contacts with eastern and southern areas, since other non-local items, such as serpentine pendants were also discovered in the same grave. This study is part of the dissertation that problematize the Holocene hunter-gatherer relationship with the animal world and surrounding environment, how animal and human worlds co-existed, confronted, affected and used one another during Stone Age. Other materials included in this research come from Zvejnieki cemetery in northern Latvia and Skateholm cemetery in southern Sweden. The theoretical framework of this project is anchored in the growing field of environmental humanities and related theoretical approaches including posthumanism, new animism and new totemism, which all in different ways aim to decentralize human dominance and assign more active roles to other participants of the multi-layered relations between humans and animals.

**Keywords:** human animal relations, tooth pendants, Zvejnieki, Sakhtysh, Skateholm

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\*Speaker

# The symbolic use of shell beads in the Palaeolithic of the circum-Mediterranean

Daniella Bar-Yosef Mayer \* <sup>1</sup>

<sup>1</sup> The Steinhardt Museum of Natural History, Tel Aviv University (SMNH, TAU) – Ramat Aviv, Tel Aviv 69978, Israel

Beginning about 100,000 years ago, shell beads are found in sites in the Levant and North Africa. These assemblages are composed of a small selection of shell species that are mostly perforated naturally and were used as personal ornaments. Their use is evident from use wear on the perforations, as well as the apparently intentional darkening of the shell color by heating, as well as the presence of red ochre on many shells. With the dispersal of modern humans, beginning at about 45,000 years ago shell beads become much more common in sites, their numbers increase, as does the diversity of species. Different trends of dispersal of specific shell species seem to follow the dispersal of humans, especially between Europe and the Levant. Several shell species spread from the Levant to Europe, and others track in the opposite direction. The symbolic use of the shells is understood from the application of color to them, and from the choice of specific species at specific times in the Mediterranean world, which is not random, but intentional and consistent.

**Keywords:** Shell beads, Middle Palaeolithic, Upper Palaeolithic, Circum, Mediterranean, symbolism

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\*Speaker

# Personal ornaments from Tito Bustillo Cave (Ribadesella, Asturias, Northern Spain): evidence documented in the Dwelling Area

Esteban Álvarez-Fernández \* <sup>1</sup>

<sup>1</sup> Departamento de Prehistoria, Historia Antigua y Arqueología, Universidad de Salamanca. – Facultad de Geografía e Historia Calle Cerrada de Serranos s/n, 37002, Salamanca, Spain.  
estebanalfer@hotmail.com; epanik@usal.es, Spain

In the excavations performed by M. A. García Guinea and J. A. Moure in the *Dwelling Area* of Tito Bustillo Cave (Ribadesella) between 1970 and 1986, 24m<sup>2</sup> were excavated, documenting two archaeological levels. In Level 1, more than 200 personal ornaments were found, made from different raw materials that came mostly from animals and to a much lesser extent from minerals. Many were made from small shells of different marine gastropod (above all, *Littorina obtusata* and *Trivia* sp.), bivalve (e.g. *Glycymeris* sp.) and scaphopod species. These are followed in frequency by pierced teeth (mainly red deer atrophied canines, but also goat and reindeer incisors) and objects used as adornments that were made from different kinds of bones, including diaphyses and hyoids, and from antler. Beads in minerals and rocks (e.g. schist, jet) are also documented. All together, Tito Bustillo Cave has yielded the largest number of personal ornaments dated in the Magdalenian in Cantabrian Spain

**Keywords:** personal ornaments & beads, Lower Magdalenian, Greenland Stadial 2, Upper Pleistocene, Tito Bustillo Cave, Cantabrian Spain

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\*Speaker

# Shell beads in Neolithic burial contexts - the curious case of Kfar HaHoresh

Heeli C. Schechter <sup>\*† 1</sup>, A. Nigel Goring-Morris <sup>2</sup>, Daniella E. Bar-Yosef  
Mayer <sup>3</sup>

<sup>1</sup> Mandel School for Advanced Studies in the Humanities, The Hebrew University of Jerusalem  
(MNDL-HUJ) – Jerusalem 91905, Israel

<sup>2</sup> The Hebrew University of Jerusalem (HUJ) – Jerusalem 91905, Israel

<sup>3</sup> The Steinhardt Museum of Natural History, Tel Aviv University (SMNH) – Tel Aviv 6997801, Israel

This study examines the use of shell beads in specific burial contexts found at the Pre-Pottery Neolithic B (PPNB) cultic-mortuary site of Kfar HaHoresh, Israel. The site includes strata representing the three major phases of the PPNB – Early, Middle and Late. Architectural elements, material culture and mortuary practices change through the Neolithic sequence found at the site, reflecting changing cultural behaviors, norms and beliefs.

Architectural changes include the transition from the use of a massive walled and lime-plastered podium, to multiple complexes of terraces, smaller structures and plastered surfaces, cists, installations and combustion features, scattered in groups throughout the site. Burial customs change from single, mostly primary adult burials, to multiple secondary burials, some with bone arrangements and an increase in accompanying grave goods. These developments are graduated, complex and not necessarily synchronous yet represent a general vector of change.

A very large molluscan assemblage (> 3,200 items), including marine, freshwater and land snail shells, was found in different contexts at the site. Concentrating on the marine shells, the assemblage is typical of Mediterranean zone PPNB sites, including mostly Mediterranean bivalves, accompanied by a small group of Mediterranean gastropods and rare Red Sea gastropods. The presence of Red Sea shells, originating at least 350 km away, attests to the long distance connections between different human populations in the Levant. A small fraction of the shells from the site are worked, perforated, or otherwise manipulated to function as beads and pendants. The shell beads recovered from burial contexts at the site, representing an integral aspect of developing funerary practices, are examined, and the different trends of change and continuity in this cultural behavior during the course of the PPNB, are discussed.

**Keywords:** shell beads, burial contexts, Kfar HaHoresh, Neolithic PPNB

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\*Speaker

†Corresponding author: heelinka@gmail.com



# Gravettian personal ornaments of southwestern Germany and southwestern France – a link of a shared cultural behaviour ?

Sibylle Wolf <sup>\*†</sup> <sup>1</sup>, Carole Vercoutère <sup>\*</sup>

<sup>2</sup>, Dorothee Drucker <sup>\*</sup>

<sup>1</sup>, Susanne Münzel <sup>\*</sup>

<sup>1</sup>, Nicholas Conard <sup>\*</sup>

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<sup>1</sup> University of Tübingen – Germany

<sup>2</sup> Muséum National d'Histoire Naturelle (MNHN) – Museum National d'Histoire Naturelle – 57, rue Cuvier - 75231 Paris Cedex 05, France

The two regions southwestern Germany and southwestern France yielded Gravettian personal ornaments in form of tear-drop-shaped beads made from mammoth ivory. Here we present a detailed overview of this characteristic feature that appeared with the beginning of the Gravettian culture. The artefacts are of striking similarity in the two regions and we discuss this fact by means of artefacts at hand; this was the starting point of the current research.

In contrast to the Swabian Aurignacian ivory was less used for the manufacturing of domestic tools during the Gravettian; the people, then, nearly exclusively used this special material to carve tear-drop-shaped beads. In addition, much more animal teeth were worked as personal ornaments than during the Aurignacian times. This could reflect a reduction of the availability of raw material, which could be due to a decline of mammoth populations, and/or reflect a change in the cultural behaviour.

In southwestern France, if evidence exist that people could have used ivory of contemporaneous animals present in Dordogne, an importation of the material from other regions is also convincing so far. The hypothesis of importation of exogenous material must be considered seriously. We investigate if we could state the production of tear-drop-shaped beads on site in both regions. One research question is how we could envisage a link between two regions, southwestern Germany and southwestern France, geographically so far one from the other.

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\*Speaker

†Corresponding author: sibylle.wolf@senckenberg.de

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**Keywords:** Gravettian, Personal ornaments, Southwestern Germany, Southwestern France, Cultural behaviour

# Insights in Epigravettian ornamental traditions: use-wear analysis on the shell ornaments from Martin rockshelter (Alpes-Maritimes, France)

Leïla Hoareau <sup>\*† 1</sup>, Didier Binder <sup>2</sup>, Sylvie Beyries <sup>3</sup>

<sup>1</sup> Cultures et Environnements Préhistoire, Antiquité, Moyen Âge (CEPAM) – CNRS : UMR7264, Université Côte d’Azur (UCA) – France

<sup>2</sup> Cultures et environnements. Préhistoire, Antiquité, Moyen Age (CEPAM) – CNRS : UMR7264, Université Côte d’Azur (UCA) – Université Nice Sophia Antipolis Campus Saint-Jean-d’Angély - SJA3 24, avenue des Diables Bleus 06357 Nice Cedex 4, France

<sup>3</sup> Culture et Environnements, Préhistoire, Antiquité, Moyen-Age (CEPAM) – CNRS : UMR7264, Université Côte d’Azur (UCA) – Université Nice Sophia Antipolis Campus Saint-Jean-d’Angély - SJA3 24, avenue des Diables Bleus 06357 Nice Cedex 4, France

More than simple embellishments, ornaments have very diverse roles in human groups: cultural marker, symbol of a social status, etc. This polysemy certainly goes hand in hand with a wide variety of ornamental compositions, which could carry diverse information. Reconstitution of ornamental composition, by restituting the different uses of the elements, can allow us to understand, at least a part, the role of ornaments in societies.

When ornaments are found in undisturbed burials, the preservation of the initial arrangement of the elements facilitate the reconstitution of ornamental compositions, which can have a cultural value. However, this kind of context of discovery is very rare for Epigravettian sites, and ornaments are often scattered over the habitat. It is the case for Martin rockshelter (Alpes-Maritimes, France). Attributed to terminal Epigravettian, this small rockshelter revealed, among other vestiges, dispersed human remains belonging to only one individual, and 138 marine shell ornaments, also scattered in the site. The refitting of lithic and bones in the 3 terminal Epigravettian layers suggests a reworking which explains vestige dispersal. In this context, observing directly the arrangement of ornaments on the body is impossible and only a functional study can give us elements for reflection.

An experimental protocol have been carried out in order to identify the different traces on shells. Smoothing of edges and modification of the shape of the objects, observed macroscopically, allow to recognise the area of rubbing and constraints on the objects, giving precious evidence about the arrangements of the objects. Polish and striations, observed with the microscope provide information on the materials in contact with the objects and the way ornaments moved during their use.

These experimentations enabled us to suggest a reconstitution of ornamental composition used at Martin rockshelter.

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\*Speaker

†Corresponding author:

**Keywords:** shell ornaments, Epigravettian, use, wear analysis, experimentation

# Personal adornments and tools made of wild boar tusks in the Final Stone Age of Central Russia.

Ekaterina Kashina <sup>\*† 1</sup>, Aija Macane <sup>\* ‡ 2</sup>

<sup>1</sup> State Historical Museum (SHM) – Krasnaya Square 1, 109012, Moscow, Russia

<sup>2</sup> Department of Historical Studies, University of Gothenburg – Sweden

Wild boar (*Sus scrofa*) and its biological relatives were always a desirable hunting prey for people at all times all over the world. Prehistoric populations of North-East European forest zone used wide range of osseous materials in their everyday life, including wild boar tusks. This presentation focuses on collection of items made from wild boar tusks obtained from several hunter-gatherer settlements (dated around 3000 cal BC) located in the center of Russian plain (territory of Volga and Oka River interfluvium).

The following categories of items were made of tusks: knives, burins, small oval pendants, small triangular pendants and torque-shaped adornments. During the investigation, various modification traces were observed on tusks. For instance, traces of preliminary cutting of tusk, tool damages, which appeared during the process of working (for knives and burins), as well as reparation and reuse of damaged tools. The torque-shaped adornments could have been made in different ways: of tusk pair from one specimen, of left and right tusks from two different individuals, or of one split tusk. Sometimes the end-parts of torque-shaped pieces were deliberately cut off and were used as separate small pendants.

Apparently, all types of tusk adornments were worn by people in everyday life. This observation is based on tusk items exhibiting heavy use-wear from settlement contexts. Finds from several settlement and burial contexts allowed to reconstruct the functional use of torque-shaped adornments: they were obviously worn in pairs, not only around the neck, but also at the head or chest. Besides morphology and functionality, the special attention will be paid to the age and size estimation of used wild boar specimens.

