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INTERDISCIPLINARITY IN ARCHAEOLOGY
UISPP2023 BOOK OF ABSTRACTS

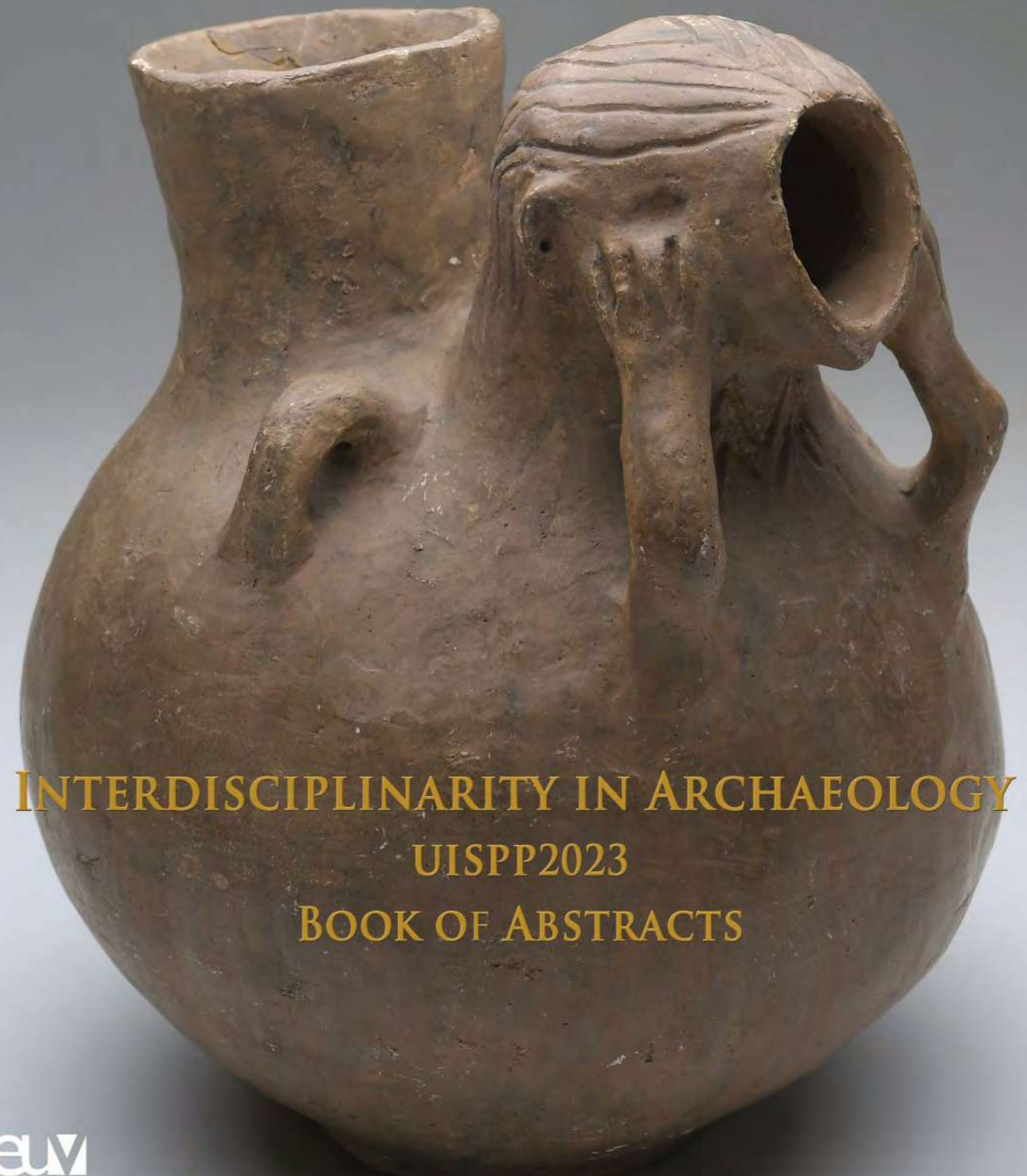
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Editura Universității de Vest din Timișoara

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Welcome to UISPP World Congress 2023

Timișoara, Romania

Marilen Gabriel PIRTEA

Rector of West University of Timișoara

It is a great honour for us, at the West University of Timișoara, to organize the anniversary XX UISPP World Congress in Timișoara. After a long period of time in which the state of the pandemic has affected all the major scientific events, we look with confidence to returning to live presentations and joyful debates on the hottest topics in Pre- and Proto-historical archaeology, and also on the cutting-edge approaches leading to the ever-new achievements in the science of archaeology.

West University of Timișoara (WUT) is the main higher education institution and research hub in Western Romania. Here, we encourage inspiring and competent research, education, and artistic creation with due regard to academic rigour as we scrutinize the future through how we bring together advanced knowledge from various disciplines taking a great focus on trans- and interdisciplinary research. This is why we fully resonate with the general theme of this edition of the UISPP congress which is **Interdisciplinarity in Archaeology**. Beyond the prospect of a permanent renewal and necessary synchronization with the global scientific landscape, the interdisciplinary vision in archaeology brings new hopes for the conservation of **endangered archaeological heritage** through the latest technologies in the field of digitization.

Once again, the great disasters that are destroying communities and human lives are returning where none of us thought it would be possible. Beyond human suffering, what we see more often are the incredible series of destructions of archaeological sites and archaeological heritage in museums and collections. It is the duty not only of the body of archaeologists, but of the entire scientific community to always find new solutions to ensure the preservation in the best conditions of the universal archaeological heritage and its transmission to future generations. Here at West University of Timișoara, we will be permanently involved in the generous purposes of this mission.

The scientific debates are to be continued far beyond the spaces that our university offers for the works of the congress, in the enchanting setting of Timișoara, one of the most beautiful cities in Eastern Europe, acting as a bridge between east and west, a model of historical harmony and modern development in a cultural multi-ethnic environment.

Welcome to Timișoara!

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FOREWORD

Dan Ștefan

The National Museum of Eastern Carpathians

In the long journey of humankind, archaeology stands as a bridge between the past and the present, unearthing the remnants of long-forgotten civilizations and piecing together the puzzle of our shared human heritage. Over the years, the field of archaeology has not only evolved but has also woven itself into the intricate fabric of various disciplines, giving birth to the fascinating realm of interdisciplinarity.

From its very inception, archaeology displayed a natural affinity for the insights offered by other fields. Early archaeologists intuitively borrowed methods from diverse disciplines to unravel the mysteries of the past. Inspired from geology, they harnessed the power of stratigraphy, carefully deciphering the layers of Earth to reconstruct ancient timelines. Engineering contributed the meticulous art of archaeological drawing, based on horizontal and vertical sections, enabling the transformation of buried remnants into precise visual narratives. These pioneers adopted various survey methods, a gift from the engineering domain and cartography, to navigate landscapes teeming with historical secrets. Meanwhile, early statistical insights breathed life into archaeology's core. Typology, inspired by biological classification, became a dynamic system for categorizing artifacts based on shared traits. This, paired with foundational principles of quantitative analysis, illuminated patterns and narratives hidden within the archaeological record, forming the bedrock of traditional archaeology. This collaboration marked the dawn of interdisciplinarity in archaeology, setting the stage for a journey that would see the discipline enriched by an ever-expanding array of methodologies.

The emergence of processual archaeology marked a watershed moment in archaeological practice. A profusion of novel methodologies, grounded in physical and chemical analyses, remote sensing techniques that paved the way for Landscape Archaeology, geophysics, and advanced statistical tools, reshaped the landscape of archaeological investigation. As archaeologists embraced these new methods, they unlocked unprecedented insights into the lives, cultures, and landscapes of antiquity.

Anthropology, sociology and basic philosophy, with their profound insights into human behaviour and societal dynamics, subsequently found their place within the archaeological narrative. The contextual interpretation of archaeological records acquired a new dimension, as archaeologists began to appreciate the intricate relationship between material remains and the sociocultural milieus in which they were embedded. This fusion of disciplines brought human stories to life, turning ancient artifacts into vessels of narrative.

As we stand on the precipice of a new era, the advent of Artificial Intelligence (AI) has thrust archaeology into uncharted territory. Archaeologists now find themselves at the vanguard of a technological revolution, experimenting with Language Model models (LLMs) and AI-driven algorithms. These digital tools hold the potential to revolutionize data analysis, enabling us to parse through vast volumes of information with unprecedented speed and precision. The marriage of archaeology and AI exemplifies the pinnacle of interdisciplinarity, where the analytical prowess of AI meets the nuanced understanding of human history.

The role of interdisciplinary approaches in archaeology has long been a subject of discussion, with each decade marking a resurgence of this debate. While interdisciplinarity brings undeniable benefits, it has, at times, resulted in a dispersion of focus and a divergence of research directions. Therefore, it is only natural to occasionally pause and question, especially as archaeology solidifies itself as an independent scientific field, whether interdisciplinarity remains essential. In a context where archaeology is increasingly asserting its autonomy within an academic landscape characterized by the growth of all disciplines, the answer remains resoundingly affirmative. Yet, it is the archaeologist

who ultimately shoulders the responsibility of selecting the most effective interdisciplinary tools and techniques. This responsibility is crucial in piecing together the intricate fabric of past human societies.

This is way we devoted the UISPP XX World Congress to "**Interdisciplinarity in Archaeology**". Here in Timișoara we embark on a journey through time and knowledge, tracing the evolution of archaeological methodology from its humble beginnings to its contemporary frontiers. We delve into the symbiotic relationship between archaeology and its interdisciplinary partners, acknowledging the profound contributions of each field to the collective pursuit of understanding our past. Just as a mosaic is composed of diverse fragments, so too is the realm of archaeology enriched by the collaborative efforts of archaeologists along physicists, chemists, geologists, statisticians, anthropologists, IT specialists, and more.

Defining itself as a unique scientific pursuit, archaeology is tasked with carving its own trajectory while harmonizing with the tapestry of knowledge woven by various disciplines. The intertwining threads of interdisciplinarity enhance our ability to decipher the narratives etched into ancient artifacts and landscapes. As the chapters of this volume, echoing the sessions of the Congress, unfold, we invite you to explore the captivating interplay between archaeology and its interdisciplinary companions. Each facet contributes to the ever-evolving saga of the pre and protohistory of humankind.

KEYNOTE SPEAKERS' PRESENTATION TITLES

The main plenary session will involve eminent speakers who will talk about major themes in Romanian and world archeology through the prism of the lessons of the past and the opportunities of the present.

Salt Impact on the Later Prehistory of Southeast Europe

Valerii Kavruk*

National Museum of the Eastern Carpathians
Moldova State University

The paper endeavours to trace the dynamics of salt production, use and circulation of this mineral in South-Eastern and East-Central Europe from the end of the 7th millennium to the beginning of the 1st millennium BC and integrate it into the holistic picture of the region's development from the early Neolithic to the end of the Bronze Age. To this end, the study correlates the available evidence of salt production with data regarding its environmental, economic, social, cultural and political contexts.

The direct evidence of prehistoric salt production in the region is known from about 60 locations. It was categorized based on the most relevant environmental and anthropogenic criteria. Environmental ones included the geospatial distribution, geological and geomorphological contexts, consistency, and physicochemical characteristics of accessible salt sources, as well as other crucial resources like food, metals, rocks, amber, Spondylus, etc., as well as the geospatial connectivity between them. Anthropogenic criteria for salt production classification included data on its character, technology, complexity, intensity, duration, and scale. Cultural, economic, social, and political contexts of salt exploitation focused on food production, metallurgy, trade, wealth, power, exotic, and ritual.

Based on the correlation of the above data we can gain a more comprehensive understanding of the dynamics of salt production and its socioeconomic role in each period.

The most remarkable pages of prehistoric salt production in the region are associated with periods when this production was large-scale. This kind of salt production was witnessed in the Neolithic of Subcarpathian Moldavia and north-eastern Bulgaria, in the Eneolithic of Subcarpathian Moldavia, north-eastern Bulgaria and Bosnia-Herzegovina, in the late Early Bronze Age in western Transylvania and Late Bronze Age in Transylvania and Maramureş. Moreover, the holistic approach can enable us to map some new predictable large-scale salt production sites.

When correlating all available data, it turns out that large-scale salt production was associated with periods of economic and social upsurge, as well as the intensification of long-distance trade and contacts with more developed but salt-poor regions.

The most remarkable large-scale salt production was revealed in *Provadia-Solnitsata* (north-eastern Bulgaria, Eneolithic) and *Băile Figa, Săsarm* and *Caila* (north-central Transylvania, Late Bronze Age). The Provadia-Solnitsata salt production was tightly related to the fabulously rich Varna cemetery and long-distance Black Sea coastal and Balkan average trade, while that in Transylvania was related to the metallurgical and hoarding boom, unprecedented fortifications, and concentration of wealth and power in the key location to control salt production and trade. Moreover, the Eneolithic salt production in Provadia-

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Solnitsata and the Late Bronze Age salt production in Transylvania can be considered industrial, i.e. large-scale, professional, technologically and socially complex, oriented towards external consumers, and elite-controlled.

A destroyed and forgotten generation: Ukrainian Archaeologists victims of Stalinist purges

Une génération détruite et oubliée: les archéologues ukrainiens victimes des purges staliniennes

François Djindjian*

CNRS UMR 7041 Arscan

Cette communication reconstitue l'histoire des archéologues ukrainiens entre la fin de la première indépendance de l'Ukraine et les débuts de la seconde guerre mondiale. La quasi-totalité des archéologues a fait l'objet d'une répression dont les conséquences ont été soit l'exécution, soit la condamnation au Goulag, soit le suicide et pour les plus chanceux l'exil. Après 1945, l'Institut d'archéologie de Kiev a été recréé avec des archéologues russes venant de Saint-Pétersbourg et de Moscou. Cette politique d'éradication et de russification a concerné également les ethnographes, les folkloristes, les historiens de l'art, les écrivains (« la renaissance fusillée »), les bardes itinérants et plus généralement la plus grande partie l'intelligentsia ukrainienne.

This paper reconstructs the history of Ukrainian archaeologists between the end of Ukraine's first independence and the beginning of the Second World War. Almost all archaeologists were subjected to repression, the consequences of which were either execution, sentencing to the Gulag or suicide and for the lucky ones exile. After 1945, the Kiev Institute of Archaeology was recreated with Russian archaeologists from Leningrad and Moscow. This policy of eradication and russification also concerned ethnographers, folklorists, art historians, writers ("the renaissance shot"), itinerant bards and more generally the largest part of the Ukrainian intelligentsia.

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A Glimpse to the Romanian Neolithic and Eneolithic: Farmers, Artefacts, and Beliefs

Mihai Gligor*

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Present-day Romania is a part of what is known by the scholars as *Old European Civilization*. Between 6500-3000 BC, within the territory dominated by the Carpathian Mountains, Danube River and the Black Sea a flourishing civilization has been developed. After more than 150 years of continuous archaeological researches in Romania, the general picture of the Neolithic and Eneolithic Ages reveals a complex prehistoric society with a high technological level and an elaborate spiritual life.

The goal of this paper is to present the main characteristics of the Neolithic and Eneolithic life: the evidences of the sedentarisation process, the typology of the houses, pottery production, lithic, bone and horn industry, the emergence of metallurgy and other - belonging to Starčevo-Criș, Vinča, Foeni, Petrești, Boian, Hamangia, Gumelnița, Precucuteni and Cucuteni cultures. Also, we will discuss the new results of archaeometric analyses made on different types of artefacts.

The agricultural society from that period is also characterized by an amazing plastic art, which indicates the symbolism of fertility cult. In the same time, we will try to briefly present the mortuary practices and the grave goods. In the end, our paper will provide an overview and a link of the region with the Balkans and S-E Europe.

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Session 15-2

Re-Examining Mortuary Practices and Human Sacrifice through Interdisciplinary Advances

SESSION ABSTRACT

The field of mortuary archaeology has a long and rich history, with many studies focused on understanding the social, cultural, and religious aspects of death and disposal of the dead. However, recent interdisciplinary advances, particularly in the fields of biology, ancient DNA (aDNA), isotope analysis, statistical reasoning, remote sensing and artificial intelligence, have opened up new avenues of inquiry and revealed new perspectives on our understanding of mortuary archaeology and sacrifices.

In this session, we would like to bring together archaeologists and experts from various disciplines, including anthropology, history, and science, to explore the latest developments in interdisciplinary research and to re-examine our understanding of mortuary archaeology and sacrifices.

The following list serves as a suggestion for the topics covered in the communications and discussions, not as a limiting factor.

- The use of ancient DNA analysis to identify human remains and trace population movements.
- The application of isotope analysis in reconstructing diets and mobility patterns.
- The integration of statistical reasoning to improve our understanding of mortuary practices, sacrifices, and rituals.
- The utilization of remote sensing techniques for 3D reconstruction, augmented reality and precise recording of funerary and sacrificial contexts.
- The potential impact of artificial intelligence on revolutionizing our approach to mortuary archaeology.

This session aims to promote interdisciplinary dialogue and inspire new ideas for future research in the field. Additionally, we propose to explore how our understanding of social, cultural, and religious beliefs and practices surrounding death and the afterlife evolves in the context of the technologically developing world.

We strongly encourage authors to investigate exciting new topics that are inspired by the recent cross-disciplinary advances.

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Dan Ştefan

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Valeriu Sîrbu

Maria-Magdalena Ştefan

Deviations, relicts and innovations? Late Bronze Age Inhumations within the Urnfields from the south-eastern Alpine Region

Brina Škvor Jernejčič*¹, Bine Kramberger

1. Institute of Archaeology ZRC SAZU, Slovenia
2. Institute for the Protection of Cultural Heritage of Slovenia, Centre for Preventive Archaeology, Slovenia

During the Middle and Late Bronze Age cremation burials appeared together with new burial customs in the south-eastern Alpine region and far beyond, framing the phenomenon of the Urnfield culture. Inhumation burials from the region dating to the Middle and Late Bronze age are exceptional. We can number only a few Middle Bronze age inhumations under barrows from SE Slovenia that can be associated with the Tumulus culture. Moreover, skeletal remains found in caves attest that these special underground places were also in use for funerary practices. Until recently, the cemetery at Dobova (SE Slovenia) – where more than 400 cremation burials were unearthed – was the only Urnfield site in the region that yielded 5 partial and complete inhumation burials dated according to the grave goods to the Late Bronze Age. New AMS dating confirmed that all these inhumations can be assigned to the 10th and 9th century BC, this is to the Late and Final Urnfield period. It is interesting to note a general rule according to which the LBA inhumations from Dobova were associated with cremation burials that were earlier according to the results of radiocarbon dating. This goes true also for the Middle and Late Bronze age cemetery at Obrežje just across the river Sava, which yielded 381 burials. The cemetery that was published just recently revealed that the inhumation as a manner of burial within the late Urnfields in SE Slovenia was not straightforward. Moreover, beside the fact that two inhumations proved to be contemporary with the latest phase of the cemetery (10th – 9th century BC), one additional inhumation burial was found at the site, which proved to be contemporary with the oldest cremation burials (14th – 13th century BC). Full skeletonization and manipulation with skeletal remains prior to collection and internment was also observed and documented at the site, and similar to Dobova cremated bones of other individuals were found inside inhumation burials. Combining new archaeological, anthropological, 14C AMS and aDNK data led us to present some of possible interpretations of these exceptional LBA inhumations within the large Urnfield cemeteries from Dobova and Obrežje.

Key words: inhumations, deviant burials, 14C AMS analysis, Urnfields, Slovenia.

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Internal organization of Iron Age necropolises in the Outer Carpathian area based on spatial and statistical data

Dumitru Condrea*¹, Aurel Zanoci¹

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Following the research of several Iron Age cemeteries in the Outer Carpathian area (Hansca “Lutărie”, Murighiol, Canlia, Bugeac II, Enisala, Stelnica etc.), especially during the post-WWII period, sufficient data was collected to determine the funerary practices of the Getic communities. Among the adequately known aspects are those related to rite, including the coexistence of both incineration and inhumation of the deceased, the former being prevalent, the skeleton orientation, sepulchral structures and pits, recipient types for the cinerary remains, funerary inventory, food offerings and animal sacrifices. However, little consideration was given to establishing the internal organization of the necropolises and the relationship between the graves. Such an undertaking faces, in turn, several issues: cemeteries that were researched only partially, incomplete publication of the results etc. At the same time, intensive agriculture and erosion have altered the landscape of prehistoric sites to a degree where it is difficult or impossible to ascertain on the ground if the graves were initially tumular or flat. Despite these shortcomings, some results regarding the cemeteries’ internal organization are achievable through spatial and statistical methods, both in topographic and in chronological terms. Of these, the present research used the correspondence analysis, the Shapiro-Wilk, Jarque-Bera and other normality tests, the correlation test (Pearson correlation coefficient), seriation and point pattern spatial analyses, namely nearest neighbors, and kernel density estimation. The last two highlight the graves’ spatial intensity on the necropolises’ plans and, evidently, their utility increases with the number of contexts in an archaeological site. The correlation test and multivariate analyses, such as seriation or the correspondence analysis, show the associations (dependency) between different characteristics of the assemblages, including funerary inventory, thus facilitating the identification of grave groups (chronological, familial, cultural etc.) and the formulation of typologies. For example, a significant correlation is observed between the depth of the grave pits and the number of artifacts found in them. An overdispersion of the graves indicates that the excavated sections are in proximity to the cemetery’s periphery or that they were disturbed afterward. The tendency to arrange the graves in rows, similarly to the flat necropolises at Stelnica, Hansca, Canlia etc., and to position the marker-cinerary remains pair along the east-west axis adds to the evidence that we are dealing with another flat cemetery. Preliminarily, considering the low number of large-scale necropolises excavated, the overdispersion of funerary contexts is not an indicator of tumular organization. In the C2/C10 sections of Zimnicea “Câmpul Morţilor” they imitate a random distribution, even though the kernel density estimation emphasizes the tumuli’s visibility on the necropolis’ plan. Besides solving narrow problems, the spatial and statistical methods have the right tools to scrutinize the necropolises’ elements as a whole. Getting a holistic outlook on the gravesites, in particular the larger ones from Zimnicea, Bugeac, Stelnica and others, reveals patterns in funerary behavior, crucial for our knowledge of Iron Age communities in the Outer Carpathian area.

Key words: necropolis, funerary, Outer Carpathian, horizontal stratigraphy, topography.

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Archaeometric steps to decipher the immortalization of the Getae

Diana Gergova*¹

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The Getae are the most just among the Thracians. Their priest, king and god Zalmoxis was slave or even predecessor of Pythagoras. They immortalize. The Herodotus words, as well as other ancient authors imply the existence of some specific features of this Northern Thracian tribe of prophets. The discovery of the unique Sveshtari tomb in the Sbornovo National Reserve in 1982 provoked the beginning of the long term excavations in the area. It could be expected that the archaeological investigations of the territory of unusual density of archaeological sites would confirm or deny the ideas of the ancient authors about the Getae. The investigations lead to the discovery of the spiritual and political center of the Getae from the 1st mill BC, its identification with The City of the wolves or of the light ("Dausdava" from Tabula Nona of Kl. Ptolemaeus), where the polis Helis was founded in the Hellenistic period. An exceptional source for elucidating the mystery of the "immortalization", mentioned by Herodotus, were the Hellenistic necropolises. Swept away by the hypothesis of their astronomical layout, their potential could clarify also another Thracian phenomenon – that of the empty tombs. Plundered or places for specific burial practices and mysteries? The team tried to get the answer by improving the methods of excavation and extracting as complete scientific information as possible. The interdisciplinary research included documentation through aerial photogrammetry and photography, archaeoastronomical analyses, geophysical prospecting to refine the excavation methods, anthropological and dietary studies, paleozoological studies, petrographic and chemical studies on the origin of building materials, traceological analyses, etc. These studies allowed to obtain significant new information, confirming the credibility of the ancient authors about the specific aspects of their culture and beliefs, about the high level of their knowledge in astronomy, architecture, mathematics and arts. The reconstruction of the rite of immortalization of the Getae reveals its predetermination by the Orphic doctrine of astral immortality and as a system of rites closely bound up with this system of knowledge.

Key words: immortalization, archaeoastronomy, archaeometry, geophysics, diet.

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Pour la formalisation d'une approche : renouvellement méthodologie et anthropologique autour de la question de l'étude de l'os humain anthropisé

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L'état des lieux préliminaire des recherches dans le domaine de l'archéologie de la mort a permis de constater que la plupart des études portant sur les os humains en Préhistoire se concentrent sur les restes dans leur contexte. Malgré un véritable tournant opéré en 2003 grâce à l'approche nécro-archéologique proposée par Jean Zammit, qui a permis d'ouvrir une porte sur une analyse tournée vers la compréhension de la sépulture dans son entièreté, et pas seulement sur l'ossement lui-même in situ, les études portant sur l'appréhension des modes de traitement funéraires et mortuaires demeurent tournées vers l'archéologie de terrain. Si l'archéothanatologie, proposée par Bruno Boulestin et Henry Duday en 2005, a également mis en avant la relation entretenue par les populations avec leurs morts, ces deux approches restent centrées sur des études en contexte. En tant que vestige anciennement vivant, l'os humain permet d'atteindre à la fois la mémoire de l'individu, la mémoire du groupe et la mémoire archéologique. Lorsque celui-ci est porteur de traces d'origine anthropique – toutes les modifications faites par l'Homme ayant un impact sur la matière – son analyse nécessite de réaliser un renouvellement méthodologique à l'interface vacante entre l'archéothanatologie et la nécro-archéologie en y ajoutant les apports de domaines telles que la technologie osseuse, l'anatomie et la taphonomie. Si l'os est ainsi révélateur d'une pluralité d'informations, l'étudier lorsqu'il est porteur de traces issues de manipulations post-mortem et dépourvu de contexte archéologique nécessite la mise en place d'une méthode spécifique et adaptée à formaliser. Cette méthode a pour but de comprendre ce qui a réglé l'action technique effectuée lors de la manipulation, voire de l'appropriation, du corps par l'Homme : les conditions de possibilité sont ainsi à rechercher dans les contraintes imposées au travail du défunt par l'état du corps au moment de la transformation. La perception de l'artéfact humain n'ayant pas forcément toujours été la même, l'approche proposée dans ce travail souhaite aller au-delà du seul reste biologique pour aller vers l'artéfactuel. Témoignant d'une humanité, l'os humain est ainsi porteur d'anciennes conceptions de la mort à identifier dans les gestes opérés dans la modification corporelle et/ou dans l'intérêt représenté pour la composante matérielle représentée par un ou plusieurs éléments du squelette. C'est grâce à la transdisciplinarité de cette approche, qui combine les enseignements de la taphonomie, de l'ostéologie, de l'épistémologie, de la technologie osseuse et de la nécro-archéologie, que cette approche souhaite démontrer qu'elle offre un renouvellement anthropologique de la discipline permettant de mettre en avant des pratiques mortuaires inédites pour la Préhistoire en France.

Key words: démarche scientifique, mort, os humain, pratique mortuaire.

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Mortuary Expressions of Gender, Age, Status, and Eschatology in the Visual Language of the Red-figured pottery in the Light of Anthropological Data. The Case of Apollonia Pontica

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The case study of some funeral complexes from the necropolis of Apollonia Pontica (the ancient Greek colony on the Western Black Sea coast) aims to discuss the perspectives provided by the multidisciplinary approach in reconstructing of some sociocultural and eschatological aspects of the pictorial repertoire on one important category of funeral offerings. The red-figured pottery – since Beazley’s work on its classification – has turned out to be a long-debated subject of several disciplines, such as art studies, cultural history, religion, economy, and trade and recently, archaeometry. The prerequisite, however, is that the depictions should be interpreted as historically specific constructs, whose visual language can only be understood in the interplay of various elements in each archaeological context. Thus, iconography or iconology, semiotic analytical approaches, social and religious studies and, of course, analyses of the osteological remains must interlock to be able to trace the social values and norms on which the representations are based.

For this purpose, several burial complexes and groups of objects have been selected, which exemplify specific concepts towards the deceased. Although the analyzes of the osteological material from the excavations in the 1940s and 1990s are incomplete, the results of the last twenty years allow some statistical observations and conclusions to be drawn regarding the specific use and preferences for certain themes and subjects determined by gender and/or age characteristics, by the behavior of the community members, as well as by some local/regional factors.

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Advances in Geophysical Exploration of Prehistoric and Ancient Mounds

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Exploring funerary sites using geophysical methods has long yielded essential insights, enriching our understanding of past mortuary practices and landscapes. A notable example is the case of funerary mounds, which dot so many landscapes across Europe and Asia. Traditional excavation-based studies of these mounds can demand an immense undertaking, comparable in magnitude to the initial construction endeavours undertaken by the deceased's family and mourners from the past. As a result, employing geophysical techniques to detect and characterize graves and other buried structures within these mounds proves indispensable for modern research into the mortuary practices associated with these remarkable monuments.

This presentation is a compelling exploration into the realm of detecting and characterizing of the funerary structures under the tumuli, aiming its focus on unravelling the intricate tapestry of mortuary practices within past societies. This presentation offers an in-depth examination of the theoretical frameworks, methodological breakthroughs, and compelling study cases that collectively spearhead the advancement of archaeological understanding in this specialized field.

Covering various geographical and historical contexts, the showcased case studies vividly demonstrate how geophysical exploration has become an indispensable tool for uncovering concealed burial landscapes. Through meticulous analysis of these instances, attendees will witness the resurrection of burial grounds obscured by the passage of time, enabling the reconstruction of rituals, societal values, and cultural intricacies from bygone eras. The presentation will also address methodological advancements, highlighting state-of-the-art techniques meticulously crafted to reveal and characterize funerary structures. Utilizing modern geophysical tools such as magnetometry, electrical resistivity tomography (ERT), and ground-penetrating radar (GPR), complemented by LiDAR survey, participants will be immersed in a realm where the enigmatic past is unveiled through distinct patterns and underground mappings. It is within these innovations that the art of comprehending mortuary practices finds its most powerful expression.

Key words: applied Geophysics, mortuary archaeology, geophysical methods, tumuli.

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Human sacrifices or deviant burials? A bioarcheological investigation on a sample of La Tène pit burials from Romania

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Starting with the II c. BC. until the I c. AD. there is a marked change in the funerary habits exhibited north of the Danube. The funerary practices exhibited in the previous period were centred on large cemeteries, incineration being used in most circumstances especially in case of adult individuals. Starting with the II c. BC we see a radical decrease in the number of burials, under 400 funerary contexts being known to exist. There is evidence of the use of both cremation and inhumation, sometimes the two rites coexisting in the same settlement. While the incineration graves are generally characterised by the presence of a small human bone quantity and of martial inventory, the inhumation burials are mostly waste pit depositions. These contexts show either singular or multiple burials, with a low level of bone representation and a lack of clear funerary inventory. The singular depositions are always subadult individuals while the mixed ones show both subadult individuals and male and female adult individuals. Most archaeological publications centred on these finds imply that they are the result of human sacrifices in accordance with the contemporary literary sources available about this geographical area. In most cases this conclusion was presented without an anthropological examination of the materials, most of the burials discovered in this timeframe not being subjected to an analysis until recently. This presentation will focus on a few La Tène pit burials both individual and multiple. The aim is to present through a bioarchaeological approach a conclusion on the nature of these depositions. Looking for signs of perimortem trauma and linking the pathological and anthropological information of these individuals in the larger context of their burial is the main goal of this inquiry.

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Session 2-1

Interdisciplinary studies on earthen architecture

SESSION ABSTRACT

The aim of this session is to increase interdisciplinarity in the analysis of earthen construction in archaeology, private or public, modest or monumental. We look for examples not only from archaeology (building sequence and systems), but also from micromorphology (of soils, surfaces and building materials), palaeobotany, analytical techniques in physics and chemistry, studies of mechanical properties, etc. We will also draw upon ethnographic studies of traditional vernacular earthen architecture, to observe the viability and survival of some techniques and structures, with the purpose of comparing and understanding architectural solutions that we find archaeologically. An interdisciplinary approach will help us to interpret both the technological knowledge and the motivations of pre- and protohistoric societies that built with earth in different ecological and cultural environments. An interdisciplinary approach is particularly relevant, as recurrently archaeological and ethnographical studies have shown the existence of architectural solutions, in terms of technology or spatial logic, considered inappropriate according to modern construction standards and conventions. With all these examples, we aim to highlight the importance of earthen architecture at the global level, to approach the differences between vernacular and monumental architecture in their cultural setting, past and present, as well as to understand the construction processes at archaeological sites.

Main Organiser

Marta Mateu

Co-Organiser

Annick Daneels

Continuity and change in Neolithic earthen architecture: an Anatolian case study

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A notable feature of Central Anatolian Neolithic architecture is the prevalence of mudbrick houses, often displaying elaborate ritual and symbolic expressions, a highly structured use of domestic space, and a significant duration of buildings and fixtures in the same location. This research examines Neolithic houses as the material expression of distinct social practices, influenced by a wide range of variables that include resource availability, technological developments, symbolically charged activities, and the representation of social identities. The multifaceted nature of houses is here explored through the high-resolution examination of intact microstratigraphic sequences of floors, collapsed roofing and accumulated residues through integrated micromorphological and geochemical analyses. The paper summarizes ten years of micro-contextual geoarchaeological research at the sites of Pınarbaşı (9,000-7,900 cal BC and 6,500-6,000 cal BC), Boncuklu (8,300-7,800 cal BC), and Çatalhöyük East (7,100-5,950 cal BC), which together span approximately 2,300 years of occupation in the Konya Plain of south-central Turkey. Results highlight the occurrence of distinctive building practices and maintenance strategies at each settlement as dictated by complex combinations of ecological adaptations and societal changes, shedding light on the lesser-known aspects of Central Anatolian Neolithic architecture, such as roofing techniques, the use of upper stories, building hierarchies, and the intensity of site occupation.

Key words: Neolithic; Central Anatolia; architecture; plaster; technology; use of space; microarchaeology.

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Sequential slab technique in the Late Neolithic architecture at the Central Balkans

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Mud plaster is the most frequently used material in the Late Neolithic architecture at the territory of the Central Balkans. It is used for the construction of houses, furniture and other architectural features inside dwellings. However, in Serbia, determination of building techniques has not been in the focus of the archaeological research up until recently. Usually, in the published literature one could only find that the house walls were made in wattle and daub technique, but the other architectural features and furniture have been neglected. In the past several years, this has changed, especially after a new methodology has been applied for the excavation of ovens. By following braking patterns and removing single constructional elements one by one, we have been able to distinguish previously undetected building techniques, principally sequential slab technique. Sequential slab technique is known as an early pottery manufacturing technique in the Middle East, especially in the Zagros region. Slabs are made as pre-formed elements of non-uniform shape and joined in butt, bevel and complex joins of three or more elements. In architecture, this technique does not require usage of a wooden frame or wattle and was applied on both smaller and larger architectural features. The revision of the archaeological record and larger objects made from mud plaster has shown that it was used frequently at the Vinča culture sites (for ovens, compartments, querns, etc.). The results obtained during the archaeological excavations were later tested in archaeological experiments, with the reconstruction of an oven, architectural features and furniture. The aim of this presentation is to show how sequential slab technique was applied in the Vinča culture architecture with emphasis on methodology used for the excavation of ovens and other mud plaster features that can help in detecting building techniques more accurately. Additionally, archaeological experiments showing the application of this technique will be presented.

Key words: Architecture, building techniques, methodology, Neolithic, Vinča culture.

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The microstratigraphy and micromorphology of earthen constructions in tell-type settlements from Muntenia and Dobrogea (Southeastern Romania)

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The pluristratified tell-type settlements in Muntenia and Dobrogea are representative of the Boian and Gumelnița cultures, being chronologically placed in the period 4900-3900 cal BC. Tells are characterized by an oval or circular shape, with a maximum diameter of approx. 200 m, an internal area often marked by delimitation structures and well-developed stratigraphy, as well as an organization of inhabited space. The archaeologically studied stratigraphic successions are made up of sedimentary units attributed to burnt or unburned wood and clay dwellings, some auxiliary structures, household waste areas, passage areas, various activity areas, pits, etc. The presented case studies come from two important tells, in which detailed multidisciplinary archaeological research was carried out: Hârșova tell and Bordușani Popină. Regarding the architecture of the built structures, they present many analogies with very rare modern constructions that are still preserved in isolated rural areas or restored in dedicated ethnographic parks. The Eneolithic houses are made of a wooden structure dressed and systematically arranged with 'clay' and fine plasterings made of a mixture of fine sediments with vegetable matter such as straw and chaff. These were arranged both within the walls and on the floors, sometimes making up impressive sequences. Along with the microstratigraphic research, the micromorphological analysis highlighted elements regarding the architecture of the built space, the structuring of the inhabited space, as well as the use of natural resources specific to the area where the site is located. Through the micromorphological analysis, details were observed regarding the finest fitting out units on the floors, such as the vegetal mats that protected the built soil in certain areas, as well as the fine accumulation units, attributed to the successive stages of habitation. A comparative analysis of the floors of Gumelnița houses allowed the identification of typical sequences, corresponding to different spaces, inside a house: activity areas, located especially in the vicinity of hearths and ovens, passage areas, and rest areas. The raw materials used for the construction and the arranging were available in the immediate vicinity of the site, the daub-type construction materials being made either from loess-type sediments or from fine alluvium. Plant materials were also used to make the roof and the soil matting.

Key words: Tells, Eneolithic, earthen constructions, microstratigraphy, micromorphology.

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Earthen building traditions in humid climates: the Cantabrian façade during the Iron Age

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The Iron Age on the Cantabrian façade is often regarded in the collective imagination as a golden age of stone, where domestic structures and ramparts were built using this material. However, archaeological interventions frequently uncover fragments of earth of construction origin, indicating the presence of distinct building techniques and traditions. Unfortunately, there has been limited interest in earth architecture in the northern Iberian Peninsula, both ethnographically and archaeologically, leading to a lack of attention towards earth constructions and resulting in a concerning terminological confusion in the literature and a scarcity of specific studies. In view of this situation, a project is currently underway to study and characterize earth construction techniques during the Iron Age on the Cantabrian coast from an interdisciplinary perspective. The objective of this communication is to present this project, providing initial results regarding the characterization of techniques and building processes. While in contemporary contexts in other areas of the Iberian Peninsula there is a predominance of techniques in which the building material is left to dry before being used, and despite the fact that the bibliography refers predominantly to adobe and rammed earth for the Cantabrian sites, in these territories with a humid climate and abundant forests we find predominantly mixed techniques, where wood plays a structuring role, while earth, always applied in a humid state, fulfils the function of covering. These findings suggest different operational chains, which contribute to understanding the particularities of the social processes of the protohistoric Cantabrian populations.

Key words: earthen architecture; Iron Age; domestic structures; Cantabrian façade; technology.

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Experimentation and Micromorphology for a Better Understanding of Archaeological Cob Balls

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Cob balls and blocks have been used to build structures since prehistoric times. Their remains can be found in archaeological sites, although they are not always identified as such. Cob structures can be mistaken for rammed earth and shaped mud units mistaken for mud bricks. This construction technique could have been widespread in many areas but has been scarcely studied compared to other earth building systems. Interdisciplinary research is needed to improve our understanding of this often-invisible way of building. This paper addresses the preliminary results of an experimental test on cob units, to which a micromorphological study has been subsequently applied. Different variables have been taken into account in the experimental archaeology experience on cob modules produced at present: diverse components on the mud mixture (varying quantities of water content, pebbles, and plant material), shapes, sizes and disposition, time spent in the open (from just one month to a year) and exposed to atmospheric agents, fauna, and flora, as well as contact with fire, inside an experimental oven. The possible effects of these variables are examined in a macro and microscopic way, including the study and comparison between them with thin-section micromorphology. Which changes observed with the naked eye (in color, hardness, morphology, etc.) also imply transformations on a microscopic level, and which are these? Which implications have these insights for the study of archaeological earth building remains and, specifically, for the so-called cob balls? With this research, we aim to gain better knowledge on two aspects: the production processes involved in this earth construction technique and the transformations and post depositional alterations which can affect these materials. In short, how this technique was and could have been implemented in the past, and how their remains can be better interpreted in the archaeological record, during excavation processes and following studies in the laboratory.

Key words: earth building; shaped mud; Prehistory; experimental archaeology; micromorphological analysis.

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Characterization of earth building materials for evaluating earthen constructions

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Earthen constructions have been used for centuries as a sustainable and cost-effective building method. The construction of houses on land has evolved over the centuries, diversifying techniques according to the times and regions and remains today the basic material for the construction of much of the houses. However, the quality and durability of these structures depend largely on the properties of the earth materials used in their construction. Characterization of these materials is essential to evaluate their suitability for earthen constructions. The characterization process involves analyzing the physical, chemical, and mechanical properties of the earth materials. The objective of sub-project Terra-Cycle 1 (TED2021-129705B-C31, Circular economy in land construction and development of suitable soil databases) is to create an open access public web tool, cross-referenced land-based construction data and techniques and georeferenced soil databases where suitable land-based construction soils can be located. The first step is to characterize the construction materials of the historic land buildings in Catalonia to determine the best soil materials to make them. In the laboratory, the material will be studied by: granulometry; the limits of Atterberg and the unified classification of Casagrande; the determination of organic matter; the mineralogical composition by chemical microanalysis and X-ray diffraction. In situ, the material shall be studied by: organoleptic tests; determination of cohesion by tape test and ball drop; determination of consistency by pearl and ball test and ball cutting. Micromorphological analyses shall also be performed, based on the microscopy of thin sections collected in earth building walls, recording their position, orientation and function in construction. This type of examination will provide details on the composition, and in particular the mixing of soils, as well as the amount of water used during preparation and the direction and the intensity of the pressures applied to the earthen mixes during construction. The research will be carried out through the collection of existing soil georeferenced databases mainly those hosted by the Institut Cartogràfic i Geològic de Catalunya in its Geotrells on Soils, and selecting the soil characteristics to be studied as requirements for raw material extraction (such as grain size distribution contained in organic matter, stony, gypsum content, carbonates and salts). As a result, an assessment of suitability for onsite construction will be made.

Key words: Construction; Historical buildings; Earthen; Energy; Environment; Sustainability.

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Tradition and Technological Transfer in Mesoamerican Earthen Facings through Chaîne Opératoire

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While facings of earthen structures have no structural function, they are essential as they provide the building of protection from external agents. They consist in mixtures of earth, compacted and smoothed over the surface, and although they may differ in terms of their structural components, they fulfill their function. Earthen facings in Mesoamerica are continuous, as one layer covers walls, interior and exterior floors, taluses and plazas. This procedure avoids joints at structural angles (as in modern building), thus reducing the possibility of water infiltration. This research will focus on the micromorphological analysis of the chaîne opératoire of earthen facings at different Mesoamerican archaeological sites, such as Teotihuacan (State of Mexico), Tlalancaleca (Tlaxcala), La Joya (Veracruz), Trapiche and San Andrés (El Salvador), Kaminaljuyú (Guatemala) and Buenavista (Zacatecas), observing the similarities of the technological features and the differences in composition (granulometry and addition of vegetal temper). The results suggest the existence of two main traditions of facings, one fine-tempered, widely distributed from early on, and the other gravel-tempered, appearing later in the Central highlands, then adopted and adapted by a select series of sites apparently through interaction with Teotihuacan, through different mechanisms: technological transfer and imitation. The research shows that a finer understanding of technological processes and decision making can inform on the inner workings of the societies under study.

Key words: micromorphology, earthen architecture, technology, geoarchaeology.

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Session 11-1

Continuity, variations, and replacement? Lithic techno-functional traditions and population movements during the Final Palaeolithic in Northern Eurasia

SESSION ABSTRACT

The cyclic glaciations of the Northern Hemisphere resulted in a number of dramatic climatic changes that significantly impacted human occupations in the Northern part of Eurasia. It was only around the onset of the Late Glacial (Greenland Interstadial 1; ca. 15000 BP) that groups of hunter-gatherers began to continuously inhabit extensive regions of the North European Plain. People living in such a dynamic environment adapt and develop different strategies to survive, i.e. subsistence, mobility, and social. These subsistence strategies had very different environmental and geographic ranges varying from reindeer hunting in tundra conditions to elk and small fauna hunting in birch forests. As far as we know, all of the hunter-gatherer societies during the Late Glacial in northern Europe used lithic tools as part of their toolkits, and these were produced using techniques displaying not only cross-cultural but also regional differences within the same culture. The session aims to contribute to the ongoing discussion of continuity and change within the techno-functional traditions of Late Glacial Northern Eurasian communities in relation to recent palaeogenetic studies. We are especially interested in: a. Final Palaeolithic lithic techno-functional diversity and traditions; b. the relationship between cultural and genetic continuity, modification, and replacement; c. the scale and resolution of integration of assemblage, site, or region with other datasets (genetics, isotopes, dating, etc.).

Main Organiser

Iwona Sobkowiak-Tabaka

Co-Organiser

Katsuhiro Sano

William Mills

Katarzyna Pyżewicz

Mara-Julia Weber

The evolution of technical systems of Epipaleolithic lithic industries in the arid zone of the Northern Levant the example of Nadaouiyeh 1 in El Kowm in Central Syria.

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To date, the Levant is considered the oldest territory where the transition from nomadism (the Paleolithic) to productive sedentism (the Neolithic) took place. In the Levant, the Epipaleolithic represents the pivotal period between these two lifestyles and is composed of the Geometric Kebaran and Natufian cultures. The site of Nadaouiyeh1 in the region of El Kowm in central Syria, in the center of the Northern Levant presents a large number of lithic industries. The technological analysis shows the presence of a large quantity of debitage products, pieces of geometric or non-geometric microliths, retouched tools and cores. The study of these series aims to understand the technical traditions and knowledge, and their adaptation in an arid environment.

Key words: Epipaleolithic, Geometric Kebaran, Natufian, central Syria, El Kowm.