Finally, the symbolic meaning and possible interpretations of tusk adornments will also be discussed. The find contexts, at least in the discussed region and time, allow us to argue for more pronounced male role connected with the use and probably with production of wild boar personal adornments.

**Keywords:** wild boar tusks, personal adornments, Central Russia, Stone Age, Middle Holocene

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\*Speaker

†Corresponding author: eakashina@mail.ru

‡Corresponding author: aija.macane@gu.se

# Cultural evolution through the scope of personal ornaments

Solange Rigaud <sup>\*†</sup> <sup>1</sup>, Solange Rigaud <sup>\*</sup>

<sup>2</sup>, Solange Rigaud <sup>\*</sup> <sup>‡</sup>

<sup>1</sup> CNRS PACEA (UMR5199) – Université de Bordeaux – Université Bordeaux, Bâtiment B18, Avenue des Facultés, 33405 Talence, France

<sup>2</sup> CNRS-CIRHUS (UMI3199) – 4 Washington Square North, New York, NY 10003, United States

I will present how personal ornaments can be used to explore past cultural geography when using appropriate GIS and statistic methods. Based on the extensive record of personal ornaments recovered from 436 well preserved stratigraphic units, I investigate cultural and population dynamics at work during transition to farming in Europe. The method comprises several multivariate analyses, including Partial Mantel test, NeighboNet Joining, AMOVA analysis, Wilcoxon rank test and spatial interpolation, in order to document how cultural traits, knowledge, and symbols circulated from a community to another and if similar cultural mechanisms acted in the various regions.

**Keywords:** Method, GIS, statistic, Neolithic, Mesolithic, Europe

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\*Speaker

†Corresponding author: srigaud17@gmail.com

‡Corresponding author: srigaud17@gmail.com

# The manufacture of ostrich eggshell beads at Mumba Rockshelter, Tanzania

Andrew Kandel <sup>\*† 1</sup>, Nicholas Conard <sup>2,3</sup>

<sup>1</sup> Heidelberg Academy of Sciences and Humanities (HAW) – The Role of Culture in Early Expansions of Humans (ROCEEH), Rümelinstr. 23, 72070 Tübingen, Germany

<sup>2</sup> Department of Early Prehistory and Quaternary Ecology, University of Tübingen – Germany

<sup>3</sup> Senckenberg Center for Human Evolution and Paleoenvironment at Tübingen – Germany

Although Margit Kohl-Larsen excavated Mumba Rockshelter in Tanzania during the mid-1930s, her excavation still provides one of the best reference sections for studying the transition from the Middle to Later Stone Age in East Africa. The exceptional 11 m stratigraphic sequence from Mumba yielded an impressive succession of Stone Age artifacts and fauna from the base of Bed VI, through Bed V and to the top of overlying Bed III. Across this sequence, the typology, technology and raw materials of the stone artifacts tell a story of gradual change. Ostrich eggshell (OES) artifacts represent another important category of finds, but these first appear in Bed III. The OES collection from Mumba is the one of the largest known in Africa and includes more than 3,600 artifacts, two-thirds of which are complete beads. The OES assemblage also counts among the earliest expressions of personal adornment in Africa. We studied the artifacts and examined the different chains of production which prehistoric people used to manufacture the OES artifacts. The analysis shows that people employed different modes of production related to different needs and that these likely reflect a choice of style. Like the associated studies of the stone artifacts, the OES assemblage provides evidence for a surprising level of technological continuity. Furthermore, our study provides 12 radiocarbon dates for the OES artifacts of Bed III. Seven of the dates range between 38-33,000 cal BP, as consistent with previous studies. Two artifacts yielded ages between 29-23,000 cal BP, while three artifacts date from 5,000-4,500 cal BP. Based on stratigraphic considerations, dating results and the technological analysis, we conclude that the appearance of OES artifacts occurs suddenly and in numbers greater than at most other East African sites. Examining the results of the lithic and OES analyses together, we note that defining a clear break between the Middle and Later Stone Ages is not as straightforward a task as some researchers assume. Over the last decade, studies of other East African localities have documented the importance of OES artifacts, suggesting that the makers of these symbolic artifacts used them as markers of individual and group identity. These finds provide a glimpse of the complex cognitive and social behavior of people in East Africa at the time when modern humans were spreading across Eurasia.

**Keywords:** Tanzania, Middle Stone Age, Later Stone Age, ostrich eggshell beads

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\*Speaker

†Corresponding author: a.kandel@uni-tuebingen.de

# Group identity and social networks in Gravettian. The case of perforated shells from Poiana Cireşului site, north-eastern Romania.

Elena-Cristina Nitu <sup>\*† 1,2</sup>, Marin Carciumaru <sup>3</sup>

<sup>1</sup> “Princely Court” National Museum Târgovişte – 7 Justiţiei Street, Târgovişte 130017, Dâmboviţa County, Romania

<sup>2</sup> Museum of Human Evolution and Technology in Palaeolithic, “Princely Court” National Museum Târgovişte – 7 Justiţiei Street, Târgovişte 130017, Dâmboviţa County, Romania

<sup>3</sup> “Princely Court” National Museum Târgovişte – 7 Justiţiei Street, Târgovişte 130017, Dâmboviţa County, Romania

Most of the Paleolithic art objects and adornments discovered in Romania come from Poiana Cireşului site. Recent investigations in this settlement have revealed four archaeological layers: one Epigravettian layer and three Gravettian ones. The oldest habitation, the third Gravettian layer, is dated to between  $25,760 \pm 160$  BP (Beta Analytic 244073) and  $27,321 \pm 234$  BP (ER 11859) (31,969 cal BP) and yielded lithic material, fauna remains and large combustion structures. The adornment items discovered in this layer are represented by 48 perforated gastropods shells belonging to the *Homalopoma sanguineum* (10 items) and *Lithoglyphus naticoides* (38 items) species. *Homalopoma sanguineum* is a red-coloured gastropod which belongs to the *Turbinidae* family and is found exclusively in the Mediterranean Sea. The discovery of this species at Poiana Cireşului, a site located in a mountain area specific for the region east of the Carpathians, 800 kilometers away from the nearest possible source, may have significant implications on understanding human groups mobility and vast spaced social networks. Poiana Cireşului is one of the very few Gravettian sites where perforated *Homalopoma sanguineum* shells were found. Furthermore, to our knowledge, the *Lithoglyphus naticoides* species was not being used for adornments in the Gravettian, the perforated pieces discovered in Poiana Cireşului being the only ones of this type. Except for the perforated shells, no other adornment item was discovered in this layer. The surprising facts are the morphology and morphometry of these two species, which may account for the reason behind their selection, as well as provide a clue to the identity of the group. This unique association of perforated shells, found in no other Gravettian settlement, contributes to the individualization of the Poiana Cireşului group’s identity through their adornments. In addition to describing the pieces of adornments and the contexts in which they were discovered, the presentation will comprise the result of the technical and functional analyses carried out on the perforated shells (microscopy, traces of use), as well as discussions regarding group identity and social networks in the Gravettian.

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\*Speaker

†Corresponding author: elenacristinanitu@yahoo.com



**Keywords:** Gravettian, adornments, group identity, social networks, north, eastern Romania

# New bead assemblages from the Later Stone Age to Iron Age of Northern Malawi: examining technological choice and local economies in diachronic perspective

Claire Heckel \* <sup>1,2</sup>, Jennifer Miller <sup>3</sup>, Andrew Zipkin <sup>4</sup>, Francesco D'errico <sup>5,6</sup>, Elizabeth Gomani-Chindebvu <sup>7</sup>, Jessica Thompson <sup>8</sup>

<sup>1</sup> Division of Anthropology/Richard Gilder Graduate School, American Museum of Natural History - AMNH (US) (AMNH) – Central Park West at 79th Street New York, NY 10024, United States

<sup>2</sup> Travaux et Recherches Archéologiques sur les Cultures, les Espaces et les Sociétés UMR 5608 T.R.A.C.E.S, Université de Toulouse - Jean Jaurès (UMR 5608 TRACES) – UMR 5608 - TRACES – 5 allées Antonio Machado F-31058 Toulouse Cedex 9, France

<sup>3</sup> Department of Anthropology, University of Alberta – United States

<sup>4</sup> University of Illinois at Urbana-Champaign [Urbana] – 205 N. Mathews Ave., Urbana-Champaign, IL 61801, United States

<sup>5</sup> Department of Archaeology, History, Cultural Studies and Religion – University of Bergen, Postboks 7805, NO-5020 Bergen, Norway

<sup>6</sup> de la Préhistoire à l'Actuel, Cultures, Environnement, Anthropologie (PACEA) – CNRS : UMR5199, Ministère de la Culture et de la Communication, Université de Bordeaux (Bordeaux, France) – Bâtiment B18, Allée Geoffroy Saint Hilaire, CS 50023 33615 PESSAC CEDEX, France

<sup>7</sup> Ministry of Tourism, Wildlife, and Culture Malawi – Malawi

<sup>8</sup> Emory University [Atlanta, GA] – 201 Dowman Dr, Atlanta, GA 30322, United States

This paper presents the initial results of a multi-pronged approach to the analysis of newly-excavated assemblages of beads from three rockshelter sites in northern Malawi: Hora 1, Mazinga 1, and Kadawonda 1. Excavations in 2016 and 2017 at these sites yielded an assemblage of over 150 beads and bead preforms made of terrestrial and aquatic shell and, to a lesser extent, bone and ostrich eggshell. Together, the assemblages span the Later Stone Age to Iron Age and constitute by far the oldest bead assemblages in Malawi. The assemblages present an unparalleled opportunity to examine change over time in beads and bead-production in the region. Earlier excavations (1950) at Hora 1 yielded the only complete LSA skeletons known from Malawi, which are also the source of Africa's oldest DNA (at 8100 BP); this provides further opportunity to understand ornament production within its larger cultural and biological context. A collective effort of specialists in Canada, the United States, and France, the analysis of these ornaments and their production stages integrates a range of methodological approaches: raw-materials characterization, radiometric dating, isotope analysis, morphometric analysis, residue and use-wear analysis, chaîne-opératoire reconstruction, and experimental archaeology. The combined results show technological choice and cultural transmission in LSA societies over time and space, and across at least three environmental and climatic transitions: the Last Glacial Maximum, the dawn of the Holocene, and the end of the African Humid Period. They further

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\*Speaker

serve as a basis of comparison between bead assemblages of the LSA bead and the Iron Age (after about 2 thousand years ago).

**Keywords:** East Africa, ornaments, parure, Later Stone Age, Iron Age

# Personal ornaments, raw materials and mortuary practices: new insights into the Square Mouth Pottery culture of the Po Plain (Italy)

Roberto Micheli <sup>\*†</sup> <sup>1</sup>, Paola Mazzieri

<sup>1</sup> MiBACT - Soprintendenza Archeologia, Belle Arti e Paesaggio del Friuli Venezia Giulia (MiBACT-SABAP FVG) – piazza della Libertà, 7 - I-34135 Trieste, Italy

The Neolithic is an interesting phase for observing the changes which affected the material culture and ideology of the prehistoric European communities. In particular, the Middle Neolithic of northern Italy records the full development of Neolithic groups and the progressive transformation of their economic and social basis. During this period, the production of ornaments improved and new types appeared indicating an increase in the complexity of costume and appearance of individuals. This is also possible through the choice and manipulation of particular raw materials and/or characteristics shapes and colours of the ornaments, as well by their combination on the body or the dress.

The Vasi a Bocca Quadrata” or Square Mouth Pottery (hereafter SMP) culture is the main cultural entity spread during the 5th millennium cal BC in northern Italy. It developed in three main phases, marked by variations in pottery style and decorations and interesting a vast geographical zone comprises between the Alpine range and the northern Apennines. Thanks to many recent excavations, SMP mortuary practices are now well known in the western Emilia and Mantua territories of the Po Plain. SMP material culture is characterized by a complex symbolic manifestations perceiving by funerary evidence and influencing also the personal ornament field. In fact, SMP culture presents, particularly in the two earlier phases between 5.000 and 4.300 cal BC, a certain complexity of the costume domain as indicated by the variability of forms and raw materials employed for ornaments, while the information is very scanty instead in the last phase. In addition, many bodily adornment differences are recognized among coeval SMP groups of Liguria, the central Po Plain, and the Trentino area.