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The finds of Andernach Roonstraße – the latest addition to the Federmesser layers of Andernach Martinsberg

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In 2006, the General Directorate of Cultural Heritage of Rhineland Palatinate (GDKE) carried out an emergency excavation on the Martinsberg in Andernach. The lithic artefacts have now been evaluated in the course of a master's thesis (Krahl/Maier 2020; Krahl 2022). In addition to a technological and typological analysis, the analysis of the lithic raw material and a detailed analysis of the spatial distribution were the main focus of the thesis. The technological analysis confirmed the expected use of both organic- and soft stone hammers for blank production and underlines the chronological classification into the Late Paleolithic, which is also corroborated by the typological spectrum (short scrapers; backed pieces). Despite the suboptimal conditions during the emergency excavation and medieval use of the area, the spatial analysis yielded interpretable results as well. During a little experimentation with the acquired data by applying Staperts ring and sector method as well as Binford's hearth model, another Late Palaeolithic activity zone with a possible fire place became visible (Binford 1983; Stapert 1989). The comparison of the raw materials with those of the concentrations Andernach 2 and 3 showed a clear correlation concerning the proportions of the raw material groups of Andernach 3 and Andernach Roonstraße. The raw material spectrum, however, rather resembles that of Andernach 2. The comparison of the typology shows similarities between the tool compositions in all three concentrations, although Andernach Roonstraße stands out with a higher percentage of short scrapers. In terms of technology, Andernach 2 and 3 show a similarity with a predominant use of the organic hammer. This preference is not visible in Andernach Roonstraße. A spatial comparison of the three concentrations strengthens the discussed possibility of Andernach 2 being a separate occupation phase of the Martinsberg (Stevens et al. 2009). If we look at the surrounding Late Palaeolithic sites, the suspicion quickly arises that these are the traces of one and the same group, especially with regard to the existing raw materials as well as the technological and typological finds. Within the framework of a doctoral thesis these possible connections of different Late Palaeolithic sites and therefore the visibility of taxonomic groups will be looked at in more detail. As a starting point, Late Palaeolithic assemblages of the Rhineland and the Neuwied Basin shall be examined beyond the standard analyses. Particularly well suited for this purpose are refits, however, they are rarely included in large-scale comparisons between different sites and regions. A meta-analysis of those refits is has great potential for gaining more insights into the variability of technological systems and the interregional exchange of technological information, and therefore also offers the possibility of learning more about the social aspects and motivations of Late Paleolithic hunter-gatherers.

Key words: Rhineland; spatial analysis; technological analysis; typological analysis; raw material; Andernach Martinsberg

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Differentiation of siliceous rocks used by Final Paleolithic communities in the Vistula River basin

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Interpersonal contacts are the essence of humanity. This topic has been studied by prehistorians since the birth of this scientific discipline. Research on this issue is extremely important but also difficult. It is not easy to determine whether the contact was a necessity or a choice. Those investigations are difficult when it comes to studying Final Paleolithic, or generally Stone Age communities. Fortunately, artefacts from siliceous rocks come to our aid. The area of the Vistula basin boasts deposits of several kinds of flint which were widely used in prehistoric times: chocolate, grey white-spotted, striped (banded), on its eastern borders, Volhynian, and the southern border radiolarite and obsidian. Unfortunately, mistakes are sometimes made when distinguishing the various rocks, and it is necessary to develop methods which will allow for a very precise distinguishing of the different rocks. One of the methods is precise macroscopic characterization. Therefore, the Institute of Archaeology and Ethnology of the Polish Academy of Sciences in Warsaw participates in project entitled Open Resources in the Digital Repository of Scientific Institutes (OZwRCIN), one of the tasks of which is creating and publishing an online database of siliceous rock samples - Atlas of rocks. Our open-access online database of siliceous raw materials from Poland and neighboring areas consists of about 500 samples from 55 outcrops. The collection includes raw materials collected during systematic archaeological work of the employees of the Institute of Archaeology and Ethnology of the Polish Academy of Sciences, as well as gifts from other specialists in this field from Poland and abroad. The collection is stored at our Institute and consists of e.g., flints, cherts, obsidians and radiolarites. The database contains basic information about the raw material, such as its name, and place of origin, as well as metric data, a description of macroscopic features, or more detailed data on deposits. Every example is visible on detailed photographs and in most cases, 3D models were also created. Our main aim of this presentation is to introduce the main siliceous rocks used by Final Palaeolithic communities in relation to the published online database. One of the more important problems related to studies of the Stone Age is determining the mechanisms of the long-distance distribution of siliceous rocks. However, in order to achieve this, they must be properly characterized to facilitate their proper recognition.

Key words: lithoteka, siliceous rocks, Final Paleolithic communities, East-Central Europe.

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Emergence of arrowheads and arrowshaft smoothers during the Late Glacial in the Japanese islands

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The Upper Palaeolithic – Jomon transition in the Japanese islands is represented by the emergence of pottery at ~16 ka. Morphologically classified “stone arrowheads”, bifacial triangular points thinly made by pressure retouching, emerged at the Incipient Jomon, which temporally coincides with the Late Glacial. Thereafter, the number of stone arrowheads gradually increased through time. Simultaneously, “arrowshaft smoothers”, grindstones with grooves, also appeared at the Incipient Jomon. As recent experimental and morphometric studies on Japanese Upper Paleolithic stone tips indicated that some of them may have been fired using a bow, the emergence of stone arrowheads does not necessarily reflect the onset of bow-and-arrow hunting in Japan. Nevertheless, increased demand for bow-and-arrow hunting in forest-rich environment in the Late Glacial would have triggered systematic production for arrow-tips and arrowshafts, leading to the development of stone arrowheads and arrowshaft smoothers. In this paper, we examine spatio-temporal patterns of stone arrowheads and arrowshaft smoothers in the Japanese islands based on the Bayesian models of reliable radiocarbon dates and discuss the relationship of the patterns with the climate oscillation.

Key words: stone arrowheads, arrowshaft smoothers, Jomon period, Late Glacial, Japan.

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The dynamic of the last Late Glacial hunter-gatherer population on the North European Plain

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In this presentation, we would like to take a closer look at the population dynamics of the North European Plain in the Greenland Stadial – 1 (the Younger Dryas) and the transition from the Pleistocene to the Holocene. We analyzed more than 300 radiocarbon dates using a multi-stage approach. Radiocarbon determinations from one site were calibrated to obtain the chronological date range of singular site duration. Then, the overlapping chronological ranges, modeled dates, and single calibrated determinations from different sites were grouped into chronological ranges. The next step was mapping the sites belonging to a single chronological range to gain the chronological distribution of the sites on the North European Plain. The final stage contained the correlation of chronological date ranges with the GRIP paleotemperature curve. This approach enabled us to analyze the internal dynamic of Ahrensburgian and Swiderian population development, their subsistence strategy, and their behavior in changing environmental conditions.

Key words: North European Plain; Final Palaeolithic; radiocarbon dates; Bayesian analysis; environmental changes.

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Techno-functional diversity of Late Palaeolithic points in Northern Germany

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Stone points are the most representative artifacts, reflecting a chronological and territorial area. During the early Late Glacial, Hamburgian hunter-gatherers first expanded onto the Northern European Plain. Their stone points are characterized by shouldered points for the classic faces, but also by tanged points for the Havelte Group. It has been assumed that the morphological difference between the sub-units of the Hamburgian tradition resulted from chronological, regional, and/or functional background. The assessment of the spatio-temporal patterns of the two subgroups revealed that the classic Hamburgian appeared earlier and was geographically distributed over a wider area of the Northern European Plain than the Havelte Group that are concentrating on a north-western restricted region. However, little is known if Hamburgian shouldered and Havelte tanged points were worked for different functional systems. In addition, there is a morphological variability in shouldered points that may represent different projectile and/or hafting modes. Elucidating the remaining questions, we undertook a use-wear analysis of Hamburgian shouldered points from Poggenwisch and Teltwisch in the Ahrensburg tunnel valley and Havelte tanged points from Ahrenshöft in Nordfriesland. A total of 32 points were macroscopically and microscopically analyzed. The paper presents results of the use-wear analysis and discusses the relationship of the functions and possible hafting modes with the morphological variability of these points.

Key words: use-wear analysis; classic Hamburgian; Havelte Group; Late Glacial; Northern Germany.

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Positioning Brockhill and Hengistbury-Type Assemblages within the British Late Glacial Interstadial Record and Beyond

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The British Late Glacial record has some significant taphonomic biases. With a concentration of organic recovery from cave sites, these contexts are also, where the most accurate dating, isotopic records and more recently DNA data come from. However, cave sites do not represent all of the Late Glacial records, notably with limited records for the second half of the Late Glacial Interstadial (LGI, GI-1e to GI-1a) and a near absence of the subsequent Younger Dryas and Pre-Boreal assemblages. Recent re-evaluations of isotopic and genetic data on human material among the British cave assemblages are quite exceptional for Northern Europe. They represent both the earliest and latest phases of the LGI and indicate both a change in diets and a population turnover at both ends of this period. At the two extremes of the LGI, this trend is also reflected in the lithics technology, with quite divergent technological approaches and raw material strategies. There remain quite a few questions concerning technological transitions in the middle of the LGI, notably with the Hengistbury Head Type industries. Whether these are continuations of the Magdalenian tradition adopting a different technological approach due to changing environmental conditions and therefore maintaining some technological traits, a transmission of techniques to a newly arrived population of Federmesser (curved backed point)-producing groups, or a true population turnover remains an important research question. The Hengistbury Head Type industry is only represented by stone tools, is poorly dated, and depends on the combination of technological (preferential soft stone, well-prepared large blade cores) and typological (diversity of points, notably curved backed and bi-points) traits to distinguish it from the previous Creswellian and later Allerød (GI-1a-c) Federmesser groups. Is this the tail end of the Creswellian, or an open-air expression of it with either a different functional or seasonal signature to the cave sites? Are these the first signs of a population turnover, contemporary with early sites in the Rhine Basin such as Bonn-Oberkassel? These questions are all the more important when addressing sites that do not have a strong techno-typological representation due to an absence of refitting such as Brockhill. Yet this assemblage demonstrates all of the traits of a Hengistbury Head Type site, with both elements that could be considered as Magdalenian-Creswellian, and others that are Federmesser. One of the most striking elements of the Brockhill assemblage is the large number of burins. The burin typology appears initially to resemble a Magdalenian rather than a late Allerød Federmesser assemblage. This presentation will focus on the parallels and idiosyncrasies of this assemblage with the Hengistbury-type assemblages, comparing and contrasting with Creswellian and later Allerød assemblages. A specific focus on the extent of burin production, and whether there might be a functional or cultural aspect is considered.

Keywords: Late Glacial Interglacial, Environmental Change, Lithics technology, Hengistbury Head Type, Northwestern Europe, Creswellian, Federmesser, Final Upper Palaeolithic.

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Session 21-3

The archaeometry of rock art

SESSION ABSTRACT

In the last decade analyses of prehistoric rock art have become widespread. The combination of different physical and chemical techniques and new methodological approaches has made it possible to determine raw material sources, operational sequences, pigment compositions, and taphonomy processes, among other parameters, which can also have direct implications for the improvement of the chronological framework of rock art sites. Nevertheless, there are few studies linked to the characterization and identification of the organic binders, probably related to technical difficulties, high degradation of the components, or site preservation. The session will consider presentations related to these subjects of rock-art imagery from all chronological periods or cultural traditions. Likewise, papers will be accepted from any rock art site in the world. Finally, since rock-art Archaeometry and Conservation are closely related to other disciplines (Geology or Biology, for example), papers will be accepted from practitioners from other relevant fields of study related to the theme. It is expected that the session will discuss relevant guidelines for archaeologists, geoscientists, physics, chemists, conservators' researchers, and managers. We invite and encourage the participants in this session to debate around the different studies related to pigments, binders, absolute dating, the most recent methodologies, and scientific instrumentation, taking into account the state of the current issue and the future prospects of this line of research.

Main Organiser

Hugo Gomes

Co-Organiser

Hipólito Collado

Virgínia Lattao

Sara Garcês

Scientific Approaches to Schematic Rock Art. An Updated Review of Physicochemical Analysis in Western Iberian Peninsula

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This manuscript provides an updated and comprehensive review of the various physicochemical analysis methods applied to Schematic rock art found in some shelters in Western Iberian Peninsula. The primary objective of this study is to evaluate the effectiveness of scientific approaches in rock art research, as well as to assess their contributions to the understanding of this unique cultural heritage and the research questions that arise from it. With a particular focus on Schematic rock art, this research aims to investigate: 1) the underlying principles behind the different types of analyses that have been performed and published to date; 2) the techniques used to answer the research questions posed; and 3) whether the results obtained thus far have met the expectations of rock art researchers. Moreover, this manuscript reflects on the potential, limitations, and future developments of these types of studies, as well as the current protocol that the team employs to sample such delicate remains. This protocol has been developed and refined over years of research and aligns with current conservation needs, as well as the increasing experience and quality of the work performed. While the focus of this research is on Schematic rock art, the discussions and experiences presented in this paper regarding the various techniques used are of global interest, particularly in the study of open-air rock art.

Key words: Schematic rock art; Physicochemical analysis; Heritage conservation; Research methods; Pigment composition.

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Technology and new analytics. Interdisciplinarity to advance in the knowledge of the first pictorial manifestations of Cantabrian Paleolithic art. The Picos de Europa region in Asturias (Northern Spain)

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In recent times, extensive investigations have been conducted on multiple Palaeolithic sites situated within the Picos de Europa region, specifically within the valleys of the river Sella and the river Cares in Asturias. The Upper Palaeolithic era witnessed significant human occupation in this region, as substantiated by the copious number of identified and excavated sites. Moreover, the area is characterized by an abundance of caves and shelters featuring parietal art, notable among them being Tito Bustillo, La Lloseta, Llonín, and El Pindal. These archaeological findings span a broad chronological range, encompassing the early stages of human occupation up until the conclusion of the Palaeolithic period. We have examined cavities that exhibit zoomorphic iconographies and red signs, which can be attributed to the Pre-Magdalenian period. The initial stage of our research involved diligently documenting and cataloging the graphic repertoire found in caves such as Les Pedroses, La Lloseta, Balmori, Tebellín, El Covarón, El Molín, and Pruneda. During the second phase, our research has shifted towards a more comprehensive analysis, employing novel methodological approaches. Various physical-chemical techniques have been used to discern key information, such as the origins of raw materials, operational sequences, pigment compositions, DNA traces, and taphonomic processes. Additionally, U/Th dating has been employed to determine the age of stalagmitic formations or C14 crusts found in association with artistic production sites. The primary objective of this phase is to provide contextualization and dating for these artistic creations. To accomplish this, a diverse and extensive multidisciplinary team is involved in conducting the research.

Key words: Palaeolithic sites; Picos de Europa; Prehistoric art; Pre-Magdalenian period; Multidisciplinary research.

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Finding bacon in Bacon Hole, the Gower Peninsula, South Wales Applying a staged approach to dating and identification of painted imagery

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Bacon Hole overlooks the Bristol Channel to the south and southeast. The size and extent of the original entrance is unknown, but it is probable that the cave may have extended at least a further 30-50m, at a time when the Bristol Channel was a continuous landmass, supporting megafauna such as bison, horse, mammoth and reindeer. Currently, the cave entrance stands c. 40m from the maximum low tide mark. The name Bacon Hole apparently originates from the cave's solid geology, resembling a rasher of bacon. Since initial scientific interest, the cave has undergone numerous investigations, revealing a complex sequence of Pleistocene and Holocene stratigraphy. Later archaeological material indicates an Iron Age, Roman, Early Medieval, and medieval presence.

In 1912, Abbe Breuil and Professor William Sollas visited Bacon Hole with a view to prospecting for rock art. Following scrutiny of the cave walls, a series of ten red horizontal lines were discovered on the wall of a side chamber and were claimed to be of Palaeolithic date. However, by 1928 the rock art discovery had been dismissed. In September 2022 a team of archaeologists rediscovered the art and, in April this year, pigments forming the painted panel and a covering stal flowstone were sampled and analysed by a team for the University of Southampton and the First Art team.

This paper will contextualize the cave, its palaeoenvironmental history and the story of a potentially significant discovery of how and possibly why art was applied to the wall of the cave. The art was produced at a time when the last vestiges of ice had retreated from Wales several thousand years previously and roaming the landscape were small bands of hunter/fisher/gatherers.

Key words: iron oxide, painting, rock art, Speleothem, Upper Palaeolithic.

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Exploring the Rock Paintings of Siligo, Sardinia: A Comprehensive Scientific Research of Pigment Composition and Nature through Advanced Analytical Techniques

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The recent discovery of rock paintings in the Meilogu region of Siligo, Sardinia has revealed a unique collection featuring 18 orange-coloured hand stencils rendered in negative form, inclusive of forearms. This extraordinary find has prompted an extensive scientific inquiry surrounding these artworks. The authenticity of this discovery raises significant questions, including inquiries about its veracity. Furthermore, the major aspects to be addressed encompass the identification of the individuals involved, the timeframe in which it occurred, the motivations behind it, and the purpose it served. The study entailed meticulous documentation, sampling, and subsequent analysis, employing state-of-the-art methodologies including FTIR-ATR (Fourier Transform Infrared Spectroscopy-Attenuated Total Reflection) and micro-Raman instrumentation. The primary objective of this investigation is to discern the pigment composition used in these paintings and provide valuable insights into their nature.

The Meilogu region, characterised by the presence of extinct volcanoes, serves as the backdrop for the remarkable rock-shelter, with these paintings recently discovered. An in-depth analysis of the rock substrate has revealed distinct geological indicators, including mineralogical and chemical properties, affirming the shelter volcanic origin. This volcanic nature of the substrate adds an additional layer of complexity to the overall context of the rock paintings, offering valuable insights into the interplay between the artistic expressions and the unique geological environment.

The use of FTIR-ATR and micro-Raman instrumentation will facilitate a meticulous examination of the rock paintings, enabling a comprehensive analysis. These techniques play a crucial role in determining the composition of the pigments employed, thereby offering valuable insights into their origin and authenticity. Through a thorough research of the chemical properties of the pigments, researchers aim to establish the accuracy and genuineness of the depicted hands.

The objective of this comprehensive work is to contribute to the understanding of the rock paintings found in the vicinity of Siligo, Sardinia. The outcomes of this study will enrich our comprehension of the artistic legacy of Sardinia and contribute to the cultural importance associated with this extraordinary archaeological site.

Key words: Sardinia; Prehistoric Art; Hand stencils; FTIR-ATR; Raman.

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A three-pronged multi-method approach to date and determine the temporality of creation of rock art sites in Quebec, Canada

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Rock art is one of the oldest form of symbolic expression. It can provide a unique and valuable insight into the human spirit and open a window on the world and cosmogony of those who created it. Although widely studied throughout the world, many questions remain: What is the temporality of creation of the ornated sites? Are all the representations contemporary or not? Can we measure the time between realization of two representations? And in the case of the art of the Canadian Shield, another question arises: How to date the (red) figures covered by (silica) crusts?

In this presentation we will present the complementary strategies we are developing to overcome the limitations that prevent us from exploring these questions, by focusing on two rock art sites from the province of Quebec in Canada. First, we will present a new dating strategy using radioactive damage halos, a quantifiable alteration of paintings. Second, we will present how pigment characterization analyses can be a means to identify several paint "recipes", possibly indicative of different phases of creation. Finally, we will present how high-resolution geochemical analysis of thin silica wall crusts could be a means of identifying new chronometers to discuss the temporality of painted figures' creation. Our goal is to discuss and share this three-pronged approach, which is highly prospective, to determine the age of the artwork in order to link it to the history of the native populations.

Key words: dating, characterization, archaeometry, pigments, LA-ICP-TOF-MS, elemental analysis, silica crusts, rock art, archaeology, First Nations

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The Archaeometry of Space

Bernie Taylor*

Animistic and shamanistic peoples worldwide have traditions of regarding geological formations as being spiritual and the observances of them in songs and myths are widely recorded in the anthropological record. We find these traditions carried directly and metaphorically into ancient religions and literature, often retaining seasonal and celestial information that reinforce the narrative. Such global observances may indicate prehistoric roots.

These geological observations are pareidolia and consistent with our ability to find other imaginary patterns, such as animals and faces of people in clouds and asterisms. This ability is also foundational to our internally processing and identifying recognizable patterns in drawings, engravings, sculptures and similarly constructed art forms. The ability to find pareidolia in the natural world is apparently innate to humans and logically should have preceded our earliest intentional art.

This interdisciplinary study was designed to determine if pareidolia predates cave art and whether consistent dating can be established between pareidolia outside of the caves and intentional images archaeologically dated on cave walls. Previously documented images of cave panels in Cantabria and Asturias, Spain were visually compared with photographs of prominent geological formations in the greater region. The visual orientations to the geological formations in their depicted seasons were compared with regionally known asterisms utilizing Starry Night Pro Plus 8, an astronomy software package utilized by professional astronomers and planetariums. The findings were also compared with the established archaeological dates of the cave images.

Fifteen panels of animals in nine caves were found to visually represent pareidolia observed at nine prominent geological formations outside of the caves. Findings from three panels in three caves are discussed in this presentation. They suggest that Upper Paleolithic cave artists in Northern Spain found geological features outside of caves that were meaningful to them through the pareidolia of both the geological formations and associated asterisms. The artists then projected those visualizations onto the walls of caves. The choices of cave panels by the Ice Age artists appear to have been determined by the initial identification of natural geological irregularities on the cave walls that had some visual similarities with the pareidolia observed outside of the caves. Those natural geological irregularities on the cave walls were then improved upon to be more closely represent the out of cave pareidolia. The millennium of the asterisms against the established archaeological dates using Starry Night Pro Plus 8 were found to be within the range of the archaeologically dated images through their seasonal and apparent positions relative to the horizon. This interdisciplinary approach offers clarifying additional tools and perspectives for the archaeometry of cave art.

Key words: Archaeometry, Geology, Geoarchaeology, Cave Paintings.

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Session 20-2

Exploring the relevance of mountain occupation in prehistoric and protohistoric times: a worldwide perspective with a focus on the Carpathians

SESSION ABSTRACT

Mountain archaeology has experienced rapid development in the last decades. This has led to increasing acknowledgment that high-elevation landscapes have played a key role in shaping major processes in human (pre)history, such as large-scale migrations, culture contact dynamics, domestication of animals and plants, technological and subsistence innovations, and so on. Due to preservation and environmental factors these influences appear particularly marked from the end of the Last Glacial Maximum onwards (i.e., 16,000 years cal. BP). Thus, for millennia mountains have been settled and exploited by human societies with a multitude of adaptations taking advantage of the high geological and biological diversity of their unique environments. Today numerous projects are being carried out in different mountain regions around the globe. Archaeological methodologies (from field and topographic survey to excavation) are increasingly being calibrated and adapted to the characteristics of mountain environments, while investigations continue to explore the tensions between the role of such landscapes as barriers versus conduits, and as incomparably rich territories for resource availability versus harsh and hostile areas. The adaptive capacities of past mountain communities, highlighted by archaeologists, are also playing an increasingly important role in the development of novel policies for the management of mountain landscapes and the protection of traditional practices. In this session, we welcome proposals organized as syntheses aimed at highlighting the role of mountains during prehistoric and protohistoric times in different regions of the globe. Given the seat of the conference, papers focused on the Carpathian Mountains are particularly appreciated.

Main Organiser

Martin Callanan

Co-Organiser

Francesco Carrer

Federica Fontana

Sabine Reinhold

Brian Stewart

Pawel Valde-Novak

Hypoxic wasteland, hunter's paradise, or something in between?

Current issues surrounding the early settlement of the Andes

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The South American Andes constitute Earth's longest mountain range, spanning 8900 km from 90° N to 55° S and including the inner and outer tropics and the southern temperate zone. Between the Pacific Ocean on the west and the Amazon basin to the east is an extensive habitable high-elevation plateau at an average elevation of 4000 masl, with mountain peaks up to 6700 masl. By virtue of this structure, the Andes contain diverse environments across short horizontal distances and along their extent. High-mountain regions (above 4000 masl) historically have been considered marginal areas for habitation because of low temperatures and primary productivity compounded by the physical stress of hypoxia (low oxygen pressure). The "hypoxic wasteland" model posits a relatively late entry of people into high-elevation lands from adjacent lowlands believed to be less challenging. Yet, the early archaeological record of the Andes demonstrates a widespread, persistent history of occupation by hunter-gatherers beginning in the Late Pleistocene. Some highland sites exhibit intense and apparently successful occupations early on, where there are abundant and year-round resources, including fresh water, wild camelids and other herbivores, useful plants, and high-quality lithic raw materials. To some, this pattern suggests a "hunter's paradise," where highlands were the preferred habitat of hunter-gatherers. Hypoxic wasteland or hunter's paradise - which model is correct? Comparing early archaeological sites along the entire Andes, we see a spectrum of settlement and mobility configurations, reflecting flexible responses to seasonality and resource structure. Intriguingly, some of the earliest and highest sites indicate thorough familiarity with highland resources, implying either considerable pre-existing cultural knowledge about mountain environments or rapid landscape learning. Current research in the Andes is focused on the timing of initial dispersals and when residential use of highlands began and intensified, the nature of connections between early highland and lowland sites, development of physiological and genetic adaptations to high altitude, and potential use of the Andes as an early migration corridor. In this talk I will review the current state of knowledge about these topics, highlighting some of the approaches and methods currently being applied to better understand early human engagement with the Andes mountains.

Key words: Andes, South America, Late Pleistocene, high altitude, prehistoric archaeology.

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Why in the mountains? The use of Alpine space at the end of the Pleistocene and in the Early Holocene

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A recently concluded project entitled “LiMPH – Living in the Mountains at the Pleistocene-Holocene boundary” and carried out in the framework of a Marie Skłodowska-Curie Individual Fellowship has allowed, for the first time, to compare from a functional perspective a series of Late Palaeolithic and Early Mesolithic sites located in the Southern Alps. The project aimed to assess how different mountain belts (e.g., uplands vs valley bottoms) were exploited. In particular, by integrating data obtained through the traceological analysis of lithic assemblages to the available information on site distribution, LiMPH aimed at reconstructing the settlement strategies and exploitation modalities of the Alpine area of the last European prehistoric hunter-gatherers. Traceological analyses were carried out on seven stratigraphic contexts to reconstruct the functional spectra. The rationale behind the site selection was the inclusion of both open-air and rock-sheltered sites as well as valley-bottom and high-altitude ones belonging to the Late Epigravettian or Sauveterrian cultural entities. The selected assemblages come from four main archaeological sites: Arco - via Serafini (TN) and Romagnano Loc III located respectively in the Sarca and Adige valleys (TN), Casera Staulanza (BL) and Mondeval de Sora in the Dolomites (BL). By combining the low- and high-power approaches currently applied in the traceological discipline, it was possible to identify a rich and varied set of data reflecting the execution of various tasks and the processing of different resources. This paper will present the general results obtained by modelling the data obtained for the single sites. The site comparison allowed us to reconstruct the changes in the exploitation of the south-eastern Alpine area between the end of the Pleistocene and the Early Holocene and assess the relationship between valley bottom and upland sites in the two main considered periods.

Key words: South-Eastern Alps, Late Palaeolithic, Early Mesolithic, traceology, settlement strategies.

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First on the roof of the world. New evidences from Kurteke and Istikskaya sites

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The highlands of Central Asia played a crucial role in cultural development across the later Holocene, serving to foster the diffusion of cultural elements by late prehistoric populations and to support the trans-Eurasian exchange routes of the historic Silk Road. However, the early chronology of human occupation in many areas of Inner Asia – particularly the high Pamir Mountains – remains poorly understood. Intensive archaeological study of this area, by Soviet archaeologists, first began in 1950–1970, at which time scholars theorized that the earliest human occupation in the high valleys dates to the Final Pleistocene. To explore early human history in this key region of cultural transmission, a joint expedition conducted new excavations at the archaeological sites of Istikskaya cave and Kurteke, confirming that there was human presence in the area as far back to Final Pleistocene. We applied a multidisciplinary archaeological and paleoenvironmental approach to investigate early human activity at the site, including lithic analysis, absolute dating, and zooarchaeological and archaeobotanical analyses.

Key words: Central Asia, Eastern Pamir, archaeology, migration.

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A small but essential “cluster” of dots on the map: new Mesolithic evidence from the Comelico Mountains (Upper Piave valley, Belluno, Italy) in the Eastern Alps

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The south-eastern Alps are well known for their rich Late Palaeolithic and Mesolithic evidence, testifying to the first and uninterrupted occupation of the region since prehistoric times. This occupation started at the beginning of the Late Glacial, following the retirement of glaciers and the progressive recolonization by vegetation and fauna. In the Early Holocene, the number of sites increased considerably, and their distribution reached the core area of the Alps. Highland sites (mostly located at altitudes between 1900 and 2300 m a.s.l.), attest to intense seasonal exploitation by late prehistoric hunter-gatherer groups. However, the distribution of known sites is not homogeneous, possibly reflecting different phenomena related to research biases, including visibility and preservation, and effective occupation patterns. While the Dolomites display very dense evidence with several hundred identified sites and some tens of excavated ones, the surrounding mountain areas appear either much less rich or almost devoid of any prehistoric archaeological trace. This presentation focuses on a group of new findspots, exclusively represented by lithic scatters, identified in the Comelico area, very close to the source of the Piave river, near the border with Austria. We have applied multidisciplinary investigations, including analysis of sites location and distribution along with techno-economical and typological studies of lithic assemblages to highlight aspects related to land use and mobility of Mesolithic groups and thus contribute to enlarging our perception of Alpine prehistoric occupations.

Key words: South-eastern Alps, Mesolithic, Comelico, lithic scatters, techno-economic studies.

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The colonization of the uplands around of the flatlands. The case of Cantacorbs (Rojals, Montblanc, Northeast Iberia)

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Research on high mountain prehistoric sites is slowly showing how human groups occupied new ecological niches that were unthinkable until recently, with a growing body of evidence of ancient human occupations in remote places, climatically demanding or at high altitudes. In the case of high-altitude prehistoric sites, these occupations usually occur in places where there is no possibility of finding land at low altitude, that is, they are usually within large mountain ranges such as the Pyrenees or the Alps. In this work we present new data from the Cantacorbs site, of Neolithic ascription and with very possible Lateglacial occupations. This site is located in the Prades Mountains at 1,022 masl. However, in this area there is abundant flat land around it, with altitudes below 400 meters above sea level. The site extends through the plateau of the homonymous mountain and is characterized by surface dispersions of knapped lithic remains. Three different sectors have been excavated to date. The first two are interpreted as an open-air chert workshop. It has been possible to document the entire operational chain of blade production, highlighting a cache of blade cores ready to be exploited. Although most of the remains are blade fragments and knapping waste, various diagnostic Neolithic tools have been found, such as double-beveled microliths or borers. On the other hand, many ground stones and structures are being documented that in the future will allow us to better understand the occupation. The third area corresponds to a sheltered area, where no remains associable to the Neolithic have been documented yet. Instead, some characteristics of the lithic assemblage, mainly exploitation techniques, resemble typical Mesolithic blade productions, although it has not yet been

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possible to date this facies yet. However, the first anthracological data allow us to differentiate both areas, evidencing a possible Lateglacial occupation in the latter. The occupation of Cantacorbs opens an interesting debate about the reasons for these groups to occupy this type of high-altitude areas, where the environmental conditions must not have been the most ideal. This debate becomes especially important when considering there are abundant flat and low-altitude lands relatively close, a priori with greater amenities for crops and cattle. In addition, the nearby low-lying areas are rich in resources, such as large chert source areas, although we have recently documented a large chert vein around the Cantacorbs mountain as well. At the spatial level, other new possibilities open up in relation to the choice of location. In addition to the visual domain itself, that extends to the sea (about 30km away today), there is another possible key factor of the occupation: being in the center of an important cultural landscape with abundant locations of contemporaneous rock art (both Mesolithic and Neolithic). Although we cannot ensure the relationship between one and the other evidence, the presence of pigments could give clues about the choice of the highlands as the settlement area. Cantacorbs can become a referential site for understanding the reasons for this phase of colonization of the heights.

Key words: High-mountain, neolithic, Mesolithic, chert workshop.

Becoming elands' people: Neoglacial subsistence and spiritual transformations in the Maloti-Drakensberg Mountains, southern Africa

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Southern Africa's Maloti-Drakensberg Mountains possess excavated archives of ancient human highland engagements together with one of the world's richest corpuses of rock art. With new direct dates from rock paintings comes the opportunity to relate excavated data to the parietal record, enabling the incorporation into socioecological models of ideational inferences about how foragers perceived the mountains they operated within. Of particular interest is the late Holocene Neoglacial (3-2 ka), during which skilled paintings were being made as the region experienced dynamic changes owing to climate change. Responses of local foragers are evident across a range of cultural spheres, including dramatic subsistence transformations. With the Maloti- Drakensberg's well-known 'traditional corpus' of fine-line art now known to extend back to 3 ka, here we explore how such changes may have precipitated – and in turn been influenced by – ontological shifts in relation to the food quest. As desirable game declined and hunting windows narrowed, we suggest that afromontane foragers sought to manage social and scheduling conflicts through enhanced spiritual negotiation with non-human entities in the landscape. Facilitated by the supernaturally charged nature of their elevated cosmos, this intensified spiritual labour may have found material expression in an elaborate new style of painting.

Key words: Maloti-Drakensberg; Neoglacial; Intensification; High-Altitude Hunting; Spirituality; New Animism.

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Mapping and assessing the archaeological value of lost glacial sites

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In recent years, the focus of glacial archaeology has been on identifying and surveying alpine sites that are actively producing finds. The driving motivation here is to locate and secure fragile artefacts before they degrade and disappear. Often the focus is on prehistoric sites. This is pressing work, as weather patterns become increasingly unstable, and temperatures continue to rise. At the same time, if we look back on the last 150 years or so, we see that many glacial structures such as ice patches and smaller glaciers have already been lost. Many of these, while at lower elevations obviously younger in age, have received little attention. Not much is known about their use in the recent past, or about the timing of their decline and disappearance. Historical air photography and satellite images can be a valuable tool in surveying this part of the landscape and in recently lost sites. In this paper, I will discuss this set of sites and describe recent experiences with historical and satellite images as part of the Norwegian FONNSAT project.

Key words: Glacial Archaeology, Mountain Archeology, Climate Change, Satellite Monitoring.

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Session 8-6

Discontinuity, Recycling and Unclassified pieces within knapping processes during the Lower and Middle Paleolithic

SESSION ABSTRACT

The fragmented character of lithic reduction processes during the Lower and Middle Paleolithic is attested on numerous sites, especially for this latter period (Turq et al., 2013). The presence of discontinuous knapping processes in the archaeological record may be induced by mobility patterns, but not only. In the same way, some pieces can fulfill several functions, whether for economic or cultural purposes. This session aims to discuss on which forms the discontinuity exists in the lithic record and their possible causes, in various geographical contexts. We wish to make a particular focus on the artefact which does not always match into a single box (tool/core, core/hammer etc.). In that context this session aims also to discuss recycling phenomenon and secondary uses of artefacts. The idea is to think about the lithic assemblage sometimes outside a strict typology corresponding to prehistorians and not to prehistoric populations. These issues can be addressed through raw materials management (spatio-temporal and techno-economical processes; import, discard and export events), reduction sequences organization (management of chaînes opératoires within a site -simple, ramified etc.) or tool-use (techno-functional studies). The presentations from this session will help us to consider some of the adaptive choices made by hominins, and to determine which part is cultural, functional or economic.

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Schöningen: hybrid artefacts, beyond classic lithic classifications

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The site of Schöningen is located in Lower Saxony, Germany, and dates back around 320-300,000 years (MIS 9). The paleontological and archaeological record was found in the surroundings of a paleo-lake within two cycles (I-II) and embedded into 2 (Fs1-Fs2) and 4 (1-4) main phases, respectively, with different sedimentary layers. It comprises a wide variety of finds that include a vast number of micro and macro vertebrates –with several bones bearing anthropogenic marks–, stone tools and the famous and oldest wooden artefacts (spears and throwing sticks) that were found in Schö 13 II-4. The lithic artefacts are not abundant and in many occasions appear isolated, the assemblage is characterized by low density sites. Although previous works gave a general overview on some of the lithic assemblages [1], most of the lithic record had not been revised after being stored following their discovery. Therefore a detailed study was conducted consisting of a proper identification, classification and analysis of the stone artefacts using morpho-technical and low-power approaches, and on some pieces use wear and residues analysis were carried out. This work includes the lithic record from 8 archaeological sites at three main localities. The results reveal the presence of unretouched flakes as the main category, follow by few tools, debris, (pseudo) cores and a small group (2%; n=17) of stone artefacts that were impossible to ascribe to a “classical” category. These show some kind of ambiguity on their use, and are mainly characterized by fulfilling two functions on the same blank. They combine the presence of few detachments and also some sort of retouch, a duality between exploitation and configuration. As a result, the term “hybrid artefact” was coined. They are not understood as means of recycling but as an optimization of the blanks, which are not discarded, and might be related to the availability of raw material. Sometimes it is impossible to establish the sequence of transformation because the simultaneous use of the blank can occur on the same surface, overlapping the record, or on different –even noncontiguous– faces. As it is not possible to determine the temporal lapse between the two use events because there are no alterations on the artefacts surfaces and there are not linked products that can provide information on the spatial distribution. Sometimes, it is not either possible to determine if they are just cores or planned as retouched pieces. This is the case of artefacts bearing isolated notches, where it is not possible to say whether they were conceived as cores, notched-denticulated tools, or both. In addition, one hybrid artefact was also used as a hammerstone or maybe as a retoucher-like. These pieces

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are present all along the sequence and the dimensions of their blanks are similar to those of the regular core-like pieces and tools, as are the knapping methods and the retouching. They seem to have been a complement to the gear and reveal the technological behavior of the hominins in Schöningen.

Key words: Lower Paleolithic; Lithic assemblages; Hybrid artefacts; Low density sites

Reference:

[1] Serangeli, J., Conard, N.J., 2015. The behavioral and cultural stratigraphic contexts of the lithic assemblages from Schöningen. *Journal of Human Evolution* 89, 287–297.

Tools, cores, or both? Exploring the continuum between shaping and flaking chaînes opératoires in late Acheulean Jaljulia, Central Israel

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The use of typologies for classifying archaeological objects dates back to the 17th century, predating the establishment of the archaeological discipline itself. Inspired by the natural sciences and developed by the early archaeologists, these artifact taxonomies primarily rely on shape and presumed functions derived from it. The history of Prehistory has been marked by the classifications made by G. de Mortillet, H. Breuil, F. Bordes (statistical approach), among others. Apart from these typologies, several other classification methods have been employed based on different criteria, such as the analytical and structural typology developed by G. Laplace.

With the advancement of archaeological sciences and the emergence of functional and technological studies revolving around the concept of chaîne opératoire, the discriminatory nature of "fossiles directeurs" has been challenged. Nowadays, classification systems still persist, often combining various parameters including typology, technology, and function. However, certain challenges remain in specific contexts, such as the differentiation between cores and tools. In this paper, we present the issues encountered during the analysis of a significant lithic collection attributed to the Lower Paleolithic.

Jaljulia, an open-air site with various occupation phases ascribed to the late Acheulean, served as the focus of our analysis. Specifically, we examined area D, which is estimated to be approximately 500,000 years old based on TT-OSL and ESR dating. Our technological analysis encompassed all the flaked and shaped artifacts found at the site, totaling over 12,000 lithic items.

Throughout our analysis, we encountered difficulties in assigning certain items to a specific techno-typological category, or even to a single category at all. This was particularly evident in distinguishing between bifacial cores and bifaces, as well as in classifying large notches found on flakes and cores-on-flakes. Some bifacial cores and bifaces exhibited similar characteristics, such as a peripheral or almost peripheral worked edge, which could be bifacial or alternating, as well as volumetric similarities. Additionally, it became apparent that some bifaces were recycled after being discarded as cores, resulting in preferential flakes that displayed affinities with the Levallois concept. We focused on examining the characteristics of the worked edges (angulation, regularity, conformation) by comparing bifaces, cores, and unclassified pieces.

Despite our efforts, it remained challenging to assign certain pieces to a specific category, blurring the line between shaping and flaking. However, we must question whether this distinction is necessary. Our taxonomies are a product of our own perception and our desire to classify and categorize each artifact within predefined boxes, without necessarily reflecting how these pieces were viewed by prehistoric populations. While the archaeological object exists independently of the observer, the types created by archaeologists do not necessarily correspond to the true nature of the object, which often remains elusive. Therefore, we have chosen to consider certain pieces as combined

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or mixed matrices, capable of serving as both tools and production matrices. This polyfunctional character may or may not have been intentional for the knappers. In the absence of further evidence, as prehistorians, we must acknowledge that we will likely never know for certain.

Key words: Combined matrices; Recycling; Late Acheulean; Levant.

Crossed Functions: Cores and Hammerstones from the Brive-Laroche Aerodrome Site (Brive-la-Gaillarde, France)

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The analysis of the chaînes opératoire of a newly discovered site, which contains two assemblages attributed to the Middle Paleolithic and dated to the Upper Pleistocene in Corrèze (France), reveals variations in the selection and utilization of hammer tools. The lithic assemblages uncovered from two different areas (North and South) are dominated by quartz, available at the vicinity of the site in alluvium or sandstone deposits of the Brive basin. Among the percussion tools used are quartz pebbles and cobbles, exhibiting diverse morphologies. Additionally, multiple intertwined chaînes opératoires are observed, demonstrating the repurposing of fractured hammerstones for flake production, the use of cores as percussion tools, and the utilization of bulb of retouched flakes for percussion. These behaviors are primarily observed with quartz materials (recycled cores and hammerstones), albeit to a lesser extent with silicites (bulb retouchers, recycled cores). The study describes this variability in use and its interpretation is supported by dedicated experimental testing of debitage and retouch. Recycling phenomenon are common during the Middle Paleolithic. However, beyond simple adaptive behavioral flexibility, the analysis suggests that these are deliberate technical choices made by Neanderthals.

Key words: Mixed matrices; Middle Paleolithic; Recycling; Quartz.

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Re-use and scavenging of handaxes in Boxgrove (Sussex, UK)

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In the last few years, the re-use and recycling of artefacts has become one of the most interesting topics in the study of Middle Pleistocene industries. Reuse could refer to different stages in the life of a tool whilst in the possession of a single hominin individual but sometimes the presence of a discard phase between the different technical/functional episodes, identified by differences in patination, can also be identified. While changes in the surface patination of artifacts is still a poorly understood subject, and might be affected by various processes, identifying phases of reduction distinguished by different surface conditions is a clear indicator of multiple, separate phases of artefact use. Where artifacts previously discarded in the landscape can be shown to be reworked after a period of time, by a different hominin individual we might be seeing an important reuse mechanism which we could characterize as scavenging or recycling. This pattern of reuse of pre-existing artifacts could have important implications and may reduce the energy invested in lithic production, taking advantage of previously manufactured artefacts for which the use-life can be extended. Boxgrove Q1B is a good context for analyzing the reuse of Large Cutting Tools (LCT). Together with the abundance of raw material in the same occupational site, there is a high level of discard of hand axes due to the intense mobility pattern of hominins through the landscape. Artifacts are either unpatinated or lightly patinated allowing variations in surface weathering to be easily identified. This pattern could be related to the short-life of the tools and the result of an expedient way of life. So, within this work we consider factors such as mobility landscape patterns, intensity of site use and the effective constraints of LCTs for multiple periods of recycling. The combination of technological and morphometrical analysis help us to analyze the variations produced by the re-sharpening. Through examination of surface condition and patterns of LCT tip preparation through specialized tranchet removal techniques, we explore how extensive the reuse of these tools might have been and how this affects the morphology of tools.

Key words: Middle Pleistocene, Boxgrove, hand axes, scavenging, recycling, shape variability.

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Shaping hand axe in Southwestern France during Late Middle Paleolithic: How to “Faire d’une pierre deux coups”!

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During Late Middle Paleolithic, in Southwestern France and northern Spain, one element of variability in industries is the production of large blank flakes, shaped in order to make heavy cutting tools. Duclos and Septos sites are part of these pyrenean-garonne Acheulean sites (Acheuléen pyrénéo-garonnais), which is found from the Massif Central to the Pyrenees. This techno-complex is very similar to the Iberian Acheulean (Vasconian), especially because of this production of cleaver flakes *stricto sensu* (Tixier, 1956) and large handaxes. Lithic assemblage is in hard local raw materials, mostly pebbles of quartzite collected in the river system. However, knappers also produced small flakes from discoidal debitage method. They have used only one percussion technique for both method of lithic production: mineral hard hammer percussion applied with a strong internal gesture. As it leaves similar scars on flakes, it is then very difficult to distinguish shaping flakes and debitage products. The difficulty of classifying these flakes leads researchers to propose that knappers used a combined shaping chaîne opératoire concept, mixed with debitage concept (Colonge 2012, Brenet 2013) and made use of shaping flakes as tools. This hypothesis is confirmed by an experimental work that brings a new light to Neanderthal lithic technology. Through techno-functional analysis and raw material attributes, we analyzed the archaeological series and the experimental production. Despite an in-depth knowledge of shaping rocks, chaîne opératoire and non-flint raw material, experimental handaxes are not made in the same way than archaeological ones, especially for the volume of artefacts. We have demonstrated that the technique choice is as bound to the raw material chosen as it is to the structure of bifacial concept, for both Septos and Duclos (Clément 2019). This attests to the very great adaptability of Neanderthal technical know-how regarding his environment, his need and his skills.

Key words: Late Middle Acheulean, Shaping concept, Debitage concept, experimental knapping, Southwestern France.

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Session 10-3

Upper Paleolithic portable art in Europe

SESSION ABSTRACT

Comprising a wide variety of forms and being made of diverse raw materials (stone, bone, antler, ivory, clay), the importance of art objects in understanding the origin of symbolic behavior and the evolution of the cognitive abilities of hunter-gatherer communities is highly recognized. In the last decades, the number of discoveries has increased, which allowed the filling of some gaps in areas where they were not frequent. In addition, artefacts from older collections, thanks to new study techniques such as high-resolution microscopy, benefited from fresh approaches. Because dating techniques and analysis methods have considerably evolved, besides the description of objects, in the frame of this session we will also focus on interdisciplinary contributions. To have a broader view of symbolic behavior, synthesis studies focused on different regions, chronological contexts or diverse categories of objects are welcome.

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Upper Paleolithic portable art objects discovered in Eastern Carpathians

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The Upper Paleolithic in the Eastern Carpathian is characterized by a high density of sites, most of which belong chronologically to the Gravettian or Epigravettian. Despite the large number of settlements, only some of them has provided art objects and in a few cases the occupations are rich in such finds. Our presentation will include representative sites located between the Carpathians and the Dniester River, in the Romanian territory and the Republic of Moldova, in order to highlight differences and/or similarities in the cultural manifestations of the communities in this region. Many of the discoveries have been made in recent years, as is the case of Poiana Cireșului-Piatra Neamț site, or other sites close to this area, therefore the study will also include an update of the art objects.