The paper considers funerary evidence of the first two SMP phases of the Po Plain area on the basis of the adornment objects and raw materials employed. Personal ornaments are made of diverse materials such as shells, animal teeth and steatite. The study considers their geographical distribution and chronology, the resources exploited, the variability of typology and their association with grave-goods, and finally their importance as material expressions of social persona in order to better understand economic and social importance of personal ornaments in SMP culture and their significance for the SMP groups of the Po Plain.

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\*Speaker

†Corresponding author: roberto.micheli@beniculturali.it

**Keywords:** graves, personal ornaments, raw materials, Middle Neolithic, Square Mouth Pottery culture, northern Italy

# Biomolecular identification of prehistoric shell ornaments

Jorune Sakalauskaite <sup>\*† 1,2</sup>, Søren Andersen <sup>3,4</sup>, Maria Borrello <sup>5</sup>, André Colonese <sup>6</sup>, Alberto Girod <sup>7</sup>, Igor Gutiérrez-Zugasti <sup>8</sup>, Hannah Koon <sup>9</sup>, Kirsty Penkman <sup>6</sup>, Samantha Presslee <sup>6</sup>, Helmut Schlichtherle <sup>10</sup>, Caroline Tokarski <sup>11</sup>, Julie Wilson <sup>6</sup>, Jarosław Wilczyński <sup>12</sup>, Frédéric Marin <sup>2</sup>, Beatrice Demarchi <sup>1</sup>

<sup>1</sup> Life Sciences and Systems Biology, University of Turin – Turin, Italy

<sup>2</sup> UMR CNRS 6282 Biogéosciences, uB-FC – Université Bourgogne Franche-Comté – Dijon, France

<sup>3</sup> Søren Henning Andersen – Denmark

<sup>4</sup> Aarhus University [Aarhus] – Denmark

<sup>5</sup> Département de géographie et environnement, University of Geneva – Geneva, Switzerland

<sup>6</sup> BioArCh, University of York – York, United Kingdom

<sup>7</sup> Italian Malacological Society – Sorengo, Switzerland

<sup>8</sup> Instituto Internacional de Investigaciones Prehistóricas de Cantabria, University of Cantabria – Santander, Spain

<sup>9</sup> Archaeological Sciences, University of Bradford – Bradford, United Kingdom

<sup>10</sup> Landesamt für Denkmalpflege im Regierungspräsidium Stuttgart – Gaienhofen-Hemmenhofen, Germany

<sup>11</sup> USR Lille1/CNRS n3290, MSAP, University of Lille1 – Université des Sciences et Technologies de Lille - Lille I – Lille, France

<sup>12</sup> Polish Academy of Sciences – Krakow, Poland

Mollusc shells are one of the most widespread and iconic raw materials used in prehistory to make ornaments. Different species of shells underwent consistent exploitation as far back as early prehistory (e.g. *Nassarius* in Middle Stone Age sites), and were chosen on the basis of their aesthetic qualities and material properties. The selection of certain species and the ornaments' typology can be used as a proxy for reconstructing patterns of cultural diversity, cohesiveness of local communities and changes in past societies. This would in turn help to untangle the complex processes that have contributed over time to the shaping of present-day European cultural and biological population diversity.

Taxonomic identification of shell ornaments among prehistoric artefacts remains challenging, due to the fact that working the material (e.g. polishing) and/or degradation during burial may have disguised or altered diagnostic morphological features. Moreover, shell ornaments do not typically attract the full attention of the archeometrist as a "cultural heritage" item and are rarely considered for comprehensive analysis using the latest innovative technologies. This hinders the possibility of building large datasets of securely-identified ornaments which can be used to reconstruct past environments as well as trade and exchange networks.

We exploit technological advances in biomolecular archaeology (analysis of proteins using mass

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\*Speaker

†Corresponding author: jorune.sakalauskaite@unito.it

spectrometry or "ZooMS", and stable isotope geochemistry) and state-of-the-art spectroscopic techniques (for microstructural and morphological studies) and focus on the identification of shells that have been notably important for European prehistory, including Unionoidae (freshwater bivalves, source of mother-of-pearl), Nassariidae and Spondylidae from Upper Palaeolithic, Mesolithic and Neolithic sites. We also address the issue of how to distinguish between fossil shells (i.e. from geological outcrops) and shells that were coeval to the makers of the ornaments.

Our research shows great potential even for small, heavily degraded or fragmentary shells and ornaments; this could yield precious insights into patterns of landscape use and human mobility against a changing environmental backdrop during the Pleistocene and the Holocene, revealing possible routes for the exchange of materials and ideas.

**Keywords:** Biomolecular archeology, proteomics, mollusc shells, ornaments

# The production and distribution of personal ornamentation in the Paleolithic of eastern Central Asia

Arina Khatsenovich <sup>\*† 1</sup>, Evgeny Rybin <sup>1</sup>, Nicolas Zwyns <sup>2</sup>, Alexander Fedorchenko <sup>3</sup>, Jovan Galfi <sup>4</sup>, Roman Shelepaev <sup>5</sup>, Byambaa Gunchinsuren <sup>6</sup>

<sup>1</sup> Institute of Archaeology and Ethnography of the Siberian Branch of the Russian Academy of Sciences (IAET SB RAS) – 17, Acad. Lavrentiev avenue, Novosibirsk, 630090, Russia, Russia

<sup>2</sup> University of California [Davis] (UC Davis) – One Shields Avenue, Davis, CA 95616-5294, United States

<sup>3</sup> Institute of Archaeology and Ethnography of the Siberian Branch of the Russian Academy of Sciences (IAET SB RAS) – Russia, 630090, Novosibirsk, Acad. Lavrentiev avenue, 17, Russia

<sup>4</sup> University of Belgrade [Belgrade] – Studentski Trg 1, 11000 Belgrade, Serbia

<sup>5</sup> V.S. Sobolev Institute of Geology and Mineralogy, SB RAS (IGM SB RAS) – Russia

<sup>6</sup> Institute of History and Archaeology MAS – Mongolia

The territories of modern Mongolia, China and Transbaikalian Russia were inhabited by *Struthio asiaticus* (Asian ostrich) during the Pleistocene. The discovery of ostrich eggshell beads in Upper Paleolithic sites supports the conclusion that this raw material was used in the production of personal ornaments along with softer types of stone, bone, ivory and antler in the Transbaikal region and was the principal raw material for such purposes in Mongolia and China, with few exceptions. Focusing on Paleolithic sites in northern Mongolia, it is possible to evaluate the evolution of bead-making and the distribution of such ornaments in eastern Central Asia. A number of archaeological sites in the middle Selenga valley investigated during the past five years, including Tolbor-4, -16 and -21 as well as Kharganyn Gol-5, have yielded ostrich eggshell beads along with stone pendants, including an item made of mica bearing evidence of drilling. Ostrich eggshell beads are known in the region beginning in the Initial Upper Paleolithic, and they are associated with later stages of Mongolian prehistory, although their spatial distribution shifts south toward the Gobi Altai near the Pleistocene–Holocene boundary. This research provides additional archaeological and experimental data on ostrich eggshell bead production, yielding evidence that this type of personal ornamentation could have been produced by hand- drilling since the Initial Upper Paleolithic. Ostrich eggshell bead production, along with the use of ochre as a pigment to color them, is among the similarities observed between the Initial and Early Upper Paleolithic of Mongolia, southern Siberia and the Transbaikal. The soft stone pendants recovered from the Tolbor-21 site (the first such Paleolithic artifacts known from eastern Central Asia) as well as an apparently non-utilitarian mica item bearing a drilled perforation from Kharganyn Gol-5, allow identification of the raw material sources, suggesting that hunter-gatherer group mobility extended up to several hundreds of kilometers. This study is supported by the Russian Foundation for Basic Research, project No. 17-06-00591.

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\*Speaker

†Corresponding author: archeomongolia@gmail.com



**Keywords:** Central Asia, Paleolithic, experimental archaeology, *Struthio asiaticus*, ostrich eggshell bead, stone pendant

# Shell ornaments from the Aurignacian and Gravettian levels at La Viña rockshelter (Asturias, northern Iberia): a technological and functional approach.

Renata Martínez-Cuesta \* <sup>1</sup>, Igor Gutiérrez-Zugasti <sup>2</sup>, Solange Rigaud <sup>3</sup>,  
Marco De La Rasilla Vives <sup>4</sup>

<sup>1</sup> Universidad de Cantabria – Edificio Interfacultativo, Avda. de los Castros s/n, 39005 Santander, Cantabria, Spain

<sup>2</sup> Instituto Internacional de Investigaciones Prehistóricas de Cantabria, Universidad de Cantabria, Gobierno de Cantabria (IIIPC) – Edificio Interfacultativo, Avda. de los Castros s/n, 39005 Santander, Cantabria, Spain

<sup>3</sup> CNRS PACEA (UMR5199) – Université de Bordeaux (Bordeaux, France) – Bâtiment B18, Avenue des Facultés, 33405 Talence, France

<sup>4</sup> Área de Prehistoria, Universidad de Oviedo – Facultad de Filosofía y Letras, Universidad de Oviedo. Calle Teniente Alfonso Martínez s/n, 33011 Oviedo, Asturias, Spain

Despite the current debate on the origins of symbolic behaviour, it is accepted that the generalisation on the use of shell ornamentation in Western Europe is dated to the Aurignacian, and related to *Homo sapiens*. Shell beads in the archaeological record of this period are still scarce, but they gradually increase in the second part of the Early Upper Palaeolithic (i.e. the Gravettian). In this poster we analyse 62 mollusc shell remains recovered from the Aurignacian and Gravettian levels at La Viña rockshelter, located in the Nalón Valley (Asturias, Spain). The shell remains were recovered from the Western and Central sectors of the site during the excavations carried out at the site between 1980 and 1996. This research aims to characterize the different stages of the *chaîne opératoire* of shell beads (acquisition of raw material, manufacture, use and abandonment) in order to determine technological and social patterns among hunter-gatherers societies from the Early Upper Palaeolithic in northern Iberia. First, we conducted taxonomical identification, then we observed the shells under the microscope in order to select the remains with evidence of anthropogenic modification, and finally we analysed the perforations under the microscope in order to identify technological patterns and use-wear traces derived from the manufacture and use of the shell beads. The results showed that shell acquisition was focused mainly on species usually not used for food, such as the gastropods *Littorina obtusata*, *Littorina saxatilis*, *Trivia* sp., *Nucella lapillus*, *Nassarius reticulatus*, and *Turritella* sp.; the bivalves *Arctica islandica*, *Cerastoderma edule* and *Pecten maximus*; and the scaphopod *Antalis* sp.). Most of these remains showed signs of collection on the beach after they were dead. A few remains from species habitually used for food were also found (e.g. *Littorina littorea*, *Patella* sp.). The presence of shells like *Littorina littorea* and *Arctica islandica* indicate the existence of cold climate conditions. Only 24 out of 62 shell remains presented perforations or other evidence of anthropogenic modification. The rest of the assemblage was composed by complete

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\*Speaker

and fragmented shells belonging to species that has been used as ornaments in Upper Palaeolithic sites from northern Iberia, suggesting that they were transported to the site as raw material but they were broken during manufacture or discarded for shell bead manufacture. The results also showed the existence of different technological solutions, the use of ochre associated to the shells and the presence of some use-wear traces.

**Keywords:** Shell beads, Technology, Symbolism, Aurignacian, Gravettian, Cantabrian region.

# Coquilles et coquillages comme objets d'ornementation en Afrique du Nord durant l'Holocène

Ismail Saafi \* <sup>1</sup>

<sup>1</sup> Laboratoire méditerranéen de préhistoire Europe-Afrique (LAMPEA) – Aix Marseille Université : UMR7269 – MMSH 5 Rue du château de l'Horloge BP 647 13094 AIX EN PROVENCE CEDEX 2, France

Souvent lorsqu'on parle de production d'objets d'ornementation, la matière première utilisée serait le coquillage marin. En revanche les coquilles d'escargots terrestres présentes sur les sites holocènes nord africains, servaient uniquement à la consommation humaine (Morel, 1980 ; Camps et Morel, 1983 ; Lubell *et al.*, 1975 ; Hutterer *et al.*, 2011 ; Taylor *et al.* 2011, Saafi *et al.*, 2013). La découverte de coquilles percées juste derrière le péristome (terminus du dernier tour de la coquille) (Debruge et Mercier, 1912, Saafi, en cours) ouvre la porte sur des interprétations autre que la nourriture. Ce genre d'ouvertures serait utilisé dans la fabrication des colliers. Si l'espèce concernée par ce genre d'activité en Tunisie est limitée à *Sphincterochila candidissima*, la liste comprend plusieurs taxons dans le reste des sites nord africains. L'effectif de coquilles perforées utilisées comme parure varie selon l'appartenance biologique (marine ou terrestre) et la répartition géographique. Chaque type est plus abondant dans son biotope. La surreprésentation des hélicidés terrestres pourrait s'expliquer par l'éloignement de la mer des sites dits " continentaux " d'une part et le but et les besoins d'utilisation des tests d'autre part. Si les coquillages marins ont servi comme parure c'est grâce à leur originalité et peut être la solidité de leurs parois, par rapport aux coquilles des gastéropodes terrestres. L'utilisation des coquilles terrestres serait occasionnelle et de courte durée (lors des cérémonies). D'après les études ethnographiques chez certaines populations berbères, les colliers d'escargots terrestres sont utilisés dans diverses fêtes saisonnières ou rituels (Laoust, 1920, Doutté, 1909).

**Keywords:** coquilles, coquillages, objets d'ornementation, Afrique du nord, Holocène

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\*Speaker

# Ornamental elements of the levels P/6 to P/2 from "El Pirulejo" (Priego de Córdoba, Spain)

Miguel Cortés Sánchez\* <sup>1</sup>, María D. Simón-Vallejo <sup>1</sup>, M. Carmen Lozano Francisco <sup>1</sup>, José L. Vera Peláez <sup>1</sup>, María Gavilan Zaldúa <sup>2</sup>, Lydia Calle Román <sup>† 1</sup>, Rubén Parrilla Giráldez <sup>†</sup>

<sup>1</sup>, José A. Riquelme Cantal <sup>3</sup>, Carlos Odriozola Lloret <sup>1</sup>

<sup>1</sup> Tellus. Prehistoria y Arqueología en el sur de Iberia. Universidad de Sevilla. (TellUS) – Spain

<sup>2</sup> Universidad de Sevilla – Spain

<sup>3</sup> Universidad de Córdoba (UCO) – Spain

El Pirulejo is the largest Late Glacial archaeological sequence known to date for hinterland areas in the south of Iberian Peninsula. This archaeological site present an archaeological sequence with occupations of the middle-advanced Solutrean and Middle and Upper Magdalenian. Most of the ornamental elements correspond to a collection of malacofauna. However, there are also pigments, other exotic rocks and some fossil.

**Keywords:** El Pirulejo, malacofauna, ornaments, taphonomy, archaeometry

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\*Corresponding author: mcortes@us.es

†Speaker

# Reindeer teeth pendants: investigating red ochre residues on personal ornaments from Magdalenian and Gravettian contexts at Hohle Fels using SEM-EDS

Elizabeth Velliky \*<sup>1,2</sup>, Susanne Münzel<sup>3</sup>, Brandi Macdonald<sup>4</sup>, Martin Porr<sup>2,5</sup>, David Stalla<sup>6</sup>, Nicholas Conard<sup>7</sup>

<sup>1</sup> Institute for Archaeological Sciences, University of Tübingen (INA) – Rümelinstr. 23, 72070 Tübingen, Germany, Germany

<sup>2</sup> Archaeology/Centre for Rock-Art Research and Management, The University of Western Australia (UWA) – 35 Stirling Highway, Perth, WA, 6009 Australia, Australia

<sup>3</sup> Institute for Archaeological Sciences, Archaeozoology, University of Tübingen (INA) – Rümelinstr. 23, 72070 Tübingen, Germany, Germany

<sup>4</sup> Archaeometry Laboratory, University of Missouri Research Reactor (MURR) – 1513 Research Park Drive Columbia, MO, USA 65211, United States

<sup>5</sup> Institut für Ur- und Frühgeschichte und Archäologie des Mittelalters, ROCEEH - The Role of Culture in Early Expansions of Humans (ROCEEH) – Rümelinstr. 23, 72070 Tübingen, Germany, Germany

<sup>6</sup> Electron Microscopy Core, University of Missouri (EMC) – Columbia, MO 65211, United States

<sup>7</sup> Department of Early Prehistory and Quaternary Ecology and Senckenberg Center for Human Evolution and Quaternary Ecology, University of Tübingen – Schloss Hohentübingen, 72070 Tübingen, Germany, Germany

The Hohle Fels (HF) cave site in southwestern Germany has yielded exquisite examples of personal ornaments from the Upper Palaeolithic, such as beads made from mammoth ivory, teeth, and other faunal elements. Included in this assemblage are pendants made from permanent reindeer teeth, specifically the incisors and incisorform canines. Similar pendants are found throughout Europe during the Magdalenian, and at HF, 66 cut reindeer incisors were recovered from Gravettian (27-32ka BP) and Magdalenian (12.5-13.5ka BP) contexts, with the most coming from the Gravettian (33). The HF-pendants were created by sawing off the alveolar edge of the teeth still in the jaw, and then broken off. This resulted in a strip of the gum containing up to eight incisors, which could be worn like a necklace with ‘pearls’. Additionally, 15 of the reindeer teeth contain visible traces of red residues, which may indicate the application of red ochre mixtures to the pendants or the leathery gum flesh. The goal of this study is to establish whether the red residues are composed of iron oxides or organic residues, and, to consider the possibility of an anthropogenic vs. a post-depositional origin. For this purpose, five reindeer teeth from HF were analysed using non-destructive SEM-EDS. Results show that the residues on all five teeth contain varying amounts of iron (Fe), aluminum (Al), titanium (Ti), and silicon (Si), which are typical components of red ochre mineral phases. Some of the teeth also contain traces of sediment which showed a more variable mixture of Si, Fe, and Ti, as well as potassium (K), magnesium (Mg), manganese (Mn), and discrete traces of carbon (C). On one tooth, we were able to differentiate an overlying carbon build-up from the red residue, which

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\*Speaker

could correspond to a post-depositional event. We consequently suggest that most residues on the reindeer pendants have been purposefully added by humans, either for aesthetic purposes or more functional reasons, such as to slow putrefaction. In any case, our preliminary results show promising potential for further exploration of Palaeolithic behaviours related to the use of ochre and personal ornaments.

**Keywords:** Personal ornamentation, symbolic behaviour, Upper Palaeolithic, Red ochre, SEM

# Personal ornaments from osseous raw materials in the Late Neolithic Vinča culture

Selena Vitezović \* <sup>1</sup>

<sup>1</sup> Institute of Archaeology, Belgrade – Kneza Mihaila 35/IV, 11 000 Beograd, Serbia

The Vinča culture phenomenon was widespread in the South-Eastern Europe in the Late Neolithic and Early Chalcolithic period, roughly 5400-4500 calBC. It is characterised by long-lasting, large settlements and rich and diverse material culture, including vessels, figurines, ground and chipped stone industries, etc. Osseous industries were also well developed, and included mainly daily tools, as well as personal ornaments. In this paper, an overview will be given of the personal ornaments from several sites situated in Serbia (the eponymous site of Vinča-Belo Brdo, Gomolava, Botoš – Živanića Dolja, Vitkovo, Stragari, Drenovac, Selevac, Belovode, Pločnik, etc.). Their quantity varied, and the site of Vinča-Belo Brdo provided the richest assemblage. Raw materials encompassed mollusc shells (mainly *Spondylus*, *Glycymeris*, *Dentalium*), bones, antler and teeth from various species, mainly wild. Typologically, they included pendants, beads, bracelets, but also some more elaborated shapes, such as decorative needles or applications. Manufacturing techniques and usewear traces will be discussed as well. Technology of manufacture showed high level of technological know-how, while use wear traces enabled reconstruction of the mode of use and also showed long use and repetitive repairs, suggesting these were valued objects. It is difficult to reconstruct their symbolic role, however, some hypotheses can be made on the importance of selected raw materials, time and labour input, etc. Aside from settlement finds, it is important to note that the only two cemeteries of Vinča culture discovered so far also contained numerous personal ornaments made from osseous raw materials, in particular beads and bracelets from *Spondylus* and *Glycymeris* shells.

**Keywords:** osseous industry, bone, antler, mollusc shell, Neolithic, personal adornment

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\*Speaker



# La parure en coquillage et sa signification dans le Paléolithique supérieur méditerranéen. Les gisements valenciens comme exemple.

Begonya Soler-Mayor \* <sup>1</sup>

<sup>1</sup> Museu de Prehistòria de València – Spain

Les gisements qu'on présente dans cette étude, contiennent l'ensemble d'objets de parure plus importante appartenant au paléolithique supérieur méditerranéen. Plus de 1000 restes modifiés pour être utilisés comme ornements personnels, lesquels ont donné une information unique et globale sur la matière première utilisée –os, dents, pierres, coquillages, fossiles-, les techniques de perforation anthropique –grattage, percussion, pression-, ou le possible usage –pendu, cousu, adhérent-.

Gisements avec séquences chronologiques du paléolithique supérieur, entre l'aurignacien et le magdalénien, desquels on a travaillé directement sur les restes de sept situés géographiquement entre les provinces de Valencia et Alicante: Cova del Parpalló (Gandia, Valencia), Cova del Volcán del Faro (Cullera, Valencia), Cova de Randero (Pedreguer, Alicante), Cova Beneito (Muro, Alicante), Cova el Compte (Pedreguer, Alicante), Coves de Santa Maira (Vastell de Castells, Alicante) et Cova de les Cendres (Teulada, Alicante).

L'étude technologique et fonctionnelle des coquillages a été faite à partir de l'analyse à la loupe binoculaire et le Microscope électronique à balayage des restes archéologiques et expérimentaux pour mieux comprendre la fabrication et l'usage à travers l'étude des stigmates.

Les objets de parure de ces importants gisements, bien connus dans la recherche du paléolithique, vont nous permettre d'obtenir résultats globaux d'une façon diachronique et aussi aideront à l'étude de sa signification. La normalisation des pièces utilisées, les espèces, sa provenance, sa répartition, etc. vont nous permettre une réflexion au tour des données et avancer dans son interprétation.

**Keywords:** Ornement, Coquillage, Symbolisme, Paléolithique supérieur, Méditerranée

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\*Speaker

# Adornment for the dead? Social and funerary roles of ivory and bone adornment in funerary context of late Prehistoric Egypt

Taichi Kuronuma \* <sup>1</sup>

<sup>1</sup> Archaeology Laboratory, Tokyo Metropolitan University (TMUAL) – 1-1 Minami-Osawa, Hachioji-City, Tokyo, Japan

Late Prehistoric Period or Predynastic Period in the 4th millennium B.C. is a crucial time towards the emergence of Egyptian Early State. Although previous researches have traced the complexation of social structure through quantitative analysis of funerary goods, the meaning of goods par type in funerary context and its ideological development in the line of social complexation are still inadequate. This is due to the separation of objects and archaeological context, since most of the cemeteries were excavated until early 20th century. This paper tries to discuss the social and funerary roles of the personal adornment of the buried person through typological analysis. The object to be focused is ivory and bone material artefacts which include amulets, pendants, armlets, hairpins, combs or other objects. Since several social different roles or functions are expected in this broader category of objects, the typology by previous researchers will be reviewed in light of the way of use in funerary context, and similarity and dissimilarity of way of use among various ivory and bone artefacts will be observed. The analysis will be presented in diachronic order for tracing the development of funerary ideology. Among the various cemeteries in the relevant periods, three Predynastic cemeteries at Naqada in Upper Egypt are subject of discussion. The source of analysis is both publication and unpublished archival material which is characteristic for these cemeteries. Objects will be contextualised through these documental sources, and the evaluation for the roles of ivory and bone objects will be expected by this process.