Key words: Upper Paleolithic; Eastern Carpathians; portable art objects; symbolic behavior

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The sun-shaped geometric engravings of the Early European Upper Paleolithic

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A new type of geometric engraving, in the shape of a sun, is presented here. They belong to the Early Upper Paleolithic. The two examples presented were found at the Fongal shelter (Dordogne) and at the Boccard cave (Côte d'Or). These stone engravings are fragmentary. They probably belonged to engraved walls that disintegrated under the effect of frost action.

Un nouveau type de gravure géométrique, en forme de soleil, est présenté ici. Ils appartiennent au paléolithique supérieur ancien. Les deux exemples présentés ont été trouvés à l'abri Fongal (Dordogne) et à la grotte Boccard (Côte d'Or). Ces gravures sur pierre sont fragmentaires. Elles appartenaient probablement à des parois gravées qui se sont désagrégées sous l'effet de la gélifraction.

Key words: Geometric engravings; Upper Palaeolithic.

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The new anthropomorphic figurine from the Khotylevo 2 Upper Paleolithic site

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The presentation is devoted to anthropomorphic figurine from the excavations of the Khotylevo 2/V (B) site conducted in 2020. It provides typological, technological and stylistical characteristics of the statuette and describes its archaeological context. The authors conclude that this artefact features a male figure and can be categorized as a point with an anthropomorphic end-piece. Stylistically, this figurine is analogous to the male figurine from excavation pit 7 of the Khotylevo 2/A site. The archaeological context of the figurine is typical for the site of Khotylevo 2. It is linked to the periphery of the archaeological object system characterised the circle or the oval of shallow pits, mammoth bones and groups of flat mammoth bones sunk intentionally into soil together with the skulls. The statuette of 2020 provides a ground for singling out a special type of Eastern Gravettian figurines that complement characteristics of the Khotylevo material culture.

Key words: Upper Paleolithic; Eastern Gravette; Khotylevo 2; anthropomorphic figurines.

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L'art mobilier du Mezinien

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Le peuplement du bassin moyen et supérieur du Dniepr, ou Mézinien, est une reconquête des latitudes moyennes de l'Europe après le dernier maximum glaciaire, vers 15 000 BP. Il est caractérisé par des spectaculaires habitats à cabanes en os de mammoths, bien conservés sous les couvertures de loess des versants de vallée, dont les plus connus sont Mézine, Gontsy, Mejiriche, Kiev-Kirilovskaia, Dobranichivka. L'art mobilier est particulièrement riche : statuettes féminines et animales, éléments de parure, os et défenses gravés, associant des représentations naturalistes réalistes et des représentations, schématiques. Une synthèse générale est proposée et l'accent est mis sur les découvertes de ces dernières années.

Key words: portable art, Mezinian.

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The last hunter-gatherers of the Italian peninsula the symbolic and cognitive dimensions of the portable art

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Prehistoric portable art, found in caves and rock shelters, is a rich source of information on the anthropological cognitive and symbolic aspects of prehistoric human cultures. This paper explores the use of limestone plaquettes and pebbles in prehistoric portable art, with a focus on the cognitive and symbolic significance both for the used stone material and for the engraved or painted patterns. New data from South Italian sites going back to the Tardiglacial, among which Grotta Giovanna (Siracusa, Sicily), Grotta del Santuario della Madonna (Praia a Mare, Calabria) and Grotta Romanelli (Castro, Apulia), will be elucidated. The rich assemblages of decorated limestone plaquettes and pebbles collected in these three caves illustrate in a comprehensive manner the graphic repertoire both engraved and painted of the Italian peninsula, including zoomorphic subjects and geometric patterns. We will provide an overview of our studied prehistoric portable art contexts, highlighting the selection of limestone plaquettes and pebbles and the techniques used to “decorate” part of their surfaces as components of the cognitive and symbolic dimension associated with them. Some pieces show use-wear traces and this detail is one of the specific characters of the portable art which represents a kind of bridge between the daily life and the cosmology of the prehistoric communities. A taphonomic approach and a further set of laboratory analyses are planned to better understand the contexts of this unique heritage.

Key words: Southern Italy-Last hunter-gatherers- Portable Art-Symbolic dimensions.

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Mobile art and ritual activity on Zارايسк site

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Archaeological material does not often provide researchers the opportunity to reconstruct ancient rituals or actions performed with objects that we, from a modern point of view, consider to be ritual. The discovery of such cult items is a rare success and requires maximum effort in order to extract maximum information. No less than the cult object itself, in our case, mobile art items, the context of the find is important, which, with proper fixation, can provide certain information about what kind of ritual actions were carried out with this object on the site. In rare cases, researchers manage to reconstruct step by step the chain of actions that led to the burial of a cult object in a cultural layer. Such episodes of the Zارايسк site study will be discussed.

The Zارايسк site today represents as a cluster of sites belonging to the Kostenki-Avdeevو archaeological culture, the Eastern Gravettian, which dates back to 26,000–16,000 years ago. In total, there are six such points found for today, that were called Zaraysk A-D. Most of the sites are multi-layered, with a complex spatial structure and a large number of deepened features. But there are also single-layer sites with a clear spatial structure (Zارايسк B), which makes it possible to carry out detailed reconstructions of economic activity.

Ritual activity acts were recorded at the Zaraysk A, E, F sites. We are talking about the discovery of mobile art objects - female statuettes, bison figurine, flint items in cash pits and mammoth skulls. As well as some objects made of mammoth tusk with an unclear function, but clearly playing an important role for the ancient inhabitants of the settlement, judging by the context of their find. In addition, it is given a detailed technological and usewear analysis of a unique bifacial point found in a storage pit at the Zaraysk E site in 2018. This bifacial leaf point, put at the bottom of the pit and covered with ochre, is absolutely not typical for the technological context of the Kostenki-Avdeevو archaeological culture industry. However, it is made of local flint and bears multiple traces of wear on all edges, traces of non-utilitarian wear.

Long-term studies at the Zارايسк site provide a lot of information for comprehending the ritual activities of its inhabitants, allowing at least partially get into what they were thinking about.

Key words: Eastern Gravettian, cash, ritual activity.

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Session 9-1

Middle Paleolithic bifaces from the Caucasus to the Rhine

SESSION ABSTRACT

It was in 1967 when Gerhard Bosinski published his first extensive summary on Middle Palaeolithic bifaces in Central Europe: *Die mittelpaläolitischen Funde im Westlichen Mitteleuropa*, proposing the spatial and chronological division of the identified types of asymmetric bifaces. For the last 55 years, the proposed divisions have been challenged with different approaches and methods. Geometric-morphometric approaches and statistical analyses gave a better insight into the coherence of the assemblages as well as their crucial traits. Use-wear analyses, including the controlled experiments, let us better understand the functional aspect of the bifaces. Raw material analyses let us understand some aspects of typological diversity. The technological and techno-functional approach gave ground for identifying the general structure of the tools as well as understanding their chaîne opératoire process. Besides the considerable potential of the mentioned methods, the in-depth nature of the analytical procedures prevails from obtaining generalised views on the given topic. Therefore, 55 years later, we can get into the individual biographies of single bifacial artefacts, but we still miss the generalised view of their geographical diversity in Central and Southern Europe. By organising the session, we aim to discuss the current state of the art towards the geographical diversity of the Middle Palaeolithic bifaces from the Caucasus to the Rhine. We would like to invite all papers presenting the specific assemblages but also those trying to find more general trends between sites and regions. We invite papers on Middle Palaeolithic bifacial tools analyses from multiple perspectives, including use-wear analyses and typological and technological approaches. We are open to papers related to the specific sites and methods and those focussed on general questions, including the terminology or typological divisions.

Main Organiser

Árpád Ringer

Co-Organiser

Małgorzata Kot

A Middle Paleolithic industry with leaf shaped tools in Northeast Hungary: the Bábonyian

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My PhD theses were published in 1983 in German under the title „Bábonyien: eine Mittelpaläolithische Blattwerkzeug-Industrie in Nordostungarn” by the Archaeological Institute of the Eötvös Loránd University (Budapest) in the *Dissertationes Archaeologicae* Series. The eponymous station of the newly defined culture is Méhész Hill at Sajóbáony. 'Bábonyian' was derived from the name of the town Sajóbáony lying 8 km north from Miskolc, which is one of the regional centre towns of Hungary in its northeastern region. In 1983 I described this leaf shaped tool industry from 8 stations, 6 of which were subaerial and 2 were caves from the Bükk Mts. These caves were the famous Szeleta (near to Sajóbáony) and the Balla Caves, studied and known long before. The cultural classification of the chipped stone industry was largely influenced by the definition of the Micoquian culture in the monography of Gerhard Bosinski titled „Die mittelpaläolithischen Funde in westlichen Mitteleuropa” (1967). In 1993, a Palaeolithic flint quarry was explored by Katalin Simán (specialized on Palaeolithic archaeology) on Ravasz-lyuk Hill at Korlát (east side of the valley of the Hernád River), and she identified some stone tool findings as Bábonyian tools. This station is located 50 km east from Méhész Hill (Sajóbáony). The stations explored so far are situated within a circle of 50 km radius around Méhész Hill (Sajóbáony). My presentation will introduce the Bábonyian industry based on the results from the excavation at Méhész Hill (Sajóbáony) in 1997 and from a surface collection sampled with accurate locating at Kánás Hill (Miskolc) between 1966 and 1990, contributing to the cognitive archaeological study of the Bábonyian culture.

Key words: Middle Paleolithic, Micoquian/Keilmessergruppen, Bábonyian.

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Middle Paleolithic industries with bifacial tools in southern Pannonia and the northern Balkans

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Recent research into the transition from the Middle to the Upper Paleolithic in the Lower Danube has shown that there is a concentration of sites from the early phase of the settlement of modern humans in the area. The Initial Upper Paleolithic was confirmed at sites in northern Bulgaria, while several (Proto) Aurignacian sites were recently identified in northeastern Serbia - at the exit from Iron Gates Gorge. All these layers pre-date the CI eruption (42-40 ka cal BP). In contrast, all of the sites located on the other side of the Iron Gates and the Carpathian-Balkan mountain range in eastern Serbia are dated to the period after the eruption. The geographical distribution and chronology of the Aurignacian sites supports the hypothesis that the Danube was an important corridor at this time, especially since the sites that could be linked to the IUP and proto-Aurignacian have not yet been recorded deeper in the interior of the Balkans. This suggests the possibility that in the period before, and especially after the eruption, there was aggregation and social and cultural integration of the Aurignacian groups in the southwestern Carpathian Mountains. The richness and variability of Aurignacian industries in Banat, as well as the appearance of cave art in Coliboaia and (perhaps) Selačka Pećina 3, may indirectly attest to this.

Key words: bifacial tools, Middle Paleolithic, Balkans, Pannonian Plain.

Funding: the NEEMO project of the Science Fund of the Republic of Serbia (7746827).

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That's where the shoe pinches: an attempt to distinguish culturally different elements in Paleolithic industries. An example from the Eastern Micoquian and Zagros Mousterian in the Caucasus

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Modern archaeological data implies that two culture diverse Middle Paleolithic populations, one bearing a variant of the Eastern Micoquian industry and another bearing a variant of the Zagros Mousterian industry, settled the western (Kuban River basin) and eastern (Terek River basin) parts of the North Caucasus respectively from two various source regions. Our findings also indicate contacts between these two populations, and suggest that small, mobile hunting groups of Eastern Micoquian Neanderthals could sporadically enter to a cultural area of the Zagros Mousterian Neanderthals, moving from their habitation sites as far as about 250 km linearly. In our presentation, we will discuss the presence of bifacial tools in atypical context among the Zagros Mousterian industry, discovered recently (Doronicheva et al., 2017; 2019; 2020; 2023) in the North-Central Caucasus in Saradj-Chuko grotto. Also, our previous research show (Doronicheva, Shackley, 2014) that obsidian from the North-Central Caucasus Zayukovo (Baksan) source was transported to Mezmaiskaya cave, where 7 Middle Paleolithic layers with lithic industries attributed as Eastern Micoquian were defined, and also discuss the presence of atypical Levallois-Mousterian elements in the Miscoquian assemblages.

Key words: Middle Palaeolithic; Eastern Micoquian; bifacial tools; Zagros Mousterian; Mezmaiskaya cave; Saradj-Chuko grotto.

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Truncated faceted technology in Ciemna cave, Polish Jura

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Ciemna cave is one of the most prominent Late Middle Palaeolithic sites in Poland. The cave is situated in the Koronna rock, 80m above Prądnik Valley. The site consists of three parts. One of them is a cave itself. The second called Ogrójec is a rockshelter situated on the other side of the „Rękawica” rock. The third part, called Oborzysko Wielkie, is a terrace located between the cave and Ogrójec rockshelter with a good view on the valley. The majority of Middle Palaeolithic occupation was concentrated in Oborzysko Wielkie, which was excavated in 1918-19 by Stefan Krukowski and then in 60-ties by S. Kowalski. Unfortunately, the whole assemblage collected by Krukowski was never fully published, and it is still stored in the State Archaeological Museum in Warsaw. Recently a new fieldwork project has been conducted inside the cave in order to determine the detailed stratigraphy and collect paleoenvironmental data. Ciemna Cave is well known especially due to the presence of a specific type of Keilmesser production, called „Prądnik technique”, which aimed at preparation of the near the tip part of the working edge, by a detachment of the elongated spall called „Prądnik spall”. As a result, a Keilmesser with a sharp edge was obtained. Later on, it could be rejuvenated subsequently with the use of further „Prądnik spalls” detachments. Krukowski was the first to determine the specific „prądnik technique within the Ciemna assemblage. He also mentioned in his first detailed site description in 1939-1948, a presence of small „knives” made mostly on flakes, with minor bifacial shaping. He called them „Prądniczak” due to their distinct morphometry. The recent study aims to reevaluate the technology of production of this particular type of tools. Small artefacts with traces of bifacial shaping were analysed with the use of scar pattern analysis in order to test to which extent they represent a similar knapping concept to the fully bifacially shaped „Prądnik type”, Keilmessers. Additionally, traseological analyses were conducted on both types of artefacts i.e. „Prądnik type” Keilmessers and so-called „Prądniczaks”, in order to determine if one can see a difference in a function for these two groups of artefacts.

Key words: Middle Palaeolithic, Keilmessers, Bifacial technology, traseology.

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The chronostratigraphy and cultural context of the Blattspitzen horizon at Hohle Fels Cave, southwestern Germany

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The cultural and chronostratigraphic context of the latest Middle Paleolithic and earliest Upper Paleolithic represents a central research topic in Eurasian prehistory. This period besides the Middle-to-Upper Palaeolithic archaeological transition is also seen as marking the Neanderthal-anatomically modern human anthropological transition [1- 4]. In much of Central Europe, lithic assemblages characterized by bifacial technology and the presence of leaf points or Blattspitzen have long been viewed as the main transitional industries of this time [1; 3-4]. The exact status of the German Blattspitzengruppe, however, has been subject to lively debate because of the paucity of reliable chronostratigraphic data from recent fieldwork and also by the scarcity of finds of sites with leaf points inventory [3- 4]. In southwestern Germany Swabian Jura sites located especially in the Lone and Ach valleys are an essential part of researching the topic of the Middle to Upper Paleolithic transition. Hohle Fels Cave based in Ach Valley among other Paleolithic sites in the Swabian Jura is crucial to understand this topic, because of documented long Middle to Upper sequence discovered by modern techniques of excavations. In 2020 during fieldwork in Hohle Fels Cave in archeological horizon X a leaf point made from Jurassic chert was found. This was the first find of a leaf point in the Swabian Jura in the last 70 years of research [2; 5]. This paper presents new observations from Hohle Fels Cave demonstrating the presence of Blattspitzen assemblages long before the beginnings of the Upper Paleolithic. These data from Hohle Fels Cave are indicating that the production of leaf points is predating 60 ka BP [2]. This raises important questions about the Status of the Blattspitzengruppe and allows us to test the hypothesis that these assemblages are associated with the last Neanderthals and the transition between the Middle Paleolithic and Upper Paleolithic.

Key words: Blattspitzengruppe, Swabian Jura, leaf points.

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The Middle Palaeolithic Bábonyian industry at the eponymous site, Sajóbáony-Méhész-tető (Hungary) new results

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The Bábonyian was described in 1983 as a cultural unit of the Middle Palaeolithic with bifacial tools. From this point of view, it belongs to the Micoquian /Keilmessergruppen technical tradition. After several excavations, new archaeological investigations were carried out on the eponymous site in the framework of the ongoing French-Hungarian research program "The Palaeolithic of Hungary" archaeological mission MEAE. The complete study of the lithic assemblages of all excavations provides to review the characteristics of the Bábonyian. In this presentation, we deal with some aspects of the lithic industry: spatial distribution of the artefacts, the composition of the lithic assemblage by raw materials, artefact dimensions, main technological categories and typology. The toolkit is dominated by bifacial tools and leaf points, while scrapers and endscrapers are the most frequent among retouched flake tools.

Key words: bifacial industry, leafpoints, technology, typology, Micoquian, open-air site.

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Session 13-3

Crafts and Craftsmanship in the Metal Ages

SESSION ABSTRACT

André Leroi-Gourhan used to say that “civilization stands on the craftsman”. Through time, crafts and craftsmanship have always been an essential part of human life and the foundation of civilizations. They offer us a view of the technological and artistic level of each society and give us the opportunity to understand their social organization. For this session, we would like to invite scholars dealing with craftsmanship to share their research. Aiming to discover other traditions and create discussion around the topic, the session will cover a broad geographical and chronological range from the Mediterranean to Northern Europe and from the Copper Age to the Roman period. The session will be divided into three different themes. The first theme will address traditional archaeological studies, such as chronological issues or technological as well as artistic aspects. The second theme will focus on archaeometric aspects. The scope of processed materials to be considered is deliberately broad and can include: metal, ceramics, stone, glass, wood, amber, etc. Another key intention is to focus on natural resources and their availability, such as material deposits or resources needed for craftsmanship, but also the ecological relations with the environment. The third theme will focus on getting a more comprehensive picture of craftsmanship and its impact on the organisation of societies. This can include questions such as the place of craftsmen in society, the identification of social groups but also operational sequences, or the functioning of trade networks. The main goals of the session are to present new research data on chronological, technological, and artistic aspects as well as facilitating a forum for comparisons between Mediterranean and continental European craftsmanship. Along with the research on natural resources and social and economic backgrounds, the focus will be on the transformation and development of crafts and craftsmanship through the Metal Ages.

Main Organiser

Florian Mauthner

Co-Organisers

Linda Boutoille

Heide Wrobel Nørgaard

Lucia Ruano

L'artisanat aux Âges des Métaux

Angelo Vintaloro*¹

1. Museo Civico Comprensoriale – Corleone, Italy

La Sicile est située au centre de la mer Méditerranée, et précisément à cause de cette position privilégiée, elle a joué un rôle fondamental dans la dynamique historique à partir du Néolithique. La plupart des flux provenaient de la mer Égée et de l'Anatolie, et donc la première partie intéressée était la partie sud-est, la zone actuelle de Syracuse et Raguse. La partie occidentale de l'île était plus intéressée par le commerce et les mouvements depuis l'Afrique du Nord. Les dernières acquisitions nous livrent un chemin parfois tortueux, qui a conduit de nombreuses régions à être touchées par des cultures venues de l'est de l'île, mais cela uniquement dans des zones macro, notamment à l'intérieur de l'île. En particulier, la zone du Corleonese et du Belice supérieur, moyen et inférieur a été investie par la culture Castellucciana et par celle de Rodi-Tindari-Vallelunga, toutes deux de l'âge du bronze, mais cette dernière semble être la plus récente. Les héritages de cette culture se trouvent principalement dans la culture de Naro-Partanna, très présente dans la région corléonaise avec la décoration typique linéaire brune et en treillis. La culture de Rodi-Tindari-Vallelunga a les bols typiques avec poignée surélevée et noir brillant. Montagna Vecchia, qui devint plus tard une véritable métropole de la Sicile antique, Contrada Caputo et Costa S. Giovanni, toutes deux situées dans le périmètre de Corleone, dans le centre-ouest de la Sicile, représentent les deux points les plus importants pour la présence de ce type de découvertes. La méthode mise en œuvre à l'époque, selon les chefferies, faisait de ces macro-espaces particuliers un territoire indépendant du reste de l'île, même s'ils étaient parfois vaincus par des ennemis, comme en témoigne la couche de cendres retrouvée dans la stratigraphie des huttes.

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Sky Disk and Astral Bowl: A Re-Examination of Metal Artefacts Bearing Astral Motifs in Bronze and Iron Age Europe and the Near East (ca. 1800–700 BC)

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The archaeological evidence from the Bronze and Iron Age Europe and the Near East provides numerous artefacts bearing witness to an early interest in sky observation. This includes outstanding metal artefacts, such as the well-known Nebra sky disk (ca. 1800–1600 BC) and an Aramaic astral bowl from Luristan, Iran. The latter, although little studied, is datable to the mid-eighth century BC according to palaeographic details. The exact dating of the artefacts is somewhat problematic as they were obtained from clandestine or illicit excavations. Nevertheless, their approximate dating provides the chronological framework of our considerations. Two key observations provide the starting points of our research: first, and despite the fact that they differ in dating and shape, both artefacts are made of bronze sheet inlaid or engraved with astral symbols and thus show broad similarities to each other. Despite that, they have not yet been compared and examined under considerations of aspects, such as manufacturing techniques or colour coding. The same applies to similarities and differences in the astral imagery of the Bronze and Iron Age Europe and the Near East. This neglect is mainly due to the specialisation of research in either European or Near Eastern archaeology, leading to separate studies on the iconography of the Bronze and Iron Age periods.

Second, the astronomical content documented in these artefacts provides an additional focus of research. This particularly relates to the comprehensive interpretation of their astral decoration that can be divided into four and eight zones, respectively. By providing a relatively uniform background, the focus is intensified onto the celestial bodies (the Sun; the different phases of the Moon) and constellations (e.g., the Pleiades) represented. Although these details are obviously arranged in a meaningful manner, the bronze artefacts are by no means sky charts but rather are meant as devices for the prediction of astronomical events or for divinatory purposes. The arguments in favour of these interpretations will be followed by a brief discussion of the authenticity of the artefacts. Connecting each finding are the cornerstones of our research, which is completed by a comparative study of further metal artefacts bearing astral motifs coming from Bronze and Iron Age Europe and the Near East. Our investigation is meant as a contribution to the fields of iconography, craftsmanship, and archaeoastronomy, with the aim of making a small but genuine contribution to current research.

Key words: sky disk; astral bowl; Bronze and Iron Age; Europe and the Near East; craftsmanship and early astronomy.

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A unique female grave of the Bronze Age Tumulus culture

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In our contribution we present the traditional archaeological and archaeometric study of artefacts belonging to a unique female Bronze Age grave excavated by the Türr István Museum, Baja, Hungary on the 28th of December 2020. Although the skull had been partly destroyed by ploughing, the adornment of her former attire, several bronze and amber jewellery have been excavated in an intact position. The types of jewellery found were quite common in the area of distribution of the Central European Tumulus culture, however their occurrence within a single, skeleton grave makes the find special. Her possibly cloak-like dress was held together by a pair of sickle-shaped, disc-headed pins on each shoulder. She wore a necklace of two amber pendants and *Cardium* shells. Along her chest she wore disk-shaped pendants with concentric ribs and a protruding spike in the centre, connected with elongated spiral beads. She wore a ribbed bracelet on each wrist and double spiral rings on almost each of her fingers. Several disk-shaped pendants with spike were observed around her legs too. A small mug, sea snail shells, and a finely polished egg-shaped stone were placed in the grave pit at her legs as well. The key find was a pair of bronze anklets with chiselled ornaments found on her legs and linked with leaf-shaped pendants linked to the upper part of the spirals. The pair of bronze anklets of Sükösd belongs to the Regelsbrunn-ornamented type, which distributed from northern Germany to Poland, along the Danube to the Banat, Bacska. There is no doubt that this jewellery was used by living woman, as they display signs of use-wear. Although the jewellery found in the female graves of the Tumulus culture has antecedents from earlier periods, scientific research show that, in addition to minor regional differences, elite female representatives of the culture shared several characteristic jewelry inside the culture's significant distribution area - Germany, the Czech Republic, Western and Southern Poland, the Carpathian Basin. The regional groupings within this might also indicate a sharing of knowledge between craftsmen, not just commercial distribution. Several analyses have been made (anthropological analysis of bones, ¹⁴C radiocarbon dating, DNA analysis, strontium isotopic, soil sample analysis, use-wear etc) until now but several others are in progress with the cooperation of our research partners (ELKH Institute of Archaeology and Archaeogenomics - Research Centre for the Humanities - Momentum Mobility Research Group, ELTE Faculty of Natural Sciences, Department of Anthropology, Hungarian National Museum, Adam Mickiewicz University in Poznań - Institute of European Culture, Faculty of Chemistry, Kuny Domokos Museum, SZTE Faculty of Natural Sciences, Department of Geology and Palaeontology) : non- and destructive metal composition measurements, determination of amber origin. We would like to present and share the results achieved so far.

Key words: Tumulus culture, Regelsbrunn-type anklets, amber pendant, archaeometry.

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Show me your sword and I know where you come from...”

Remarkable Celtic swords in the South-eastern Alps

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A few decades ago, the area of Styria, a region stretching from Austria to Slovenia, was considered being a marginal territory in the historical processes of early Celtic dispersal. Rare accidental finds of graves and grave inventories presented spatially dispersed and culturally heterogeneous cultural elements. An image that was in the explanations almost equated with the topography of the region - the area being a hilly landscape, a transition zone between the Eastern Alps and the Carpathian Basin. But in the last two decades, new discoveries radically changed our perception of the geopolitical role of the region as well of the cultural (and technological) processes that took place there in the 4th century BC. Today we know several smaller or middle-sized cemeteries, illustrating the processes of Celtic occupation of the region, cultural consolidation of the inhabitants and the development of regional technological and aesthetic characteristics that can be observed in one of the most prominent crafts – in the production and decoration of swords. Early Celtic graves in the region (mostly dated to Lt B2) contain undamaged swords and scabbards ornamented with outstanding decorations using complex blacksmithing and welding technique. The focus of our presentation will be the artistry of Celtic blacksmiths in this area and in our discussion we will, based on a selection of most prominent examples, come to the conclusion that we are observing products of a regional group of Celtic swords production that was derived from the Pannonian tradition but soon developed numerous local characteristics.

Key words: Celtic weapons, Southeastern Alps, decoration, welding technique.

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Studying Metalcraft from an interdisciplinary perspective

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Today all our knowledge regarding prehistoric craft activities is through the examination of material culture. In a world where the natural sciences have fully entered archaeology, we tend to spend money and time on analyses of the material remains. However, our material remains are restricted, and the vast majority of scientific analyses need materials; they are destructive methods. The increased focus on ethical considerations has made many researchers think twice before applying destructive analytical methods. But what kind of interdisciplinarity is needed to understand prehistoric crafts, especially metalcraft? Do we need natural scientific analyses to better understand past craftspeople's skills and abilities? Which other possibilities do we have for answering questions like: How are these artefacts made? How much skill was needed to craft such a piece, or in other words, is this piece the result of professional craft or homecraft? Is this piece the result of local or foreign craftspeople? Using the material from the Nordic Bronze Age, 1700-1300 BC, this presentation will explore some methodological possibilities for studying metalcraft in prehistory. The Nordic Bronze Age is a cultural group situated at the fringe of metal-using society in southern Scandinavia and roughly existed from 1700-700 BC. Best known for its fantastic spiral-decorated large bronze items, the material culture of this group is perfect for detecting crafting traces due to the majority of metal artefacts being crafted via the lost-wax cast. The presentation aims to present different approaches to the study of metalcraft with different interdisciplinary aspects. It is additionally thought to call for better possibilities to share scientific analyses with other researchers in order to protect our cultural heritage.

Key words: Bronze Age; Metalcraft; interdisciplinary; methodology; Nordic Bronze Age

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A Middle Bronze Age metalworking workshop from Cabezo Redondo (Villena, Alicante, Spain)

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This paper will present a workshop and associated tool assemblage from the Middle Bronze Age site of Cabezo Redondo (Villena, Alicante, Spain). Well documented workshops and metalworking tool assemblages from the mid second millennium BC are relatively rare. The lithic metalworking tools from this workshop were subjected to extensive use-wear and residue analysis and together with the rest of the workshop assemblages from Cabezo Redondo provide evidence for bronze and gold working activities and the associated chaîne opératoire. As the workshop is part of an extensively excavated Early and Middle Bronze settlement, it also provides wider insights into the role of metalworking in Bronze Age society.

Key words: Bronze Age, Spain, workshop, lithic tools, metalwork production.

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Quarrying tools and stonemasons in Celtic Beturia (SW Spain)

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The Capote hillfort is the main reference site for the archaeology of the pre-Roman peoples of the SW Iberian Peninsula, given the scale of its excavations and the quality and quantity of the materials recovered. Excavated between 1987 and 1996, it has been the object of numerous publications focusing on its most spectacular finds, but it lacks specific studies on the instruments found there, or on its domestic records. Its dwellings, together with the walls and fortifications of this settlement, constitute its constructive remains, generally built in stone, alternating quartzite with slate or granite, depending on the functional use of the architectural elements. Along with them, mallets, picks, chisels, stone cutter's hammer, wedges, nails have been recovered, as well as the remains of a quarry located, surprisingly, in the center of the settlement itself. This paper presents an initial study of stonemasonry in the Second Iron Age in the territory of Capote and its surroundings, focusing on the interpretation of the chaîne opératoire of construction materials based on the study of the associated tools and quarries.

Key words: grinding stone, Neolithic, Bronze age, use-wear, palynology.

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L'artisanat en bois du cerf dans la culture de Vučedol

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La culture de Vučedol est un phénomène répandu dans la région méridionale du bassin des Carpates, dans les régions de Croatie, Serbie, Hongrie, Bosnie-Herzégovine, ainsi que dans les zones voisines pendant la fin du Chacolithique et au début de l'âge du Bronze (2900–2500/2400 avant J.-C.). La culture de Vučedol est caractérisée par l'artisanat bien développé et diversifié : production de la poterie et des autres objets de céramique très fins, avec une décoration riche, production assez développée des objets métalliques, etc. Les assemblages de l'industrie osseuse des sites de Zók et de Sarvaš (région de Baranja) ont montré que la production des objets en os, bois du cerf et dents de sanglier était très importante, bien organisée et peut-être spécialisée jusqu'à un certain degré. L'assemblage de Zók est très riche, surtout concernant une importante production des objets en bois du cerf. On a produit des objets principalement en bois de chute, mais aussi de bois du massacre, du cerf élaphe, et occasionnellement du chevreuil. Les objets finis incluent des haches, des hache-marteaux, ciseaux, ainsi que des objets décoratifs. En plus des objets finis, on a trouvé une quantité substantielle des pièces techniques – des objets semi-finis, débris, écailles, pièces de matière première avec des traces techniques. La caractéristique la plus importante de l'industrie de bois de cerf est l'utilisation des outils métalliques pour la production. L'assemblage du site de Sarvaš contient aussi de nombreux outils en bois de cerf, de mêmes types (haches, hache-marteaux, ciseaux, etc.), ainsi qu'une quantité relativement large des pièces techniques – tous avec des traces de fabrication avec des outils métalliques. Quantité des objets en bois de cerf, procédure technologique très rigoureuse, des objets finis réalisés très finement, montrent que la production des objets en bois de cerf avait une place très importante dans la vie quotidienne des communautés de Vučedol et était un artisanat bien développé.

Key words: Chalcolithique, la culture de Vučedol, bois de cerf, industrie osseuse.

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Cult and production on Grakliani Gora, Georgia (1st mill. BC)

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A diverse array of buildings has been unearthed on the 3rd and 4th terraces of Grakliani Gora (Hill), spanning the EIA and Achaemenid/post-Achaemenid eras. These structures served a multitude of purposes, encompassing shrines, residences, enterprises, and storage rooms. Among them, a truly remarkable find is the shrine with inscriptions dating back to the 10th century BC (A), which unfortunately suffered destruction during the construction of building N3-1 in the 6th-5th centuries BC (B). The shrines discovered on the terraces exhibit distinct variations in terms of chronology, architectural design, and specific function. Notably, the inscribed shrine with inscriptions is dedicated to a fertility deity, with the sole inventory comprising a millet-filled vessel. A noteworthy feature adorning the eastern corner of the central altar's pedestal is an information stela, adorned with a structural representation of a ram's head—an emblematic symbol of fertility. Significantly, the cult of the ram persisted for an impressive span of 500 years on Grakliani Gora, evident from the sculpted image of a ram's head gracing the north wall of room 'C' in building N3-1. Another remarkable structure from the same period is building N6, which serves as a shrine devoted to the patron deity of metallurgy and blacksmithing (C). Within the storeroom on the west wall of this building, amidst the objects that tumbled from the shelves, lie iron forging tools (including a hammer, two awls, a wedge weapon) and agricultural implements for plowing. It is worth noting, however, that the presence of metal objects as offerings does not invariably indicate the shrine's dedication to the deity of metallurgy. Rather, such contributions are often regarded as symbols of affluence and prosperity. This notion is substantiated by the abundance of bronze and iron artifacts, some fragmented, donated to the sanctuary of Demeter Thesmophoros in Bitalemi, Sicily. As Ch. Tarditi affirms, "The Bitalemi deposits rank third in size among the Sicilian deposits, trailing only those of Mendolito di Adriano and Santa Anna at Agrigento."

In addition to the shrines on the Grakliani Hill, evidence suggests the existence of:

1. remnants of unfinished stone hand grinders on the second terrace.
2. discoveries on the second and fourth terraces include kilns for ceramic firing (dating to the 6th and 11th centuries BC).
3. a forge for crafting iron objects on the third terrace.
4. a mold on the third terrace used for fashioning a Central Transcaucasian bronze ax from the 9th-8th centuries BC
5. copper smelting furnace (11th c BC) on the third terrace.
6. a leather workshop from the late 4th century BC on the fourth terrace.

These findings collectively affirm that in different periods of time, production was a priority on South slope of Grakliani Hill and sometimes it was given to the religious activity. Notably, religious activities and industrial pursuits in most of cases coexisted harmoniously, exemplified by the fruitful synergy observed during the 11th-10th centuries BC and the 4th century BC.

Key words: 1st mill. BC, Shrines, workshops, copper smelting furnace.

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General Session 7

Archaeological Theory and Practice

SESSION ABSTRACT

The field of archaeology lacks a single unified theoretical framework, but this is both its weakness and its strength. Instead, it is a pluralistic and eclectic field, with archaeologists using multiple and conflicting theories and methods in their work. The lack of a single theory reflects the complexity of the questions archaeology seeks to answer and the need to examine the material remains of the past from various perspectives.

This session is a platform for discussion, where new perspectives on established theories and innovative methods for studying archaeology will be presented and discussed among the authors. The focus is on exchanging ideas and fostering communication.

The session will encompass a diverse range of topics. The following list is merely a guideline and not exhaustive.

Established theories. Still relevant today?

- The importance of considering the social, economic, and symbolic dimensions of material culture in interpreting past societies.
- The use of quantitative methods to understand cultural processes and patterns. Systematic investigations of the empirical data.
- Statistical reasoning in archaeology.
- Multidimensional data analysis 50 years after
- Interpretation of data within its cultural context and recognizes the role of the archaeologist as an agent in the production of knowledge about the past.
- Understand the role of economic and social structures in shaping human behaviour and cultural change.
- The role of objects and material culture in shaping human behaviour and cultural meaning.

Archaeology on the eve of AI

- Deep Learning and the brain we would like to have. Should we be enthusiastic, or should we be afraid?
- Neural networks, the next step for big data in archaeology?
- Even more adrenaline? From deep learning (eg feature recognition in big data) to non-human-like intelligent machines (decision trees and rule-based independent systems for processing and interpreting the past)?

A spectre is haunting archaeology – aDNA. Do some studies about ancient DNA have the potential to give birth to a new Cultural-Historical Archaeology?

Main Organiser

Dan Ştefan

Co-Organisers

François Djindjian

Au croisement des données quantitatives et qualitatives: Analyse technico-fonctionnelle d'hameçons en os (Mésolithique, Norvège de l'Ouest)

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La pêche aux gadidés occupe une place importante dans la subsistance des populations durant le Mésolithique en Norvège occidentale. Cette pêche se matérialise archéologiquement notamment par la présence d'un grand nombre d'hameçons en matières dures d'origine animale. Ces équipements de pêche, dont la fabrication repose sur le principe de réduction de la matière par abrasion, relèvent de plusieurs types produits à l'aide de méthodes différentes : entre -7500 cal. BC et -6000 cal. BC, on recense des hameçons de Type Viste (subdivisé en variante Kotedalen et Viste) et entre -6000 cal. BC et -4500 cal. BC, on recense des hameçons de Type Skipshelleren (Bergsvik & al., 2016; Bergsvik & Ritchie, 2020; Mazet, sous presse). Ces différences typologiques ont une incidence fonctionnelle: les hameçons seraient associés à des pratiques de pêches différentes, respectivement la pêche à la cuillère et la pêche à la palangre.

Les hameçons en os ont été considérés par le prisme d'analyses techniques: le débitage des matrices osseuses est réalisé par percussion indirecte le long de la diaphyse (ie. le coin-éclat-fente). Les baguettes, ainsi débitées, sont régularisées dans l'épaisseur par abrasion pour produire les supports qui accueilleront les hameçons, façonnés dans un second temps. Alors que les implications fonctionnelles des différentes méthodes de façonnage de l'hameçon ont été discutées, ce champ n'a pas été exploré pour la phase de production des supports. Pour y remédier, notre étude s'intéresse à la répartition des surfaces naturelles et des abrasées induites par la régularisation des supports. Cela nous permet d'identifier différents degrés de régularisation des supports suivant la nature de la matrice osseuse employée (os long, os plat, bois de cervidé, coquillage). Le croisement de cette analyse qualitative avec les données morphométriques, comme l'épaisseur des pièces, permet d'interroger les intentions techniques des fabricants de ces hameçons en révélant des récurrences qui ne dépendent pas des contraintes anatomiques des matrices osseuses. On constate une évolution dans la manière de concevoir l'équipement de pêche au cours du Mésolithique: les hameçons de la variante Viste sont issus des mêmes supports en baguette que d'autres équipements comme les cuillères (Bergsvik & David, 2015); les hameçons de Type Skipshelleren voient certains attributs fonctionnels aménagés dès la régularisation du support. Cela implique une préconfiguration de l'outil dès la phase de production du support, ce qui les restreint à la production d'hameçons. Ainsi, en croisant l'analyse statistique de l'épaisseur des hameçons avec des informations qualitatives (techniques), il est possible d'identifier les choix opérés dans les pratiques techniques. En ce sens, l'approche technico-fonctionnelle peut être vue comme un outil d'étude cognitive.

Mots-clés: hameçon; matrice osseuse; technico-fonctionnel; récurrence; cognition.

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The life experience of an archaeologist and its impact on the process of scientific investigation and archaeological interpretations

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In recent years, there has been a lot of discussion about the agency of archaeologists and their direct impact on the production of knowledge about the past. An important aspect in this regard is the cultural context. Another however is the life experience of archaeologists. The purpose of this post is to present, in the spirit of social archaeology and autoethnography, the various areas of influence of individual researchers' perception of the past. The goal is to highlight the importance of the archaeologists' own experiences in building a multifaceted narrative about the past.

Key words: life experience; agency; archaeological interpretation; social archaeology; autoethnography.

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The problem of wetlands and the perception of archaeological remains the case of Algar da Água

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Algar da Água is a natural cavity, located in the Alvaiázere mountain range, in the municipality of the same name, central Portugal, characterized by the presence of material archaeological remains and rock art, with three periods of occupation being verified, the oldest dating back to Pre- Recent history, followed by the Iron Age, and finally the Classical/Medieval Period. The diachronic analysis, based on stratigraphic perception, presented a set of 17 stratigraphic units, ending with the finding of a calcitic mantle at its base, in addition to numerous archaeological evidence, such as lithics, ceramics, fauna and human remains, with highlighting the elements in metals, copper, silver and iron, these requiring the use of techniques aimed at Underwater Archeology during the investigation. Thus, this presentation proposes to discuss some procedures aimed at humid environments, which were used during the recovery and treatment of these archaeological materials, from the site to the laboratory.

Key words: coastal sites; environmental risks; interface zones; Portuguese coast.

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Authenticity in Digital Archaeology and Heritage: Is past theory enough?

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Since computers were first utilised by archaeologists over sixty years ago, their role within archaeological practice has grown exponentially. For many archaeologists, computer powered tools and methods are now inseparable from how they practice. Similarly, the way archaeological data is being presented and disseminated to colleagues, stakeholders and the broader public has followed the same trajectory. Multiple platforms now exist for storing and sharing 3D models of artefacts and sites (e.g. Sketchfab, Pedestal), while GLAM institutions are using centralised and decentralised XR technologies to enhance visitor experience (Waagen et al. 2023). However, as is typical, development of tools has far outpaced theory and standards of practice.

Paul Reilly (1991) first defined Virtual Archaeology as a distinct field of study in the early 1990s. This differentiated the established use of computers in archaeology for statistical analysis of quantitative and spatial datasets from the growing experiential potential and application of computer graphics, that is, their ability to immerse users within a virtual reality. But what users are immersed in and how these virtual realities reflect their real-world, authentic counterparts is less well defined and examined. While experts are better equipped to critically assess and appreciate virtual representations, when they reach less critical audiences, immersive virtual realities have the potential to shape and define conceptions of authentic pasts, presents and futures with much greater efficacy than traditional academic publications.

This presentation identifies and seeks to address two major issues. Firstly, what, where and when is authenticity in archaeological materials, practice and theory? Secondly, how does digitisation and embedding cultural heritage in virtual realities reflect, transform and construct authenticities? The need to comprehensively engage with the fundamental implications of using digital materials and tools has become even more pertinent as greater autonomy is handed over to systems now broadly defined as Artificial Intelligences. Artificial Intelligences are increasingly being integrated into digital workflows intentionally, unknowingly or without choice due to their widespread and rapid adoption by the major powers in the digital industry. It must be considered that as more production of digital heritage materials and interpretation is left to autonomous systems, the role of the archaeologist as the primary agent of knowledge production and more so, authenticity, is transforming.

Key words: authenticity; Digital Archaeology; theory; Virtual Reality; Artificial Intelligence.

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Passive methodologies for biological inhibition and stabilization of fragile pre- and proto-historic organic materials

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The use of passive conservation methodologies is an excellent alternative to the currently employed techniques for preserving and conserving fragile organic materials from humid environments.

They are more cost-effective, environmentally friendly, and sustainable, with 100% reversibility and high efficiency in the conservation and storage of artifacts. The underwater environment is a setting where organic material is better preserved, and for pre- and proto-historic artifacts, its significance is exponential. Therefore, the development of accessible and truly effective techniques should be pursued.

Key words: Conservation; Archaeology; Underwater; Technologies; Methodologies.

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A revision to Tostevin's method for studying cultural transmission in the Pleistocene

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The lithics are by far the most common class of material culture on the Paleolithic sites. Since the 19th century, researchers have developed different approaches for comprehending the variability of stone tools in time and space and generating insights about the past based on lithic remains. But, despite long research history and several approaches, large-scale assemblage comparisons remain largely subjective, descriptive, and vague.

One approach that enables large-scale comparison is developed by G. Tostevin to study cultural transmission in the Middle to Upper Paleolithic transitional period (Tostevin, 2012). This method is based on reduction sequences according to the behavior approach- the flintknapper's behaviors and decisions made during the process. Two behavior sets are recognized: technological behavior- blanks production and the curated behavior- retouched tool kit production. Quantifying those behaviors through attribute analysis based on knapping experiments, Tostevin combined qualitative technological insights with different statistical tools to make a quantitative, more formal assessment of the similarity of pairs of assemblages.

Even if Tostevin's approach was an improvement over qualitative methods when many sites were analyzed, several issues could improve aspects of this method. This study suggests several modifications of method to improve validity, applicability/repeatability, and interpretability. By applying the modified version of Tostevin's approach, we show how it can be used as a general method for conducting large-scale technological comparisons.

Key words: lithics; cultural transmission; technological behavior; Tostevin's method.

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Imagerie optique 3D: pour avancer avec l'approche nécro-archéologique

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À la suite de ses travaux, Jean Zammit propose en 2003 une nouvelle voie d'analyse pour l'étude des ossements humains qu'il présente sous le nom de nécro-archéologie. Cette approche, fondée sur une critique de l'ostéo-archéologie qui, bien que fournissant une place centrale aux restes anthropologiques, délaisse cependant le cadavre. Se questionnant sur les restes humains hors contexte sépulcral et sur ce qui a pu orienter les populations préhistoriques vers la création de nouveaux modes d'inhumation, il propose de porter l'attention plus seulement sur le squelette mais sur le cadavre. Néanmoins, bien qu'elle ait permis d'ouvrir une nouvelle porte dans l'analyse des ossements humains, elle présente ses limites par le peu de cadre conceptuel à son fondement.

Dans ce contexte, l'analyse optique au microscope - telle qu'actuellement menée dans le cadre d'un doctorat pour étudier des ossements humains anthropisés -, permet de renverser les paradigmes dans l'étude des vestiges anthropologiques anciens grâce à une méthodologie inspirée de la nécro-archéologie allant au-delà de la seule approche archéothanatologique via le contexte d'enfouissement des vestiges, notamment pour ceux hors contexte. Ne passant pas par une étude des traces par analogie, cette approche met en avant l'analyse des stigmates pris dans leur rapport à l'os en fonction de l'état de décomposition du corps au moment de la transformation. L'imagerie optique 3D, effectuée grâce au microscope numérique Hirox, offre ainsi la possibilité d'avancer avec pour fondement l'approche nécro-archéologique tout en développant une méthodologie à l'interface entre l'anthropologie physique, la taphonomie et la technologie osseuse.

Key words: Imagerie optique; os humain; nécro-archéologie; méthodologie.

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Multidimensional data analysis, 50 years after

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L'analyse multidimensionnelle des données, grâce au développement des premiers ordinateurs, est à l'origine d'une révolution scientifique à la fin des années 1960 et au début des années 1970, dans les sciences Naturelles, dans les sciences sociales et dans les Sciences humaines. Cette révolution a également concerné la préhistoire dans de nombreuses méthodes comme l'analyse stratigraphique, l'analyse spatiale, la typologie, l'identification des faciès industriels, la sériation, mais aussi dans les disciplines associées comme la géologie du quaternaire, la paléontologie humaine et animale (taxinomie), la palynologie et la paléoclimatologie.