**Keywords:** Late Prehistoric Egypt, Cemeteries at Naqada, Ivory and Bone Objects, Funerary Ideology

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\*Speaker

# Real or fake? Red deer canine beads and their imitations from the 5th millennium BC at Polgár-Cs'oszhalom (NE Hungary)

Alexandra Anders \* <sup>1</sup>, Zsuzsanna Tóth <sup>1</sup>

<sup>1</sup> Eötvös Loránd University (ELTE), Institute of Archaeological Sciences – Múzeum krt. 4/B (B épület), H-1088 Budapest, Hungary

Polgár-Cs'oszhalom is one of the most significant Late Neolithic sites in Northeastern Hungary. The settlement complex is made up of a tell, a multiple enclosure system ringing the mound, a single-layer settlement and another double enclosure system. During the almost 100 years of archaeological investigations among the settlement features a total of 145 burials could be verified. Different artefacts, grave goods and personal ornaments were found in large number in these features. The necklaces, representing high prestige value raw materials, were strung out of Spondylus, limestone and red deer canine beads belongs to this latter category, found in the graves both of women, men and children.

In our presentation we focus on the manufacturing techniques, use and role of the red deer canine beads and their imitations in the mortuary practices. Our study covered the raw materials (animal species and skeletal elements) used for the production of the beads and the reconstruction of the exact manufacturing chain. The archaeological finds were studied with optical microscopy to observe and identify the taphonomic defects, manufacturing marks and use-wear traces found on the artefacts. Our aim was the full reconstruction of the life history of the beads, from their birth until to their burying and the understanding of their role in the mortuary practices of the Late Neolithic period. Who could have wear them? Was it regularized based on biological and/or social gender? Who had the 'right' to wear real or imitated canine beads regarding sex and age? Was there a deeper meaning in the composition of the necklaces (mixing Spondylus, limestone, real canine and imitated bone beads) beneath personalizing different high prestige materials? How was personhood constructed with the help of these beads in the Late Neolithic community of Polgár Cs'oszhalom?

The project is financed from the NRDIFund (K124326).

**Keywords:** neolithic, body adornment, red deer canine beads, constructing personhood

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\*Speaker

# Animal hard tissues artefacts from the grave goods of the necropolises of Narde (Rovigo, northern Italy).

Marco Bertolini \* <sup>1</sup>, Ursula Thun Hohenstein \* † <sup>2</sup>

<sup>1</sup> University of Ferrara, Department of Humanities (UNIFE) – Corso Ercole I d’Este 32, Italy

<sup>2</sup> University of Ferrara, Department of Humanities (UNIFE) – Corso Ercole I d’Este 32 44121 Ferrara, Italy

The two necropolises of Narde were discovered during the excavation of a new channel for methane pipeline in the countryside south of Fratta Polesine (Rovigo, Italy). In the same area during the 60s of the last century the Bronze Age settlement of Frattesina and another necropolis (Fondo Zanotto) both located in the vicinity of the site, were discovered. 240 tombs mostly in incineration have been recovered. All the burials have been dated on the basis of the grave goods from one ancient phase of the Late Bronze Age to the Early Iron Age. Animal hard materials adornment are very frequent in these burial contexts for their variety and uniqueness. This study aims at analysing the artefacts in animal hard materials which were found inside the urns. The sample consists of 160 objects made of deer antler and ivory belonging to different morpho-typological categories and strongly modified by fire. Analysis was developed according to different stages, starting from the examination of artefacts in order to describe their morphometric characteristics, to their analysis with an optical stereomicroscope aimed at recognizing production and use marks. The study of the surfaces has thus allowed to analyse the main steps of the reduction sequence. Finally, the presence of use-wear traces was difficult to ascertain because of a deep damage of the surfaces linked to the exposure to fire.

**Keywords:** Animal hard material, grave goods, incineration, Frattesina, Bronze Age, northern Italy

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\*Speaker

†Corresponding author: [ursula.thun@unife.it](mailto:ursula.thun@unife.it)

# Understanding Palaeolithic social identity in the Eastern Adriatic through the lens of technological, use-wear and residue analyses. The case of Vlakno cave (Dugi otok, Croatia)

Barbara Cvitkusic \* <sup>1</sup>, Emanuela Cristiani <sup>2</sup>, Dario Vujevic <sup>3</sup>

<sup>1</sup> Institute for Anthropological Research (INANTRO) – Gajeva 32, Zagreb, Croatia

<sup>2</sup> Università degli Studi di Roma "La Sapienza" [Rome] – Piazzale Aldo Moro 5, 00185 Roma, Italy

<sup>3</sup> University of Zadar – Ul. Mihovila Pavlinovića, Zadar, Croatia

Over the last four decades, archaeologists have widely explored different aspects of prehistoric symbolic technology and, particularly, the evolutionary implications of the use of bodily ornamentation (e.g. beads, pendants, appliqués and pigments) in ancient forager societies. In the Eastern Adriatic region different types of ornaments were recovered at Palaeolithic and/or Mesolithic sites, most of which are located in Croatia. Out of these sites, Vlakno cave on the island of Dugi otok yielded the richest collection of portable art in the whole Eastern Adriatic region. The rich and unique repertoire of symbolic technology from Vlakno cave is composed of decorated tools, ornaments and small carved anthropomorphic figurine. Beads and pendants made out of animal teeth, marine and freshwater gastropods shells are the most abundant findings. Yet forager symbolic behavior at Vlakno cave is also outlined by other types of findings such as two engraved fragments of chert nodules dated to ca.14 500 cal. BP. So far, these decorated stones are the first expressions of symbolic behavior in this part of Adriatic region. Furthermore, during the last field research anthropomorphic figurine carved with regular linear motifs was found at Vlakno. Vlakno figurine has a perforation on the top upper part, suggesting its possible use as pendant. This kind of pendants are already known from the Gravettian sites like Dolni Vestonice (Czech Republic), or Mal'ta (Russia), and linear engravings resembles ones on Predmosti (Czech Republic) Venus. So far this is the only Palaeolithic figurine of this type in the Adriatic region. The authors would like to present the results of a techno-functional analysis carried out on the repertoire of symbolic technology from Vlakno, including this interesting figurine described above, and discuss their implications for understanding modalities of production and transmission of forager social identity in the region.

**Keywords:** ornamental assemblage, Eastern Adriatic, Pleistocene, Holocene, technological, use, wear and residue analyses

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\*Speaker

# First approximation to the Gravettian shell bead assemblage from Cova Foradada

Gala García-Argudo \* <sup>1</sup>, Juan Ignacio Morales <sup>2</sup>, Artur Cebrià <sup>1</sup>, Josep Maria Fullola <sup>1</sup>

<sup>1</sup> Seminari d'Estudis i Recerques Prehistòriques, Secció Prehistòria i Arqueologia, Facultat de Geografia i Història, Universitat de Barcelona (SERP) – C/Montalegre 6-8, 08001 Barcelona, Spain

<sup>2</sup> Seminari d'Estudis i Recerques Prehistòriques, Secció Prehistòria i Arqueologia, Facultat de Geografia i Història, Universitat de Barcelona (SERP) – C/Montalegre 6-8. 08001, Spain

The main goal of this paper is to approach the techno-cultural behaviour of the Gravettian groups in NE Iberia through the study of the shell ornaments. Here we present the archaeo-malacological assemblage recovered at the Early Upper Palaeolithic sequence of Foradada Cave (Calafell, Tarragona). Recent excavations have uncovered a stratigraphic sequence formed by three main layers corresponding to the Late Pleistocene. The patterns of the archaeological record points to short and ephemeral human occupations, while most of the time the cave is occupied by medium and large size carnivores.

The techno-typology and the first chronological approaches place these occupations along the Middle-to-Upper Palaeolithic transition, from the Châtelperronian to the Gravettian. The uppermost of these layers has provided a malacological assemblage composed of more than 160 shell beads that were mostly recovered in less than 1m<sup>2</sup>. A first direct AMS C14 age on a single *Homalopoma sanguineum* specimen date this layer ca.31 kyr cal BP, consistent with an attribution to the Early Gravettian.

Traditionally the studies of perforation technology of shell beads have been based on subjective methods, like the typological characterization of their morphologies. Trying to overcome this, we have developed a 2D outline characterization of the perforations through an Elliptical Fourier Analysis. This test allows the preliminary evaluation of the shape differences between the species and their differential technological management. To semi-automatically process the large amount data generated, the software package SHAPE has been used.

The perforation techniques and suspension systems (as well as the use-wear traces) have been analysed first by digital microscopy equipment, allowing to create 3D models of the perforations. Later Environmental Scanning Electron Microscope (ESEM) was used to identify polished areas and wear features. Most of the ornaments are smeared in red ochre. The residue analysis was performed first visually with the digital microscope, and then complemented with the ESEM Energy-dispersive X-ray spectroscopy.

The further development of this work will allow to understand the role of shell beads as a group identity marker in the NE Iberia coastline during the Early Upper Palaeolithic.

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\*Speaker

**Keywords:** Gravettian, shell beads, ornaments, geometric morphometric, Iberia

# Dépôt d'un ensemble d'éléments ornementaux dans le Paléolithique supérieur du Cau del Roure (Serinyà, nord-est de la Péninsule Ibérique)

Julià Maroto \*<sup>1</sup>, Ferran Millan<sup>1</sup>, Meritxell Álvarez<sup>1</sup>, Silvia Albizuri<sup>1,2</sup>,  
Carles Roqué<sup>3</sup>, Florent Rivals<sup>4,5</sup>, Ethel Allué<sup>4,6</sup>, Manuel Vaquero<sup>4,6</sup>

<sup>1</sup> Àrea de Prehistòria, Universitat de Girona – pl. Ferrater Mora 1, 17004 Girona., Spain

<sup>2</sup> SERP, Universitat de Barcelona – c/ Montalegre, 6, 08001 Barcelona, Spain

<sup>3</sup> Àrea de Geodinàmica Externa, Universitat de Girona – campus de Montilivi, 17003 Girona, Spain

<sup>4</sup> IPHES - Institut Català de Paleoecologia Humana i Evolució Social – c/ Marcel·lí Domingo s/n,  
Campus Sescelades URV (Edifici W3), 43007 Tarragona., Spain

<sup>5</sup> Institutio Catalana de Recerca i Estudis Avancats (ICREA) – Barcelona, Spain

<sup>6</sup> Àrea de Prehistòria, Universitat Rovira i Virgili – avinguda Catalunya 35, 43002 Tarragona., Spain

Le Cau del Roure est une petite cavité à accès vertical située dans les grottes du Reclau (Serinyà, Catalogne). Les fouilles anciennes, effectuées par J.M. Corominas en 1973, ont préservé la moitié de la surface du site : un témoin de 3m<sup>2</sup> et de 1.40m de puissance. Ce témoin est en cours d'étude et fouille depuis 2012.

Les 1,40 m de sédiment correspondent apparemment à une seule unité stratigraphique, qui serait située au début du Paléolithique supérieur, avec un âge compris entre 30 000 et 39 000 ans calibrés BP.

Les restes archéologiques sont très rares. L'industrie lithique est quasi inexistante, en particulier il y a un percuteur coloré avec de l'ocre. Par contre, il y a un ensemble surprenant d'éléments ornementaux, dont 7 (au moins) coquilles marines perforées du taxon *Nucella lapillus* sont les principaux. D'après les données actuelles, cette coquille provient de l'Atlantique, ce qui augmente son intérêt scientifique. Ceci n'est pas un fait isolé, car il y a aussi des perles de la coquille de cet escargot dans d'autres gisements du Paléolithique supérieur des grottes voisines de Serinyà et de la Méditerranée ibérique.

Les restes de grands mammifères sont présents mais ne sont pas très abondants. Toutefois, ils sont suffisamment significatifs. Il y a la présence, par ordre approximatif de fréquence, de : *Equus ferus*, *Cervus elaphus*, *Lynx pardinus*, *Vulpes vulpes*, *Bos primigenius*, *Capreolus capreolus*, *Canis lupus*, *Felis silvestris* et *Ursus* sp. Les marques de carnivores sont relativement abondantes, bien que la présence de nombreux os et dents complets mérite d'être mentionnée. La représentation squelettique, taxonomique et des marques taphonomiques fait penser à un apport majoritaire des carnivores. Parmi eux, il dominerait, sans être le seul, un carnivore tel que le loup. Il n'y aurait aucune relation directe entre ces restes et les éléments d'ornementation.

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\*Speaker



Les restes de lapin et d'autres méso-mammifères, oiseaux, micro-vertébrés et coquilles continentales sont très abondants, mais ils n'ont pas non plus de relation directe avec les vestiges archéologiques.