The multidimensional analysis of data, thanks to the development of the first computers, is at the origin of a scientific revolution in the late 1960s and early 1970s, in the Natural Sciences, in the Social Sciences and in the Human Sciences. This revolution also concerned prehistory in many methods such as stratigraphic analysis, spatial analysis, typology, identification of industrial facies, seriation, but also in associated disciplines such as Quaternary geology, human and animal paleontology (taxonomy), palynology and paleoclimatology.

Key words: data analysis; prehistory.

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Spatial exploration for dummies – A way to accurately improve archeological and prehistorical investigations

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Archaeological and prehistorical investigations are generally destructive. Over the years, several methodological approaches have been developed to record all the information regarding archaeological artifacts before their removal from the site. One of the main approaches is GIS analysis, which required specific software (often expensive and difficult to use), specific instrumentation (total station) and mostly specific training.

Parallely, archaeological excavation campaigns are didactical labs for graduate and undergraduate students who improve their knowledge of archaeological methodological approaches directly in the camp. This aspect is fundamental for their university education but can be a problem for the archeological excavation because the information gathered by non (yet) specialists can be biased. Indeed, we have observed over the years that several pieces of information are lost or incorrectly reported due to inattention errors. These biased can be a problem for future investigations of the site.

In this context, we propose here a simple solution to monitor and prevent these problems during and after the excavation campaign using simple geospatial exploration.

We used the information gathered from a Late Middle Pleistocene excavation site (Ciota Ciara, Piedmont Italy) which external excavation area has been totally investigated. The excavation methods are classical: spatial coordinates are taken manually for X and Y and with the total station for Z. All the information is reported by hand on a paper sheet and then digitalized each end of the week during the excavation in an Excel database.

In this context, we have at our disposal a conspicuous Excel database, built in more than 10 years, containing the information (i.e. spatial coordinate, type, orientation, inclination) of more than 6000 archaeological artifacts. To highlight and quantify the errors/incoherence in the digitalization of this information in the database, we used a newly developed R shiny app (SEAHORS kindly released by Royer et al. 2023) to perform a quick three-dimensional plot of the spatial position of the artifacts and their general information (SU, square, type).

This exploration has allowed us to: A) easily identify and then correct incoherences in spatial coordinate digitalization (i.e. absence of comma, inconsistency between the attributed square/SU and the X/Y/Z); B) highlight incoherence in the SU attribution (indeed, from an excavation campaign and another, inconsistency can appear in the identification of SU), C) quantified the errors/incoherence of 10 years excavation (less than 5%); D) find solutions to improve the information recording for future excavation campaign.

In another hand, the utilization of this open-source and user-friendly GIS solution (which does not necessitate specific training) has opened up new exploration and research opportunities related to the improvement of the stratigraphical study not only for the Ciota Ciara site but also for the other prehistorical sites under investigation.

Key words: GIS; Prehistorical excavation; open-source solution; archaeological investigation.

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Archaeological Survey in Cross-check challenges, solutions and shortcomings of assemblages' comparison at the time of OpenSource data

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Surface archaeological data are often the most accessible and readily available source of information about past cultural landscapes. In particular, survey is a well-established method for research in Northern Anatolian archaeology, where extensive regional surveys are more common than excavation. Considering this situation, the question about the reliability of modern historiography and archaeological interpretations based on the surface results for this region or other areas with a similar state of research comes to mind.

A possible approach to assess the reliability of surface collections is cross-checking against the subsurface data. The multiperiod site of Oymaağaç Höyük (Samsun, Türkiye), with its long-term multidisciplinary research, started in 2005, offers a solid starting point for this kind of analysis. The large dataset collected at the site in the last two decades is available in the OpenSource MySQL server-based excavation database directly linked to GIS, offering a broad range for comparison against geophysical prospecting, excavation results and artefacts. The database was designed in 2005 at the beginning of the project, and constantly updated according to the different needs of the researchers, providing a highly standardized infrastructure which should have guaranteed homogeneity in the documentation of the massive amount of data retrieved. However, despite such a solid digital infrastructure, several challenges were faced when cross-checking the survey record against the excavation assemblage. For example, choosing a quantification method for comparing the various pottery assemblages recorded by different researchers at different times was among the most complex tasks.

Starting from the case study of the cross-check of the pottery assemblages at Oymaağaç Höyük, this paper aims to discuss the methodological challenges arising when comparing records documented in different periods by different specialists, the importance of a coherent approach to data collection through time and space – especially when disposing of a solid digital infrastructure – and the possibilities and shortcomings of reusing data collected by someone else.

Key words: survey; quantification; digital archaeology.

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Developing ethnoarchaeological research on salt in an EU country (Romania): theoretical challenges

Développer la recherche ethnoarchéologique sur le sel dans un pays de l'UE (Roumanie): défis théoriques

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The 70-80s of the last century marked the introduction of the concept of European ethnoarchaeology into the scientific circuit. The ethnographic analogies invoked to understand the archaeological realities (especially prehistoric) in Europe were no longer to be made with living societies from other continents, but with the archaic communities of different European countries, especially those of S-E Europe. Therefore, the difference between European ethnoarchaeologists who practiced ethnographic analogies from distant spaces and those who practiced ethnographic analogies detected in the European continent became operational. Gradually, European ethnoarchaeology also began in countries located in the west of Europe. Synthesis works on ethnoarchaeology have appeared in Italy, France, Spain, Germany, etc.

Apart from the common elements between American/Anglo-Saxon and European ethnoarchaeology, the theoretical-methodological differences between them must also be discussed. Thus, in most cases, in Europe there is no *longue durée* type continuity between archaeological discoveries and ethnographic realities in the same areas. It is almost impossible to identify situations of structural or material coincidence between the socio-economic context of an archaeological site and that of current communities.

There are, however, some notable exceptions. For example, undoubted analogies were observed between the Eneolithic housing construction system and the current, but increasingly sporadic, rural Romania system outside the Carpathians. The same situation was observed in the case of transhumance from the last century.

An exceptional situation is presented by the ethnographic phenomenon that consists in the traditional exploitation of salt resources in Romania (salt springs and/or salt outcrops). Although a member of the EU since 2007, in Romania the supply of salt water or salt blocks for human and animal consumption, for preserving meat, bacon, vegetables and for therapeutic purposes, etc. is still practiced. Ethnoarchaeological research on salt was decisively stimulated by 3 large-scale exploratory projects funded by the Romanian governments (2007-2019). These also generated theoretical results: the construction of an original radial model for the distribution of salt water and salt blocks, as well as a classification of settlements according to the salt resource used. Taking into account that, according to the 500 ethnographic surveys carried out, the current communities in the intra- and extra-Carpathian space of Romania still practice the supply of salt water up to a distance of at least 30 km, it was possible to build a solid and complex ethnographic reference, without equal in the field of international research in the field. Due to the unit of space, this reference increases the degree of credibility of the ethnographic analogies in understanding the role of the salt springs in Romania, bearing in mind that in the vicinity of some of them, evidence of the production of recrystallized salt has been found since the Neolithic (starting with 6050 B.C.).

The main conclusion, which emerges at the end of these researches, is that, if at the beginning of the 21st century, in the conditions of the abundant supply of salt from the trade, this ethnographic phenomenon is so widespread in Romania, it is difficult to imagine that the prehistoric communities

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would not have resorted to large-scale exploitation of this mineral resource which is essential for human development.

Les années 70-80 du siècle dernier ont marqué l'introduction du concept d'ethnoarchéologie européenne dans le circuit scientifique. Les analogies ethnographiques invoquées pour comprendre les réalités archéologiques (notamment préhistoriques) en Europe ne devaient plus être faites avec des sociétés vivantes d'autres continents, mais avec les communautés archaïques de différents pays européens, notamment celles de l'Europe du Sud-Est. Dès lors, la différence entre les ethnoarchéologues européens qui pratiquaient les analogies ethnographiques d'espaces lointains et ceux qui pratiquaient les analogies ethnographiques détectées sur le continent européen est devenue opérationnelle. Peu à peu, l'ethnoarchéologie européenne a également commencé dans les pays situés à l'ouest de l'Europe. Des ouvrages de synthèse sur l'ethnoarchéologie sont parus en Italie, en France, en Espagne, en Allemagne, etc.

Outre les éléments communs entre l'ethnoarchéologie américaine/anglo-saxonne et européenne, les différences théoriques et méthodologiques entre elles doivent également être discutées. Ainsi, dans la plupart des cas, en Europe, il n'y a pas de continuité de type longue durée entre les découvertes archéologiques et les réalités ethnographiques dans les mêmes zones. Il est quasiment impossible d'identifier des situations de coïncidence structurelle ou matérielle entre le contexte socio-économique d'un site archéologique et celui des communautés actuelles.

Il existe cependant quelques exceptions notables. Par exemple, des analogies incontestables ont été observées entre le système de construction de logements néolithiques et le système actuel, mais de plus en plus sporadique, de la Roumanie rurale en dehors des Carpates. La même situation a été observée dans le cas de la transhumance depuis le siècle dernier.

Une situation exceptionnelle est présentée par le phénomène ethnographique qui consiste en l'exploitation traditionnelle des ressources salines en Roumanie (sources salées et/ou affleurements salins). Bien que membre de l'UE depuis 2007, en Roumanie, la fourniture d'eau salée ou de blocs de sel pour la consommation humaine et animale, pour la conservation de la viande, du bacon, des légumes et à des fins thérapeutiques, etc. est toujours pratiquée. La recherche ethnoarchéologique sur le sel a été stimulée de manière décisive par 3 projets exploratoires à grande échelle financés par les gouvernements roumains (2007-2019). Celles-ci ont également généré des résultats théoriques : la construction d'un modèle radial original de distribution de l'eau salée et des blocs de sel, ainsi qu'une classification des établissements selon la ressource saline utilisée. Tenant compte du fait que, selon les 500 enquêtes ethnographiques réalisées, les communautés actuelles de l'espace intra- et extra-carpatique de la Roumanie pratiquent encore l'approvisionnement en eau salée jusqu'à une distance d'au moins 30 km, il a été possible de construire une référence ethnographique solide et complexe, sans égal dans la recherche internationale dans le domaine. En raison de l'unité d'espace, cette référence augmente le degré de crédibilité des analogies ethnographiques dans la compréhension du rôle des sources salées en Roumanie, sachant qu'à proximité de certaines d'entre elles, des preuves de la production de sel recristallisé ont été trouvées depuis le Néolithique (à partir de 6050 av. J.-C.).

La principale conclusion qui se dégage au terme de ces recherches est que, si au début du XXI^e siècle, dans les conditions d'approvisionnement abondant en sel du commerce, ce phénomène ethnographique est si répandu en Roumanie, il est difficile d'imaginer que les communautés préhistoriques n'auraient pas eu recours à l'exploitation à grande échelle de cette ressource minérale essentielle au développement humain.

Key words: ethnoarchaeological research; salt; Romania.

The use of machine learning in the identification of archaeological sites in the area of the Polish lowland

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In recent years, a rapid increase of remote sensing data that can be used in archaeological research should be noted. These are, for example, high-resolution satellite images or LiDAR based digital terrain models covering the whole area of Poland. Despite the enormous opportunities offered to archaeologists, they are also a great challenge, not only for heritage services, but also for researchers conducting scientific projects. Accurate and thorough analysis of LiDAR data and satellite scenes for large areas requires patience, time and experience, which translates into significant costs in scientific projects.

Machine learning algorithms utilizing neural networks can become a tool to solve the above problems. Building a method that allows for quick mapping of barrows, burial mounds, field remains or other archaeological sites would be a huge improvement in the work. As part of the project “Long houses as a part of the complex cultural landscape. Reconstruction of the Kuyavian settlement network in the second half of V millennium cal. BC with use of the latest remote sensing methods” (National Science Center project no.: 2019/35/B/HS3/02941), we attempted to apply this method in selected test areas.

As part of the paper, we want to show the methodology of work prepared by us, present the results and discuss the effectiveness of the method in Polish conditions.

Key words: machine learning; neural networks; LiDAR.

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Exploration and Web-communication of Archaeological Intra-site Spatial Data with R: the “archeoViz” Distributed and Open-source Approach

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Accurately locating observations is fundamental in archaeological investigation, since archaeological knowledge is built from the spatial relationships determined between the entities recorded during fieldwork. In the history of this recent scientific discipline, the technologies for recording spatial information evolved. They have integrated the use of grid devices and coordinates, then of survey instruments, first analog and then digital, and more recently drones, 3D scanners and photogrammetric technologies. Nevertheless, these intense and long-lasting efforts to make spatialised archaeological data were not counter-parted by equivalent efforts to conserve, transmit and analyse spatial datasets. This situation is all the more problematic since archaeological data, in addition to constituting scientific data, also have a heritage status. They should therefore, in that double respect, be systematically restored to the general public.

The archeoViz software contributes to this problem. It is an open-source web application whose objective is to enable the reuse and public promotion of spatial archaeological data quickly and seamlessly. To do so, rather than reiterate the principle of a centralised platform intended to gather all the information, archeoViz implements a distributed model: released as an R package, users can both use it locally on their machine and deploy static instances of the application on the server of their choice to make a particular dataset publicly available. In addition to the package, a web portal (<https://analytics.huma-num.fr/archeoViz/home>) indexes these static instances. Currently, 39 datasets are indexed, corresponding to ~350 000 viewable archaeological objects and ~10 000 refits. The portal is currently maintained by two persons and the archeoViz users community is animated through a mailing list and a blog (<https://archeoViz.hypotheses.org>). Three objectives are pursued from the coupling of the archeoViz application and its portal.

1. To propose a simple, fast and light spatial analysis tool. archeoViz is not intended to replace more complex software (such as Geographic Information Systems). It is a complementary tool that can be easily and immediately deployed, while allowing to perform essential tasks for any archaeological investigation: generate plans and sections of the distribution of archaeological remains, and perform elementary spatial statistics. Although archeoViz is, by definition an interactive tool, particular attention is paid to reproducibility: interactive visualisation can be exported as stand-alone HTML files, and the R programming code is automatically generated to re-execute the application with the setting currently defined by the user.

2. Encourage data publication. archeoViz and its portal is a data editorializing solution, not publishing solutions. Publishing is not required to use the software; however, it is an incentive to publish, which can be done by using third-party services (Zenodo, tDAR, etc.). archeoViz can then interface with these services; in addition, the metadata of archeoViz instances deployed for specific datasets are aligned with reference taxonomies (geonames, VIAF, PACTOLS, etc.). archeoViz and its portal thus allow the visual restitution of the products of an archaeological excavation for the benefit not only of scientists but also of the general public and the inhabitants of the territories where the research is conducted.

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3. Training in digital archaeology. archeoViz and its portal constitutes a pedagogical resource to train archaeologists in spatial analysis, digital humanities, programming and reproducible research, and open science.

Key words: Data Visualisation; Spatial Analysis; Data Publication; R Programming.

Self-reflexive turn to ontological debates in archaeology

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Given the traditional definition of archaeology as the study of the human past using material remains and objects, archaeological finds have commonly been treated as (inanimate) expressions of human/cultural behavior, creativity, and perception, or as extensions of human thought patterns. The question of how to make this general theoretical statement operational and applicable in concrete case studies, or how to approach material remains to understand the human past, has been at the center of theoretical debates in archaeology for decades. Up to this moment, archaeological theory has mostly been occupied by the issue of archaeological epistemology.

Recently, however, some archaeologists have started advocating for the reorientation of archaeological theory from epistemology to ontology and have accordingly proposed new ontologically-oriented archaeological approaches. In short, they argue that earlier epistemological discussions rest on flawed metaphysical/ontological premises, commonly labeled as Cartesian dualism, and should thus be abandoned as irrelevant. As an alternative, they have proposed new ontologically-oriented approaches, aimed at overcoming Cartesian dualism by replacing it with “an alternative metaphysical orthodoxy” widely referred to as flat (or relational) ontology.

The paper briefly overviews the archaeological approaches closely related to the so-called “ontological turn”. In the final discussion it is argued that the alleged reorientation of archaeological theory from epistemology to ontology, broadly referred to as the “ontological turn” strikingly mirrors the political, technological, and environmental issues and context of the contemporary world, and for that reason, its relevance in archaeological research of the past must be deeply, self-reflexively reconsidered.

Key words: ontological turn; post-humanism; new materialism; post-anthropocentrism; archaeological theory; self-reflexivity.

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Archaeology in the Dawn of Artificial Intelligence

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The confluence of archaeology and artificial intelligence (AI) is on the verge of marking a transformative phase in the study of our past. As we stand at the threshold of this new era, the integration of AI promises to revolutionize how we explore, analyse, and understand ancient civilizations. This presentation delves into the intricate relationship between archaeology and AI, shedding light on the opportunities, challenges, and the unfolding narrative of this synergy.

The advent of artificial intelligence has introduced new tools that empower archaeologists to extract insights from extensive datasets. We aspire to see AI-driven algorithms rapidly sift through archaeological records, decode inscriptions, and reconstruct fragments of history, streamlining tasks that previously required years of manual effort. Should these prospects materialize, these advancements could illuminate the past with unparalleled clarity and facilitate the reconstruction of ancient worlds.

However, with this leap forward come challenges that demand careful consideration. The ethical dimensions of AI adoption in archaeology require scrutiny, ensuring that biases are avoided and the cultural sensitivities of the heritage being studied are respected. The potential shift from human-driven interpretations to AI-generated analyses demands a recalibration of the roles of archaeologists and technology, fostering a harmonious partnership that capitalizes on each entity's strengths.

This presentation embarks on an exploration of ground-breaking AI applications in archaeology, ranging from the visualization and conceptualization of archaeological sites in three-dimensional space to the revitalization of faded texts through advanced machine learning. It contemplates the profound implications of AI in redefining the questions we pose and the stories we unravel from the artifacts of our ancestors.

Key words: Ai-driven algorithms, machine interpretation of the archaeological data, Human-AI partnership.

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Exploring the role of humans in shaping the tropical forests of Southern Palawan, Philippines

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All over the world, conservation policies remain largely based on the concept that there is a dichotomy between Nature and Culture, a vision of the world inherited from the Enlightenment and the Bible. In tropical regions, in order to preserve virtually “pristine” forests, local inhabitants are often evicted and chased from their ancestral lands. Alternatively, many communities are prevented from practicing traditional gathering, hunting, fishing, agroforestry, or shifting slash and burn agriculture as these activities are perceived as destructive by local authorities and international NGOs. Nevertheless, it has been demonstrated by research in archaeology and ecological history that tropical forests on all continents are far from being “virgin” and that past human actions shaped them during millennia. Likewise, several studies showed that biodiversity is higher in areas inhabited by indigenous communities than in national parks empty of humans. In some cases, the eviction of local populations resulted in a complete transformation of the landscape that was supposed to be preserved. In the context of the current ecological crisis, it seems urgent to re-integrate humans within Nature, and to understand better the role of past and contemporary human practices in the shaping of the environments we want to conserve. Archaeology has a major role to play in that endeavor.

Here we will present the Archaeological Mission Palawan in the Philippines. The island of Palawan is a reserve of biosphere of the UNESCO and home to the largest remaining mangrove cover of the Philippines, primary and secondary rainforests, numerous species of sea mammals, fishes, corals, birds, reptiles, land mammals, including dozens of endemic taxa. While mines and monocrop plantations thrive on the island, traditional slash and burn agriculture is demonized as well as the gathering of wild plants by small groups of indigenous people who fear for their survival as the authorities threaten to deprive them of their sources of livelihood. By the means of interdisciplinary excavations conducted with cutting edge analytical techniques and field protocols, we are investigating how the landscape was progressively transformed by past populations during the Holocene and testing the sustainability of local practices in terms of forest resources exploitation, on the scale of millennia. The data generated will constitute a sound basis on which informed conservation policies can be established, that can hopefully combine preservation of the environment and economic development for local communities.

Key words: Traditional practices; tropical forests; anthropization; resources exploitation; millennia

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Session 4-1

What's new in (Paleo)anthropology? - Methodology, concepts and discoveries

SESSION ABSTRACT

The study of the biological aspect of past populations is in constant development and implementation, through the improvement, application, or adaptation of methodologies and most of all by the discovery of new human remains. It is worth noticing that, in recent decades, technological advances in biological anthropology have allowed us to clear some aspects of human evolution and migration. In this context, the UISPP commission "Biological Anthropology" proposes a session that embraces all the anthropological fields of study to maximize the participation of anthropologists from different horizons to stimulate debates and arouse curiosity. In this broad range of topics, a special focus will be given to anthropological studies of Europe's prehistoric populations and migrations from the first peopling until the most recent time. In this sense, we highly encourage graduate students and junior researchers to present their current research to update the anthropologists' community about what is going on in the anthropological sciences.

Main Organiser

Julie Arnaud

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Endocranial morphological features of Asian Homo erectus s.s. Comparison to African Homo ergaster and Georgian Homo georgicus

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The objective of our study is to gather endocranial data to contribute to the understanding of the large morphological variability observed in the Asian Homo erectus.

In order to achieve this, we re-examine endocast of an important Asian Homo erectus fossil record. This will complement our knowledge of the similarities and differences between the continental (Zhoukoudian LC, Hexian, Nanjing) and insular fossils (Sangiran, Trinil, Ngadong, Sambungmacan) of Asian Homo erectus, which show important variations in cranial morphology.

The endocranial results will allow the highlighting of specific characters of the brain of Asian Homo erectus, including an exhaustive description of the encephalic reliefs, vascular imprints of the cranial sinuses and middle meningeal system. All these observations will give very informative arguments concerning the endocranial variability of Asian Homo erectus s.s..

Then, their comparison with Homo ergaster and georgicus hominines samples will contribute to the debate around the 1- definition of the Homo erectus species s.s. and s.l.; understanding and interpretation of its range of variability through time and space.

Key words: Brain; middle meningeal system; Homo erectus; Homo ergaster; Homo georgicus.

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New Late Middle Pleistocene human remains from the Payre site (MIS 7, Ardèche, S-E France)

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The Early Middle Paleolithic site of Payre is located in the Rhône Valley (S-E France). It's a rock shelter formed by the large collapse of a cave at the end of the MIS 6. The stratigraphic sequence has yielded several Late Middle Pleistocene human occupations from the MIS 8 to the beginning of the MIS 5 based on ESR-U series, TL and TIMS. Faunal remains and lithics attested the recurrent human occupation of the cave: evidence of hunting as well as alternation of occupation between carnivores, bears and humans.

Human remains were found in situ between 1994 and 2002 and in 2010 corresponding respectively to 13 teeth, one parietal fragment (Payre 7) and a fragmentary mandible (Payre 15), mostly from the level G (dated by TL around 250 ky, MIS 7). They clearly belong to the Neandertal lineage while maintaining primitive features. It evidences that the fully Neandertal pattern was not yet complete at the end of MIS 8/beginning of MIS 7.

In this paper, we present two newly discovered fossil remains: Payre 16 (a fragment of mandible) and Payre 17 (a fragment of cranial remain) coming from the Ga level identified by a revision of the material.

Payre 16 is conserved from its posterior part of the mandibular corpus (around the M1) to its ascending branch part, corresponding to an edentulous individual based on its state of alveolar resorption process. We observed that this later was completed for the M1 and still in progress for M2-M3. Adding with the loss of alveolar process, reducing the height of the mandibular corpus, we suggested that this individual survived at least a little after the ante mortem loss of his teeth. It suggests that he adapted his eating habits or perhaps get help.