Étant donné que les indicateurs d'occupation humaine dans le site sont très limités, il est difficile d'interpréter l'accumulation des éléments d'ornementation si on ne considère pas qu'ils forment partie du même objet.

Mais en raison de son contexte - la présence ponctuelle de cet objet précieux dans un repaire de carnivores sans activité humaine - la possibilité d'une interprétation symbolique peut être considérée. En effet, le registre archéologique de ces dernières années dans la Péninsule Ibérique montre quelques exemples d'objets ornementaux du Paléolithique supérieur qui peuvent être interprétés comme des offrandes symboliques isolées.

**Keywords:** Ornementation, Paléolithique supérieur, *Nucella lapillus*, Méditerranée ibérique

## **XIII-3. Integrating Ballistics into Archaeology**

# Ballistic Archaeology: a new agenda for contextualizing the origin and evolution of prehistoric weaponry

Sabine Gaudzinski Windheuser \* <sup>1,2</sup>, Elisabeth Noack <sup>1,2</sup>

<sup>1</sup> Johannes Gutenberg - University of Mainz (JGU) – 55099 Mainz, Germany

<sup>2</sup> MONREPOS Archaeological Research Center and Museum for Human Behavioural Evolution (MONREPOS) – Schloss Monrepos 56567 Neuwied, Germany

The question "what made us human?" in our deep history is often answered by putting forward the hunting way of life, inextricably intertwined with the formation of weaponry. Whereas we must assume that weapons initially served subsistence means only, during the post-Palaeolithic age we witness a continuous adaptation of weapon systems that occurred parallel to warfare. In stark contrast to the omnipresent importance of weapon technology and its evolution for our understanding of the humans we are today is the limited conceptual foundation on which our current analyses on the topic is based. Thus, we currently lack a comprehensive methodological agenda, especially for the systematic identification of hunting lesions on target and prey. Properties of potential targets are only insufficiently understood which leaves us mostly ignorant if we want to evaluate the effectivity of a weapon under varying conditions. We outline here that it is the systematic integration of the scientific framework and methodological apparatus of ballistic science and controlled experimental studies that can help us to overcome these desiderata in archaeological research. The development of a "Ballistic Archaeology" represents a crucial step towards a novel and holistic perspective on past hominin behaviour.

**Keywords:** Ballistic science, prehistoric weaponry, hominin behaviour, methodology, projectile impact lesions

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\*Speaker

# Ballistic properties of lithic arrowheads of the GS-1 / Preboreal transition. Comparative approach of terminal ballistics of the trapezoidal bitroncatures and straight back (Blanchères) points.

Eugène Antolinos-Basso \* <sup>1</sup>, Nicolas Naudinot \* † <sup>2</sup>

<sup>1</sup> Cultures et Environnement, Préhistoire, Antiquité, Moyen Âge (CEPAM) – Université de Nice  
Sophia-Antipolis – 24, avenue des Diables Bleus F - 06357 Nice Cedex 4, France

<sup>2</sup> Cultures et Environnements, Préhistoire, Antiquité, Moyen Âge (CEPAM) – Université de Nice  
Sophia-Antipolis – 24, avenue des Diables Bleus F - 06357 Nice Cedex 4, France

Recent studies initiated in Western France and Northern Italy suggest that cutting edge arrowheads are not an innovation of the last Mesolithic communities but were already developed at the end of the Lateglacial in Western Europe both in the Late Epigravettian and Post-Azilian assemblages. This result is particularly interesting since it raises the question of the significance of the development of this new type of weapon. It also raises the question of the reason of the abandonment of this solution during the first Mesolithic and redevelopment during the second Mesolithic. Is the development of this type of weapon the result of the development of new hunting strategies targeting particular resources? How to interpret the appearance of this new type of arrowhead in different environmental and socio-economic contexts? To answer this question it is essential to develop use wears analysis but also, preliminary, to seek for the wound properties of these weapons comparing to classical piercing points of this period (straight back points called Blanchères points). For more than half a century experiments in natural or controlled environments, have studied cutting edge arrowheads. Nevertheless, the majority of the studies have focused on the use wear potential of experimental archaeology. Ballistic studies offers a new functional approach allowing a better understanding of techno-economical aspects of prehistoric projectiles. Through a comparative study of terminal ballistic carried out in a controlled environment conducted in collaboration with the CEPAM and the CEMEF, it was possible to start to evaluate the wound capacities of the trapezoidal bitroncated arrowheads and Blanchères points known in the same lithic assemblages attributed to the last stages of the GS1 and first half of the Preboreal. While ballistic gelatin at 10% demonstrated the lethal potential through the dynamic observation of lesions during the penetration, the addition of skin and bones in front and into the gelatin suggests differences in their penetration ability. We think that wound ballistics approach constitutes a interesting way in complement of use wear study to evaluate properties of weapons and seek for their function. The study of prehistoric projectiles in a controlled environment and on simulated organic matter now allows us to evaluate

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\*Speaker

†Corresponding author: nicolas.naudinot@cepam.cnrs.fr

quantitatively the wounding mechanisms of projectiles in order to develop a research about function diversity of prehistoric weaponry.

**Keywords:** Early Dryas / Preboreal, Transition, Arrowhead, Terminal ballistic

# Ballistics supporting the reconstitution of the functioning of microliths as projectile armatures. Methodology and archaeological results.

Lorène Chesnaux \* <sup>1</sup>

<sup>1</sup> Travaux et Recherches Archéologiques sur les Cultures, les Espaces et les Sociétés (TRACES) – CNRS : UMR5608, Université Toulouse Jean Jaurès – UMR 5608, TRACES, Université Toulouse Jean Jaurès, Maison de la Recherche, 5 allée Antonio Machado, 31058 Toulouse cedex 9., France

Within the framework of a doctoral (Chesnaux 2013, 2014) then a post-doctoral research, we developed a new experimental approach implementing shootings on animal carcasses and parametrized shootings on ballistic gelatin (Gaillard *et al.* 2016). The references we obtained allowed us to highlight a experimental model of the functioning of the projectile armatures according to their hafting modes (axial or lateral modalities).

The communication shall present this methodological strength and the archaeological findings about the reconstitution of the hunting *chaîne opératoire* and prehistoric mobility.

CHESNAUX L., 2013 - Microliths from 62 rue Henry-Farman, Paris (15th arrondissement) : specific arrows for different types of game hunted in particular places ? *In* B. VALENTIN, B. SOUFFI, T. DUCROCQ, J.-P. FAGNART, F. SÉARA, C. VERJUX (eds.), Mesolithic Pale ethnography Research on open-air sites between Loire and Neckar, Proceedings from the international round-table meeting, Paris, November 26 – 27, 2010, Paris, *Séances de la Société préhistorique française*, 2-2, p. 119 –132.

CHESNAUX L., 2014 - *Réflexion sur le microlithisme en France au cours du Premier Mésolithique (Xe- VIIIe millénaires av. J.-C.). Approches technologique, expérimentale et fonctionnelle*, Thèse de doctorat, Université Paris 1, 2014 : 197 p.

GAILLARD Y., CHESNAUX L., GIRARD M., DARQUE-CERETTI E., BURR A., REGERT M., FELDER E., MAZUY A. (2016) – Assessing hafting adhesive efficiency in experimental shoots of projectile points: a new device for instrumented and ballistic experiments, *Archaeometry*, vol. 58, Issue 3, p. 465-483.

**Keywords:** use, wear analysis, microlithism, mesolithic, hunting, ballistic.

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\*Speaker

# Does size matter? Dimensions of Magdalenian osseous projectile points and their adaptation to prey species

Sebastian Pfeifer \*† <sup>1</sup>

<sup>1</sup> Friedrich Schiller University Jena, Department of Prehistory – Löbdergraben 24a, D-07745 Jena, Germany

In his comprehensive study on the atlatl from 1993, Ulrich Stodiek, referring to modern hunting ammunition, brought forward the hypothesis that size and weight of Upper Paleolithic osseous projectiles might have been to some degree adapted to different prey species.

The general methodological problem of projectiles from archaeological context is that typically we only have the very points. Fully preserved archaeological and ethnographic examples clearly show that depending on projectile type and design, the contribution of the actual point to its overall size and mass can feature extreme variation: In case of a short arrow it might be considerable whereas being almost negligible in a long and heavy spear.

This presentation evaluates the possibilities of decoding the interplay between projectile point size and prey species based on the archaeological record. To address this question, the Central European Magdalenian, a techno-complex characterized by a high number of osseous projectiles as well as by a rich and diverse faunal record, is used as an example. The metric data of over 1.600 simple points (*sagaies*) and half-round rods (*baguettes demi-rondes*) from 62 sites are compared and confronted with the associated faunal assemblages. Additionally, available experimental data concerning projectile point dimensions and effect on different targets are discussed as well as selected ethnographic examples whose function is well known.

**Keywords:** Magdalenian, osseous, projectile, technology, ballistics

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\*Speaker

†Corresponding author:

# Hunting marmots on the Alps during the Late Glacial: experimental data and 3D morphometric analysis of projectile impact marks on bone

Rossella Duches <sup>\*† 1</sup>, Nicola Nannini <sup>1,2</sup>, Alex Fontana <sup>1</sup>, Francesco Boschin <sup>3</sup>, Jacopo Crezzini <sup>3</sup>, Matteo Romandini <sup>2,4</sup>, Marco Peresani <sup>2</sup>

<sup>1</sup> MUSE - Museo delle Scienze (MUSE) – Corso del Lavoro e della Scienza 3, IT 38123, Trento, Italy

<sup>2</sup> Università degli Studi di Ferrara, Dipartimento di Studi Umanistici, Sezione di Scienze Preistoriche e Antropologiche – Corso Ercole I d' Este 32, IT 44121, Ferrara, Italy

<sup>3</sup> Università degli Studi di Siena, Dipartimento di Scienze Fisiche, della Terra e dell'Ambiente, UR Preistoria e Antropologia – Via Laterina 8, IT 53100, Siena, Italy

<sup>4</sup> University of Bologna, Department of Cultural Heritage – Via degli Ariani 1, 48121 Ravenna, Italy

Despite the widespread application of high-resolution quantitative methods in bone taphonomy, very few studies have focused on projectile impact marks (PIMs). Therefore, in a previous work, we explored the potential of 3D microscopy in distinguishing bone hunting injuries from other taphonomic marks, developing a widely-applicable diagnostic framework based on experimental data and focused on Late Epigravettian projectiles (Duches et al. 2016). Even though we confirmed the validity of the method on zooarchaeological remains of medium size mammals (Nannini et al. submitted), the reliability of the experimental record in relation to smaller animals needed more tests and verifications: bones dimension and thickness could indeed affect their resistance to projectile impacts, influencing the morphometry of hunting injuries and the representativeness of PIM classes. In this regard, Late Glacial sites of north-eastern Italy interpreted as specialized marmots hunting camps represent an optimal case-study. Thousands of marmot bones from Grotte Verdi di Pradis, for instance, testify the exploitation of a minimum of 571 individuals, representing the 98.8% of the whole faunistic assemblage. In order to be as coherent as possible to archaeological data, the ballistic experiment involved 8 fresh coypus (*Myocastor coypus*) carcasses, shot by 130 Late Epigravettian arrows equipped with backed points and bladelets. Since only one puncture mark has been produced in front of a very high number of impact fractures and drags, the results confirm the affection of PIM class representativeness by bones dimension and thickness. If the application of 3D microanalysis in examining different taphonomic marks have proved that only punctures and drags are diagnostic of impact (Duches et al. 2016), this new experimentation established that only drag marks are relevant for the identification of PIMs on small mammals zooarchaeological remains. On the contrary, the general consistency of the morphometric data of experimental drags obtained on medium size mammals and the ones on coypus, state that the features of this PIM are generally not influenced by bones size and thickness. 3D measurements, processed through statistic, state in fact that several drags morphometric parameters - such as depth of cut, breadth at the top

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\*Speaker

†Corresponding author: rossella.duches@muse.it



of the cut, breadth at the floor of the cut, opening angle and RTF index (ratio between the breadth at the top and the breadth at the floor) - are consistent in both the experimentations and significantly different from that of cut-marks. Using the experimental results for the interpretation of archaeological marks found on Pradis remains, we could identify with certainty 9 drags on marmot bones. This result confirms the Epigravettian predation of alpine marmots using bow and arrow and enriches the current debate on the hunting of small preys during the Late Glacial.

Duches, R., Nannini N., Romandini M., Boschini F., Crezzini J., Peresani M., 2016. Identification of Late Epigravettian hunting injuries: Descriptive and 3D analysis of experimental projectile impact marks on bone. *Journal of Archaeological Science* 66: 88-102.

Nannini N., Duches, R., Fontana A., Boschini F., Crezzini J., Bernardini F., Tuniz C., Dalmeri G., submitted. Archaeological bone injuries by lithic backed projectiles: new evidence from the Late Epigravettian site of Cornafessa rock shelter (Italy).

**Keywords:** Bone Taphonomy, Projectile impact marks, Hunting, Ballistics, Late Epigravettian, Late Glacial, Italy

# Measurement set-up design for archaeological experiments

Johannes Pfleging \* <sup>1</sup>, Constantin Herbst <sup>1</sup>, Elisabeth Noack <sup>2</sup>, Eduard Pop <sup>2</sup>, Nina Behrens , Geoff Smith <sup>2</sup>, Radu Iovita <sup>3</sup>, Sabine Gaudzinski-Windheuser <sup>2</sup>, Jonas Buchli <sup>1</sup>

<sup>1</sup> ETH Zürich – Switzerland

<sup>2</sup> RGZM – Germany

<sup>3</sup> NYU – United States

The measurement of physical quantities in science is an important tool to gain insight into the system of interest. The quantification of physical variables is free of subjective bias and therefore allows understanding and validation of the relationship between those variables and the underlying processes. In archaeology we are interested in the relationship between object modifications or traces and the task that leads to such modifications. Experimental studies, which use sensors to monitor the task execution show that it is helpful to isolate the relevant quantities from the complex process of human manipulation. The relevant quantities often comprise kinetic trajectories of the experimental tool used including position, velocity, force, and the musculoskeletal variables of the subject, e.g. body kinematics, and muscle activity. Traditionally, the focus is on tasks like stone knapping, scraping, or spear handling. In this contribution we want to give a short overview of how such a set-up should be designed in order to obtain the measurements desired to answer the scientific questioning. Important considerations are based on the characteristics of the task studied, like the speed and range of the motion, and expected peak values. Related questions are: Which sensor type can be used for a certain physical quantity. What specification should the sensor meet. What are the requirements for the measurement chain connected to it. How should the sensor be integrated in the tool? What is the expected cost of a good set up? What are suitable tools for data processing? We will present three examples of measurement set-ups, which we were using recently for the study of scraping, spear thrusting and spear throwing. On the basis of these examples we evaluate different solutions, and point out pitfalls that should be avoided. Special emphasis is set on a robotic position measurement system based on camera and accelerometer measurements together with state

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\*Speaker

estimation. This solution is rather cheap compared to commercial motion tracking systems, but requires more effort in installation and coordination of the sensors as well as appropriate processing software.

The results of our measurement-based studies on tool-use show that precise measuring and monitoring of physical variables provide valuable insights to the principle processes of trace development.

**Keywords:** measurements, setup, sensor, experiments, archaeology, tool, usewear

# Origin and evolution of projectile technology – Integrating ballistics into controlled experimental design and use wear analysis

Joao Marreiros \* <sup>1</sup>

<sup>1</sup> TraCEr, laboratory for Traceology and Controlled Experiments (TraCEr) – Schloss Monrepos 56567  
Neuwied, German, Germany

In pleistocene archaeology today, the innovation of projectile technology and distance weapons is considered as one of the main thresholds in the process of becoming human. To establish timing and context of the evolution of projectile weaponry, archaeological studies attempt to combine different lines of evidence, such as techno-typology, morphometric and functional analysis. While there is general consensus on the importance of the projectile technology in human evolution, time and place of their origin are still discussed. The main reason for the ongoing debate is the absence of methodological standards in experiments that determines the basic data on which past tool use is inferred by exploring different types of use-wear traces, such as microwear (i.e. polish and striation), edge damage, diagnostic breakage patterns and residue analysis. For the description of the latter, standards have been established, but the causality behind the appearance of these diagnostic traits remains unclear. Thus, our current methodological setup to interpret the evolution of human weapon technology is based on correlation alone between a specific experimental context and its outcome.

To overcome the mere description of diagnostic traits an experimental protocol needs to be established that systematically investigates the relevant variables that determine their appearance. In this contribution, such a standard experimental protocol for prehistoric weaponry studies will be developed with the help of ballistic science. In ballistic studies the final effect of a projectile is known to vary according to the amount of energy released into the target, which includes different variables, related to the use of different projectile systems (kinetic energy), material properties of the projectile tip and target material (e.g. raw material, surface, thickness, hardness, etc.), and impact conditions (e.g. impact angles and location). Due to the fact that all these variables have major influence on the formation of impact marks on both projectile tips and target material, it is fundamental to design experiments that allow us to monitor all aspects involved as detailed as possible. By doing so, we can not only being to understand the development of specific traces of use but furthermore we can ask questions why specific weapon solutions were developed to solve functional problems.

In this talk, actual state-of-the-art methods and techniques on projectile technology studies will be discussed, with emphasis on the contribution and integration of ballistic principles. Aiming to improve variable control, experimental design and experimental validation, other lines of research on use-wear studies, such as raw material properties and 3D data quantification, will also be discussed. Against this background, a standard experimental protocol will be developed and its potential to illuminate the evolution of human projectile technology demonstrated.

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\*Speaker

**Keywords:** Projectile technology, human behavior, functional analysis, ballistics, experimental design.

# Palaeomechanical investigations of ballistic injury patterns and weapon efficiency on the basis of Bronze Age finds.

Melanie Schwinning <sup>\*†</sup> <sup>1</sup>, Hella Harten-Buga <sup>\*</sup>

<sup>2</sup>, Ute Brinker <sup>3</sup>, Jörg Orschiedt <sup>2</sup>, Frank Nikulka <sup>1</sup>, Detlef Jantzen <sup>3</sup>,  
Annemarie Schramm <sup>3</sup>

<sup>1</sup> University of Hamburg – Mittelweg 177, 20148 Hamburg, Germany

<sup>2</sup> Free University of Berlin (FU) – Kaiserswerther Str. 16-18, 14195 Berlin, Germany

<sup>3</sup> Landesamt für Kultur und Denkmalpflege Mecklenburg-Vorpommern – Landesarchäologie Domhof  
4/5 19055 Schwerin, Germany

The complex and highly dynamic processes which led to traumata on prehistoric human bones are difficult to determine by employing merely conventional methods and classical experimental approaches. In order to resolve this issue, an innovative methodological process (Palaeomechanics) was developed, which investigates the relationship between the external mechanical forces affecting the bone vis-à-vis specific injury patterns as well as the effects on the causative weapon types.

Palaeomechanic is a transdisciplinary suite of non-invasive methods covering 3D-imaging and 3D-reconstructions combined with the Finite Element Method (FEM), originally used in engineering sciences. The FEM enables to numerically verify or falsify initial hypotheses concerning mechanisms of injuries based on material properties and loading conditions.

The discovery of around 12.000 bones with numerous injuries as well as various weapon finds in the Tollense Valley in Northeast Germany hint at an armed conflict of unusual scale dating to ca. 1300-1250 BC. Among the lesions, stabbing and projectile traumas dominate. Since 2010 the site is under interdisciplinary investigations, financially supported by the German Research Foundation (DFG). In addition, the research project "Palaeomechanical investigations concerning the coherence of injury patterns and weapon efficiency on the basis of Bronze Age human bones and weapons", (funded by the DFG since 2017), has engaged in the trauma analysis.

The injuries correspond to a range of late Bronze Age weapons found in the valley including numerous flint and bronze arrowheads. Case studies, focusing in particular on the characterization and differentiation of wounding characteristics caused by projectiles, demonstrate the benefits of high-resolution imaging and 3D-reconstruction combined with digital and numerical simulations of the mechanism of injury.

Digital microscopy, micro-CT imaging and digital weapon matching were carried out, to obtain

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\*Speaker

†Corresponding author: palaeomechanik@uni-hamburg.de

information about internal and external modifications of the bone structures cause by ballistic trauma as well as for the use-wear analysis of the arrowheads.

The FEM generated data concerning the influence of projectile and possible armour properties, velocities, impact-forces and the angle of the attack on a trauma. Non-linear parameters were applied to carry out real-time-deformation and collision-analysis to allow the simulation of likely attack scenarios. Results of these simulations are possible deformations and cracking characteristics of weapons as well as the characteristics and depth of the penetrating injury, the development of microfractures and the maximum shooting distance.

The results of the presented case studies will be integrated with ongoing palaeomechanical analyses.

**Keywords:** 3D, Ballistics, Bronze Age, Armour, Finite Element Method, Injury patterns, Micro, CT, Palaeomechanics, Tollensetal, Trauma, Weapon efficiency

# The contribution of experimental archaeology to understanding hunting activities: testing the effectiveness of Middle Palaeolithic stone-tipped spears.

Alice La Porta <sup>\*† 1,2</sup>, Rob Hosfield <sup>2</sup>, Linda Hurcombe <sup>1</sup>

<sup>1</sup> Department of Archaeology, University of Exeter, UK. – United Kingdom

<sup>2</sup> Department of Archaeology - School of Archaeology, Geography and Environmental Science (SAGES), University of Reading, UK. – United Kingdom

The number of scientific publications and research projects on Middle Palaeolithic spear technology and Neanderthal behaviour has exponentially increased in the last decade, making this research topic of considerable interest for understanding human behaviour and Neanderthal complexity.

A large number of these experiments have focused on the identification criteria of diagnostic projectile use-wear (DPUw). However, only recently has the focus shifted to further testing the influence that different variables (shaft length and weight, point morphology, tip cross-sectional area and perimeter values [TCSA and TCSP]) can play in the effectiveness of hand-delivered spear systems.

Here we present the results of controlled and replicative throwing and thrusting experiments with replicas of Middle Palaeolithic stone-tipped spears. For this purpose, flint Levallois points were used. Trained human participants threw and thrust the spear replicas into animal targets (carcasses). For each throw and thrust, high-speed videos recorded human movements while an accelerometer calculated the impact velocities. The influences that different variables can have on the effectiveness of the launch (penetration index) and the formation of DPUw were investigated.

Integrated results between high-speed videos, impact velocities, acceleration profiles and penetration index, show (i) that trained participants score an high "launch rate" and are very consistent, (ii) that previous throwing and thrusting experiments overestimated the impact velocities, (iii) that the use of ballistic gel does not mimic the exact momentum of the spear during the penetration of a real-world target. Although throwing and thrusting are complex processes, the acceleration profiles have enhanced our understanding of the different launch phases.

To better understand stone-tipped spear technology in the archaeological record, we propose experimental protocols that are more successful in replicating real-world processes.

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\*Speaker

†Corresponding author: al457@exeter.ac.uk



**Keywords:** stone tipped spears, weapon delivery systems, projectiles, experiment, Middle Palaeolithic

# The relevance of the properties of target material in experimental studies of prehistoric weapons

Elisabeth Noack <sup>\*</sup> <sup>1,2</sup>, Eduard Pop <sup>1,3</sup>, Johannes Pfleging <sup>4</sup>, Constantin Herbst <sup>4</sup>, Jonas Buchli <sup>4</sup>, Radu Iovita <sup>5</sup>, Martin Street <sup>1</sup>, Sabine Gaudzinski-Windheuser <sup>1,2</sup>

<sup>1</sup> MONREPOS Archaeological Research Center and Museum for Human Behavioural Evolution (RGZM) – Germany

<sup>2</sup> Johannes Gutenberg Universität Mainz – Germany

<sup>3</sup> Leiden University – Netherlands

<sup>4</sup> ETH Zürich – Switzerland

<sup>5</sup> New York University (NYU) – United States

In order to understand the rise and fall of different weapons technologies throughout human prehistory it is imperative to establish their functional properties from a ballistic perspective. According to Kneubuehl (2008, 171 f.), a weapon can be characterized by its efficacy and its effect. Efficacy in the ballistic sense describes the damage potential of a weapon, which is determined by its physical and constructional properties. However, the actual damage of a weapon cannot be estimated by efficacy alone, since the overall properties of the target are determining the actual extend to which the damage potential can be inflicted. For estimating full effectiveness of a weapon, its interplay with the target material needs to be studied empirically. But what kinds of target materials are most suitable when developing an experimental set-up that takes this weapon-target interrelation into account?

Gelatine and soap have become well-established as target materials in ballistic and forensic experiments for empirically testing the effect of a weapon. Recently, these target materials have also been occasionally used in experimental archaeology studies. However, these materials can only be used to study the effects of weapons on soft tissues and provide no information of the effects on resilient material such as bone. To produce archaeologically relevant results, the preferred target choice for experiments conducted by archaeologists is intact animal carcasses or carcass-parts. With such an experimental set-up essential research on the principal performance of prehistoric weapons was conducted in the past decades, resulting in a comprehensive catalogue of impact traces on projectiles and in particular on skeleton elements. With the help of this diagnostic framework Zooarchaeologists consistently identified potential projectile lesions in archaeological assemblages.

These findings give rise to a new set of questions, e.g. is it possible to differentiate between weapon types such as thrusting and throwing spear based on the specific characteristics of the lesion on a bone? To answer this question, the effect of a particular weapon type on a particular target material needs to be systematically investigated on a more fundamental level. For this, all

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\*Speaker

parameters relevant in projectile-target interaction need to be controlled and/or monitored within an experimental set-up. As shooting on intact carcasses or carcass-parts makes it very difficult to control and monitor what and how hard tissue will be hit, a new method for target preparation will be presented that ensures a sufficient amount of samples under controlled experimental conditions. This method of target preparation was tested during an experiment using wooden thrusting spears. The results obtained clearly illustrate the dynamic process of weapon-target interaction and the potential of this methodology for estimating the actual effect of a prehistoric weapon.

References:

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**Keywords:** Projectile impact lesions, fracture pattern, ballistic archaeology, experiments

# Transversal arrowheads of the Mesolithic in Brittany: functional approach through a ballistic experiment

Jorge Calvo Gómez <sup>\*</sup>, Grégor Marchand <sup>1</sup>, David Cuenca-Solana <sup>2</sup>

<sup>1</sup> UMR 6566 du CNRS – CREAAH - Laboratoire Archéosciences - Bâtiment 24-25 - Université de Rennes 1 – Researcher – France

<sup>2</sup> Instituto Internacional de Investigaciones Prehistóricas de Cantabria, Universidad de Cantabria, Gobierno de Cantabria, Santander (IIIPC) – Edificio Interfacultativo, Avda. de los Castros s/n, 39005 Santander, Cantabria, Spain

European Mesolithic has been traditionally defined through the arrowheads, very often geometrical microliths. Among other technical traditions, trapezoidal bi-truncations are known in different Mesolithic assemblages, such as the Téviecian (Brittany, France). While the use of the symmetrical trapezes as transversal arrowheads is nowadays largely accepted, these bi-truncations have also been subject of various functional debates and experimentations. The present study aims to a better understanding of the functioning of transversal arrowheads armed with trapezoidal bi-truncations documented in teviecian contexts through an experimental perspective. We wonder if the weight of the arrow it's a critical parameter in the fly and the penetration of these arrows. Moreover, we wonder if the impact wears of the trapezoidal bi-truncations of Beg-er-Vil (Quiberon, France) can allow us to asses more details of the function of these arrows during the Mesolithic.

An analytical experimentation was implemented to answer these questions. 50 trapezoidal bi-truncations were reproduced, armed as transversal arrow-heads in 2 types of wood shafts, and thrown into a *Sus scrofa* corpse, previously beaten, with a 52 lb. longbow. Lately, the impact wears of the experimental bi-truncations were analyzed and compared with those observed in the Beg-er-Vil corpus. In particular, the initiation of the fractures (bending or cone initiation) was considered as a proxy to evaluate the toughness of the impacted matter.

The results of these experimental work and the analysis of the archaeological material has allowed to increase the knowledge about the ecological and technical practices of the Holocene hunter-gatherers in the European Atlantic coastline, and to understand how these groups interact with their environment, both terrestrial and marine.

**Keywords:** Mesolithic, transversal arrowheads, ballistic experimentation, use, wear

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\*Speaker

# Understanding the ballistics of osseous projectiles in southern Vietnam without the aid of direct experimentation

false<sup>\*</sup>, Jennifer Hull<sup>\* † 1</sup>

<sup>1</sup> School of Archaeology and Anthropology, The Australian National University – Australia

Comprehensive analyses of osseous implements in later Holocene contexts of Southeast Asia is still developing, and there is great potential for the development of methodological frameworks in bone technologies that are particular to this geographic region. This is especially true of the Neolithic and Metal Age periods of the region where there has been almost no comprehensive research into the diverse range of bone implements that have been recovered. In this paper I discuss osseous technologies from three settlement sites excavated in southern Vietnam. The archaeology produced a range of osseous artefacts with clear manufacturing and hafting evidence. These implements would have required a high level of technological skill to produce, and some were quite elaborately designed. The use-wear analysis reveals impact damage suggesting use as projectile points, but they seem to have a variety of functions, which are difficult to determine with certainty. This raises some important questions: what reasoning was there to produce such a variety of projectile forms, was there selective function? How can ballistics analysis assist in better understanding this technological system, especially without the aid of experimental studies?

**Keywords:** Vietnam, Osseous Projectiles, Ballistics, Usewear, Neolithic, Metal Age, Functionality

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\*Speaker

†Corresponding author: Jennifer.Hull@anu.edu.au

# What makes a warriors success? Comparing ethnographic records with concepts on prehistoric warfare

Andy Reymann \* <sup>1</sup>

<sup>1</sup> Goethe-Universität Frankfurt, LOEWE-Project "Prehistorical Conflict Research" –  
Goethe-Universität Frankfurt Institut für Archäologische Wissenschaften, Abt. III: Vor- und  
Frühgeschichte Norbert-Wollheim-Platz 1 60629 Frankfurt, Germany

What makes a warriors success? Comparing ethnographic records with concepts on prehistoric warfare

In archaeology our view on the past is still determined by evolutionistic thinking, especially in the evolution of weaponry, which are described with the expectation to observe functional progress along the time line: each chronologically younger change is expected to have advantages over the older technological solutions. Therefore, the onset of metal weapons as swords found in Bronze Age burials of central and northern Europa are regarded as being functional superior to previous, stone based weapon systems. Here, the technology of armory is considered to have reached a point where the technological most advanced weapon, the sword, are linked with the most important people in society as the model of Kristiansens "warrior chiefs" suggests. However, on the Bronze Age battlefield from Tollense vally in north-eastern Germany, not only metal weapons but also an impressive amount of lithic arrow heads was found, indicating that actual Bronze Age warfare was conducted by a combination of "old" and "new" weapon technologies. The basic question that will be addressed in this paper is therefore what factors influence the weapon technology applied by a society. As factors, the effectiveness as well as the social value is often discussed. But what makes a weapon effective, in which situations and against whom? And can a seemingly setback in weapon technology be an increase in effectiveness on the same time?

Those questions will be addressed by exploring ethnographic and ethno-archaeological case studies, where the spectrum of weapons used in warfare can be contextualized with the requirements on their effectiveness. Geographically these case studies are located in North and South America and Africa and fall chronologically between the 12th and the 19th century AD, while the archaeological correlations are taken from findings of the later Stone and Metal ages. In addition, it will be demonstrated, that weapons can appear in different social contexts, not connected to the social status of their bearer or progressive status in the eye the archaeologists. In conclusion, the established picture of the highly honored sword bearer will be overpainted by a more "realistic" model of weapon use in prehistoric time by emphasizing the fact that weapons effectiveness cannot be estimated by the weapon itself but how reliable it serves it purpose, the disablement of the target.

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\*Speaker

**Keywords:** Ethnoarchaeology, Range Weapons, Interdisziplinäre Science, Devolution, New is always better?

# Why wasn't the ceramic arrowhead invented?

Michelle Bebber \* <sup>1</sup>, Metin Eren \* <sup>† 1</sup>

<sup>1</sup> Kent State University (KSU) – United States

In biology the concept of *theoretical morphology* has been used as a heuristic device for better understanding the evolutionary trajectories of organisms. Theoretical morphology proceeds by creating and examining hypothetical specimens not actually found in nature. So instead of asking "why *does* feature X exist", a theoretical morphological approach asks "why *doesn't* feature Y exist?" Here, we use this approach to address the question of why ceramic technology did not evolve to replace stone technology with respect to hunting weapon tips (spear points, atlatl dart tips, arrowheads). In other words: why didn't the ceramic projectile point emerge? Clay is a readily available, economically efficient, and easily workable raw material. Likewise, objects made out of fired clay are extremely hard, sharp, and generally durable. We hypothesized that there was perhaps a functional constraint such that ceramic hunting weapon tips cannot perform as effectively as stone ones.

In order to test this hypothesis, projectile point test specimens were made of both stone and two grades of clay. These two materials were experimentally compared to establish parameters of how each performs under a given task. Using ballistics technology, the replicated arrowheads were subjected to performance testing to comparatively evaluate and understand each type of arrowhead's ballistic characteristics. To test the performance attributes of each point type-i.e. stone versus high-fired commercial clay versus low-fired glacial clay-the hafted points were fired into a target using a compound bow. The stone and ceramic triangle points were compared in two ways: penetrability and durability. Penetrability refers to how deeply a point can pierce a material, while durability refers to how many times a point can be shot before it breaks.

The results of this study will provide insight into past human behavior and will help archaeologists better frame questions related to understanding broad evolutionary processes. By identifying artifact types that never existed via theoretical morphology, and then positing *why* those specimens did not emerge, we can generate novel explanations for the changes that are observed over time. Such an approach may provide valuable insight to the nature of cultural evolution while elucidating new avenues for research within ballistic focused experimental archaeology.

**Keywords:** theoretical morphology, experimental archaeology, ballistics, projectile points, ceramic, stone tools

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\*Speaker

<sup>†</sup>Corresponding author: meren@kent.edu



# ‘Sticks and Stones may break these bones’: Experimental approaches to identifying the use of wooden hunting spears during the Middle Pleistocene and beyond

Annemieke Milks <sup>\*†</sup> , Debra Carr<sup>‡</sup> , Matt Pope<sup>§</sup> <sup>1</sup>

<sup>1</sup> University College London, Institute of Archaeology (UCL) – Institute of Archaeology, University College London, 31-34 Gordon Square, London WC1H 0PY, United Kingdom

The use of wooden spears as hunting weapons from the second half of the European Middle Pleistocene onwards is now well-accepted. Archaeological and ethnographic evidence supports their continued use into the Late Pleistocene through to recent hunter-gatherer societies. Examples of wooden spears are however rare, and are most famously known from the Middle Pleistocene sites of Clacton-on-Sea (MIS 11) and Schöningen (MIS 9), as well as the early Late Pleistocene site of Lehringen (MIS 5e). Partly as a result of their scarcity, experimental replication of their use is in its infancy, and therefore wound and terminal ballistics of such weapons are poorly understood. Proposed examples of hunting lesions resulting from the use of wooden spears are limited to the British Middle Pleistocene sites of Boxgrove (MIS 13) and Swanscombe (MIS 11), and confidence in whether damage to scapulae from these sites represents hunting lesions or not is hampered by a poor understanding of additional potential modifying agents. This paper presents experiments conducted at Cranfield Defence and Security’s ballistics ranges replicating the use of untipped wooden spears as thrusting and hand-thrown weapons on adult horse carcasses. The resulting bone damage is compared with damage from an actualistic study of hammerstone use on adult horse scapulae for marrow and grease access. A descriptive and quantitative analytical approach to experimentally-produced damage is compared with the Pleistocene archaeological examples, which provides an empirical basis for evaluating the curvilinear fractures on the Boxgrove and Swanscombe scapulae. Overall the experimental results outlined help explain the rarity of hunting lesions from a weapon that looks likely to have had a long period of use, aids in comparing the weapon with subsequent innovations, and lays a framework for future experimental work replicating the use of wooden spears.

**Keywords:** Middle Pleistocene, ballistics, wooden spears, hunting, horses, hunting lesions

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\*Speaker

†Corresponding author: a.milks@ucl.ac.uk

‡Corresponding author: d.j.carr@cranfield.ac.uk

§Corresponding author: m.pope@ucl.ac.uk