Payre 17, approximately 62 by 55mm, corresponds to the antero-inferior part of a left parietal including the fronto-parietal angle at the intersection of the coronal and temporal sutures whose indentations are perfectly preserved. Its thickness increases antero-posteriorly. The fragment is slightly convex with a diffuse bulge that corresponds to the location of the temporal lines. The internal face shows vascular imprints, the most anterior of which is strongly hollowed out and could correspond to the sphenoparietal sinus which is frequently observed in Neandertals.

The thicknesses of this fragment and the one of Payre 7 (a postero-inferior left parietal fragment including the region of the asteriac angle) are close, not excluding that they could belong to the same individual.

With these two new fossil remains, the site of Payre allows a better understanding of the morphological variability of Middle Pleistocene hominins as well as their means of subsistence and in a way social behavior.

Key words: accretion model; alveolar resorption; Neandertal.

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The earliest presence of Neanderthal in Northwestern Italy. The Ciota Ciara case

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The Ciota Ciara cave (Piedmont, Italy) represents the oldest evidence of the human presence in Piedmont. The site has been investigated since the early 50' and several excavations brought to light numerous Mousterian lithic industries and paleontological material. Among this assemblage, in an unprecise stratigraphical position, three human remains (two teeth and a fragment of temporal bone) have been identified by Villa and Giacobini (1996) as belonging to Neanderthal species.

Since 2009, the University of Ferrara has started a systematic investigation of the site which has contributed to understanding the subsistence behaviors of prehistoric populations in this region. Recent radiometric dating has allowed collocating the site at the beginning of the Middle Paleolithic, a key moment in Europe's evolutionary history. Indeed, this period is marked by the emergence of Neanderthal species, although fossil hominins are rare and present a great morphological variability (most of them are grouped under the taxon *Homo heidelbergensis*). In this complex framework, the difficulty is to determine if human remains present sufficiently marked Neanderthal's derived features to be identified as part of *Homo neanderthalensis* species.

Since 2019, in the Ciota Ciara cave, a total of eight fossil human remains were discovered: seven teeth (two lower lateral incisors, a fragment of upper incisor, a canine, one upper second molar, and one lower first molar) and a nearly complete fragment of occipital bone. Several methodological approaches have been applied to the fossil remains in order to investigate the internal/external morphology and structures (i.e. microCT images).

In this introductory paper, we present the context of the fossil's discovery, the analysis undertaken and the preliminary results of the morphometric analysis of the whole assemblage and their comparison with a reference collection composed of European Middle and Upper Pleistocene specimens. The main aims of the analysis are: 1) to identify through the dental morphology and wear the possible presence of more than one individual, and 2) to evaluate the "Neanderthalisation process" of the human remains to contribute to the discussion about the tempo and mode of Neanderthal lineage development in Europe during the late Middle Pleistocene.

The results of the specific analysis undertaken on the dental remains (i.e. microwear) and on the occipital bone (i.e. endocranial surface configuration) will be presented in two additional and separate presentations.

Key words: Middle Paleolithic; Neanderthal; dental remains; occipital bone; European hominin evolution.

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Endocranial morphology of the occipital bone from Ciota Ciara cave: virtual anatomy and shape analysis

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The evolution of cranial morphology in the genus *Homo* has been characterized by a trend of encephalization. The occipital bone is one of the most studied cranial regions to infer the taxonomic status of human fossil individuals. In fact, genus *Homo* has been characterized by a progressive increment of brain volume and internal occipital morphology seems to record somehow this trend.

Beside the cranial capacity, the external morphology of the occipital bone shows specific diagnostic traits in different fossil human species. During the 2019 excavation campaign, the University of Ferrara research team discovered a total of eight human fossils (seven teeth and an almost complete occipital bone fragment) at the Ciota Ciara cave site, dated to the early Middle Paleolithic.

In this research paper, we present preliminary studies of the inner surface's occipital bone reconstructed by means of Virtual Anthropology. To evaluate the morphology of Ciota Ciara, we compared its shape with a comparison collection consisting of modern human and fossil specimens belonging to *H. erectus*, *H. heidelbergensis* and *H. neanderthalensis*. By applying qualitative and quantitative methodologies, we described the anatomy of Ciota Ciara and we performed a geometric morphometric analysis on the symmetric and asymmetric components by acquiring 13 fixed landmarks and a set of 40 bilateral surface semilandmarks.

The study on the endocranial morphology allowed us to contextualize Ciota Ciara within the Middle to Late Pleistocene variability, to describe and compare the pattern of asymmetry among species. By cross-referencing the results from different analysis, it was possible to demonstrate that occipital morphology is characterized by asymmetry referred to the occipito-petalia, and in a less consistent manner by the Yakovlenian torque.

Key words: Paleoneurology; occipital bone; brain asymmetry; human evolution; Neanderthal.

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Buccal and occlusal dental microwear analysis of the Neanderthal specimens from Ciota Ciara cave (Piedmont, Italy): detecting diet and non-alimentary traces through an holistic methodological approach

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Dental microwear, as defined by P. S. Ungar (2018), is the study of microscopic scratches and pits that form on a tooth's surface as the result of its use. Previous paleoanthropological research has successfully proved that dental microwear analysis represent a powerful tool to get clues about both dietary and para-masticatory traces of past hominin populations.

In this work we have analyzed a sample of seven human fossil teeth, from the Ciota Ciara cave (Piedmont, Italy), recovered in a clear stratigraphic position and dated to the Late Middle Pleistocene: two lower lateral incisors, a fragment of upper incisor, a upper canine, one upper first molar, one upper second molar, and one lower first molar. All the specimens, attributed to *Homo neanderthalensis*, shared an optimal state of enamel preservation that allowed both molds (silicon negatives) and casts (epoxyresin positives), to be replicated with a high level of resolution.

The standard dental microwear protocols were applied on the buccal or occlusal surfaces of molars when possible, since their relationship to diet seems especially direct. The standardized procedure, moreover, includes the use of scanning electron microscopy (SEM), related to fixed parameters and magnification (100x - buccal, 500x - occlusal), to capture comparable images. While on the anterior teeth, images at different magnification have been obtained of different features.

The proposal of our methodological study is to record multiple microwear observations, on the occlusal and buccal surfaces of the sample, using different types of microscopes: Environmental Scanning Electron Microscope (ESEM), ZEISS Axioscope A1 optical microscope, and HIROX KH-8700 digital microscope. The comparison among the observations, based on the equivalence between the magnifications and the horizontal field of view, will reflect potentials and limitations of this approach.

The main objective of the analysis is to provide dental evidences about both dietary behaviors and cultural habits, through statistical analyses and comparisons with a reference collection, adopted by early Neanderthals in this geochronological context and to suggest new improvements of the dental microwear methodologies by strengthening the reliability, comparability and reproducibility when applied to human specimens.

Key words: Dental microwear; *Homo neanderthalensis*; Applied microscopy; Paleodiet reconstruction; Para-masticatory activities.

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Advances in the recovery and study of the Cova Foradà (Valencia, Spain) Neanderthal remains

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Middle Palaeolithic human remains are scarce in Spain and most of them are very fragmented. Here we present the advances in the recovery of a partial skeleton and several human fossils, belonging to several individuals, found at the Cova Foradà site (Oliva, Valencia, Spain). Cova Foradà is a karstic located near to Oliva village in south-eastern of Iberian Peninsula at 3,5 km from Mediterranean coast. Inside the cave there is an extraordinary archeopaleontological site, which is excavated from 1977. It was provided abundant fauna and lithic tools in stratigraphically levels from Upper Pleistocene to Holocene (including Mesolithic and Bronze Age) The anatomical characteristics showed by the human fossils, combined with the Mousterian lithic material associated with the human remains at the site, indicate that they may be attributed to *Homo neanderthalensis*. Finally, the partial skeleton characteristics and taphonomical information allowed attributing to an intentional burial of this Neanderthal population.

Key words: Upper Pleistocene; Neandertals; Burial; Skeleton; Anatomy.

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Evaluation of temperatures during the Middle to Upper Paleolithic transition in Central Italy through stable oxygen isotope analysis ($\delta^{18}\text{O}$) of *Equus* sp. teeth

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Rapid climate changes during the Middle-to-Upper Paleolithic (MP-UP) transition are considered one of the most critical factors of the Neanderthal-Anatomically Modern Humans (AMHs) transition. These phenomena impacted population dynamics, fragmentation of optimal habitats, the deterioration of environmental conditions, and weakened local communities after the severe cold and dry stages. If compared to colder and less hospitable climates in northern and central Europe, the southern European peninsulas have long been considered refugia during periods of rapid climatic change in the Pleistocene. The Italian Peninsula mainly played a key role due to its geographical position (at the center of the Mediterranean) and broad environmental diversity. An accurate determination of the environmental conditions in the MP-UP transition is needed to understand the influential role of climatic change in the extinction of the Neanderthals in this area. In this perspective, evaluations of the high-resolution archives in tooth enamel from anthropogenically accumulated faunal assemblages are a welcome complement to the paleoclimatic proxies from oceanic and ice-core records. Oxygen isotope analyses of skeletal remains ($^{18}\text{O}/^{16}\text{O}$, $\delta^{18}\text{O}$) are a powerful tool for exploring past human-environment interactions and reconstructing paleoclimate and paleoseasonality. Here, we present phosphate-oxygen isotope ($\delta^{18}\text{OPO}_4$) data from the horse (*Equus* sp.) tooth enamel (bioapatite) from the late Mousterian, Uluzzian, and early Aurignacian find levels at the archaeological site of La Fabbrica Cave, Italy. Based on the relationship between obtained $\delta^{18}\text{OPO}_4$ of bioapatite, body water, local precipitation, and air temperature, these data have been used to estimate paleoclimatic conditions in different cultural phases during the Neanderthal/sapiens transition. Sequential oxygen isotope measurements of enamel bioapatite phosphate ($\delta^{18}\text{OPhos}$) formed complete or partial sinusoidal curves with summer (high temperature) peaks and winter (low temperature) troughs for teeth being studied. $\delta^{18}\text{OPO}_4$ values were then used to calculate $\delta^{18}\text{O}$ of local environmental water and mean annual air temperature (MATs) during the aforementioned phases of MIS3.

This approach overcomes the problem of the scarcity of climatic information on short time scales in archaeological sites due to uncertainties in the chronometric dates, by providing a direct estimation of mean air temperature at the precise time of their occupation.

Key words: Paleoenvironments; Oxygen Isotopes; Climate Reconstruction.

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Starch4Sapiens: why expanding the foodscape was key for Homo sapiens colonization of northern latitudes

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The viewpoint that holds the reasoning of this presentation is based on the entanglement of the biological and behavioral traits that contributed to the successful colonization by Homo sapiens of the northern latitudes during the MIS 3 (65-25 ka), and then the rest of the globe.

Starch4Sapiens novel approach is multidimensional and combines bioinformatics, paleoanthropology and functional analysis on ground stone tools, hence integrating information that are at the basis of human dietary adaptation.

Bioinformatics analyzed the CNV trend of several genes i.e. AMY1A/B/C, SULT, MUC7 among others, among the publicly available genomes of the hominins roaming across Eurasia during MIS 3. The result is a strong indication that an adaptive force acted on the duplication of these genes in the archaic populations, modifying the capacity of the metabolic process with consequences on dietary habits and adaptation to different life conditions.

Ground Stones Tools functional analysis combined the conventional microscopic imaging with use-related residues chemoprofiling, finally compared with the actualistic reference collection of starch-rich plants that enabled us to gain unexpected insights into the transformative potential of macro-lithic tools as directly involved in the transformation of plant starch-rich storage organs.

We are here presenting those traits related to the efficient access to dietary carbohydrates like a pool of genes involved in starch metabolic pathways, the recognition of ground stone tools used for starchy plants mechanical processing in EUP sites and an overview of dental features and pathologies putatively relate to sugar-rich foods.

Key words: Dietary carbohydrates; Bioinformatics; CNV trend; Groundstones; Starchy organs.

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The impact of the Mesolithic – Neolithic transition on mandibular morphology in western Iberia

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Farming and animal husbandry were first developed in the near east about ~10000 BCE and were subsequently introduced throughout Europe by migrating populations via two main routes: into central Europe via the Danube and in southern and western Europe via the Mediterranean, thus reaching western Iberia by no later than 5500 BCE. This

Transition from Mesolithic foraging to a Neolithic agro-pastoralist mode of subsistence involved profound changes in the patterns of settlement, material culture, economy, diet, health and morphology of the populations involved. Notwithstanding the myriad of existing studies documenting such changes, only one previous study has examined the impact of this transition on mandibular morphology in Iberia with a limited sample. In that study, differences in mandibular shape between Iberian Mesolithic foragers and Chalcolithic agro-pastoralists were found, but it was not possible to assess the timing of the changes identified.

In this study, we examine the impact of this transition in western Iberian mandibular morphology by comparing a large sample of 100+ mandibles that includes Iberian specimens spanning chronologically from the Mesolithic to the Chalcolithic, and also Chalcolithic specimens from the southern Levant. This allows examining the impact of this transition on Iberian mandibular form and also the relationship between Iberian and near Eastern populations. Mandibles were digitized using CT and surface scanning.

Fragmented and incomplete specimens were reconstructed virtually, and morphological analysis ensued using Geometric Morphometrics. Dental wear magnitude was also quantified using the ordinal scale of B. H. Smith (1984). Previous studies show genetic discontinuity between Iberian Mesolithic and Neolithic to Chalcolithic populations (despite some degree of admixture), along with decreased dental wear. We, thus, expect meaningful morphological differences between Mesolithic Iberian and Chalcolithic southern Levant samples, and an intermediate form of the Neolithic – Chalcolithic samples when compared to the previous populations.

As predicted, the Iberian Neolithic – Chalcolithic specimens are indeed morphologically intermediate between the significantly different Iberian Mesolithic and southern Levant Chalcolithic populations. Dental wear was most severe in the Iberian Mesolithic, followed by the southern

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Levantine Chalcolithic and then the Iberian Neolithic – Chalcolithic samples. Altogether, our results suggest the Iberian mandibular morphological changes arising in the transition from Mesolithic foraging to Neolithic – Chalcolithic agro-pastoralism were mainly driven by population history and, to a lesser extent, by feeding mechanics.

Key words: Bioanthropology; form; geometric morphometrics; population history.

Hunter-gatherer Occupation on the South-eastern corner of Sundaland during the Terminal Pleistocene-Holocene: A dental perspective

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Sundaland is a landmass influenced by tectonic and sea-level fluctuations during the Pleistocene. Song Gede site (SGD) in Nusa Penida Island is a strategic dwelling cave occupied since the Late Pleistocene, located on the south-eastern corner of Sundaland towards Wallacea. This study aims to recognize the history of human occupation and adaptation during the transition of Pleistocene-Holocene in the area based on dental records. This work characterizes two-second lower molars using comparative morphology (ASUDAS), BL and MD measurements. We test its similarity and differentiation by metric and non-metric statistics analysis to put them among prehistoric and recent *Homo sapiens* samples from Indonesian archipelago. The result shows that SGD (48) and SGD (16) are closed to AMH and Preneolithic population, also affiliated to recent Australo-Melanesian. Both identical molar morphology shows the same population inhabited Song Gede for an extended period. SGD (48) dated back to the Late Pleistocene (18 Ka BP) was developing the hunting-gathering subsistence of terrestrial fauna, i.e., Cervidae, Bovidae, and Suidae. In contrast, SGD (16) from the Mid Holocene (5.373 ± 28 CalBP) shows significant buccolingual reduction, which probably indicates a diet change to aquatic sources that stimulate local adaptation and evolution in the insular context. This information gives an overview of human biological adaptation on the edge of Sundaland, across the Wallacea during Terminal Pleistocene to Holocene.

Key words: Sundaland; Terminal Pleistocene; Preneolithic; human adaptation; teeth.

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New Perspectives on sex identification from human cranial morphology

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The study of sexual dimorphism from cranial bones has a long history in physical anthropology. However, traditional methods have encountered persistent challenges that hinder accurate assessments. Besides sexual dimorphism, cranial morphology is influenced also by different factors such as ancestry and adaptation to a variety of environmental variables. In this study, we compare the results in detecting sex by using two different methodological approaches: geometric morphometrics on landmark and semilandmark data and neural network on linear measurements. The geometric morphometric sample consists of 228 sex-known individuals (112 females and 116 males). The neural network includes a training set (Howell's dataset: 82 craniometric measurements on 2524 human crania from 30 populations) and a testing set (UT Forensic dataset: 36 craniomandibular variables on 1396 individuals of mixed ancestry).

The geometric morphometric approach identifies the glabellar and supraorbital regions, mastoid processes, and nasal regions as the most dimorphic traits in the human cranium. When these traits are analysed together, classification accuracy is close to 80%. The neural network analysis on linear measurements achieved 86.7% of accuracy through rigorous cross-validation and 84.3 on external datasets unrelated to the training and validation phase. These two innovative approaches represent a significant contribution to the development of a robust and reliable method for sex estimation based on cranial shape and metric traits. By addressing the limitations of previous approaches and providing a population-inclusive protocol, our study offers an invaluable resource for anthropologists seeking an accurate determination of an individual's sex based on cranial morphology.

Key words: Anthropology; Sexual Dimorphism; Geometric morphometric; Neural Network Analysis.

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Advancements in the study of cranial cavities: R-based open access tools

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In the last decades, thanks to the use of techniques of digital acquisition (e.g., CT scan, MRI), the analysis of human remains has become more effective and not invasive. The detailed observation of the inner structures of bony elements has been made easier, and the power of analysis has increased. One rather recent output is the increased interest in the inner cavities of bones, which can nowadays be observed without any kind of risk for the specimen (e.g., dissection) in their entirety. This is particularly true with the cranium, with its complex, pneumatized structure, and several cavities reflecting functional demands and/or evolutionary constraints both with their morphology and spatial relationship with the bone. The virtual study of the cranial cavities is mostly based on segmentation, i.e., the individual labelling of the areas of interest on each image of a scan series [1]. Although effective, segmentation is very time-consuming and error-prone [2]. Recently proposed semi- and automatic methods, compared to manual segmentation, have overcome these issues in terms of precision, repeatability, and time required. Some of these are open-access tools developed in the R environment and thus available both to use and implement, all embedded in the R package for geometric morphometrics and virtual anthropology “Arothron” [3]. They can either compute the automatic extraction of the assemblage of inner cavities along to cranial external surface only (CA-LSE) or the semi-automatic extraction of single cavities (AST-3D) [4]. On the other hand, the automatic extraction of the brain endocast (endomaker) [5] or any of the other cavities (Icex) [6] can be performed in addition to the calculation of their volume. Here will be presented their application, in particular the most recent advancement in the automatic extraction and volume calculation of the cranial cavities, Icex, which found further application in the study of human craniofacial growth. The versatility and simplicity of use, as well as their open access, facilitate the application of these new tools on large digital datasets and provide an enhancement in both quality and quantity of data on bony cavities freely accessible by the scientific community.

Key words: endocast; R; virtual anthropology; nasal cavity; paranasal sinuses; segmentation.

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Mandible-3D: A suite of novel computational procedures for morphological analysis of hominin mandibles

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The mandible is of great importance from the paleoanthropological perspective. This is due to both its resilience, supporting its overrepresentation in the fossil record, and to its complex morphological structure, rendering it a valuable source of information for taxonomic, phylogenetic, and functional questions. This importance is especially significant to chrono-spatial clusters in which the paleo-genetic approach cannot be employed, such as the Middle Paleolithic Levant.

Currently, descriptions and comparisons of mandibular morphology mostly rely either on qualitative subjective descriptions, or on manually placed landmarks-based geometric morphometric methods, both of which bear some inherent disadvantages. The following presentation describes an ongoing project aimed at developing a new computational approach to morphological analysis of hominin mandibles. This approach is focused on automatic, objective and high-resolution extraction of informative features from 3D models, based on inherent characteristics and using the geometry of curves and surfaces.

In the following presentation several newly developed analytical tools will be presented. These include four independent measurements of asymmetry, based on the distributions of the directions of normal and radial vectors, as well as a spatial examination of reflection. The 2D projection of each hemimandible onto the symmetry plane is used for automatic extraction of informative landmarks, based on the outline's tangent and curvature. These two features are combined to provide a consistent automatic and objective positioning of the specimen, providing the basis for the extraction of additional features such as distance measurements and angles. In addition, the positioning supports the extraction of outline curves of the transversal and an objective reorientation of the coronal sections in accordance with the specific geometry of the mandibular body. Another objective procedure is used to identify and extract geometric information concerning the mental and mandibular foramina. A special focus will be given to an automated procedure for extraction and compact representation of the 3D curve delineating the sigmoid notch and the head of the condylar process. This curve is expressed mathematically as a modified Fourier series and analyzed in terms of its curvature and torsion, a novel approach which in turn can be associated with various biomechanical aspects. This proof of concept is aimed to exhibit the potential of custom-tailored computational solution of comparative morphological analyses. These methods will be demonstrated using a case study of Middle Paleolithic and modern hominin mandibles from the Levant and beyond.

Key words: Mandible; Morphology; Computational analysis; 3D.

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Toothnroll an R package for virtual unrolling and morphometric maps of tooth tissues

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Due to their relative abundance in the fossil record, teeth have been widely described using 2D and 3D virtual imaging methods. Teeth are often used as a good proxy for inferring taxonomic affinity and functional constraints due to their shape, which is influenced by genetics and mastication mechanics. To a lesser extent, the external morphology of dental roots of anterior and postcanine dentition has also been described in extinct and extant hominoids. Size and shape of tooth roots have been used by some authors as a proxy for taxonomical comparison in human and non-human primates. In this communication, we describe the functionalities and application of a new R package, Toothnroll, specifically designed to build morphometric maps of enamel and dentine thickness. Here we present the functions of the package applied on a single rooted tooth (a modern human canine, specimen 5929 from The Pretoria Bone Collection). The tomographic data has been manually segmented using the software Avizo to define the material of dental tissues (enamel, dentine and pulp). The required input consists of 3D meshes of dental tissues, and the outline (anatomical and geometric points) on the enamel-dentine junction. Toothnroll is fully customizable and includes an R function (ToothAlignment) to perform a virtual alignment of the model. The position of the axis origin is the centroid of the cervical outline. The ending point is the i) tip of the root if the aim is to analyze the root and ii) a fixed landmark on the dentine tissue if the operator analyzes the crown. Subsequently, the 3D meshes are virtually cut by using perpendicular planes to the dental length axis. Cross-sections are extracted along the selected interval and the dental tissues are converted into equiangular semilandmarks. The set of data is used as input to unroll the tooth tissues in order to create 2D/3D color maps. Furthermore, specific functions are available to calculate dental volumes, the shape of dental enamel junction and cross-sections along dental tissues beside the application of principal component analysis on multiple individuals.

Key words: human evolution; R package; virtual anthropology; dental morphology.

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Age Estimation of modern humans based on dental eruption and mandibular formation a geometric morphometric approach

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Dentition can provide an important indication of age, health, and developmental disorders of an organism and thus is widely used in paleo sciences for skeletal identification. However, traditional methods of estimating age based on dental eruption involve subjective assessments of tooth development and can be prone to error. In this study, a geometric morphometric approach has been developed and tested to predict age with greater accuracy than traditional methods. The study focuses on the correlation between the permanent teeth eruption (from crown completion to its eruption) and the modification in the mandible shape. Using two three-dimensional landmark configurations, the osteological features of the mandible and mandibular dentition (incisor, canine, premolar and first molar only) have been tracked on individuals from age 4 years to 14 years separately. Principal component analysis of the morphometric data is used to identify the groups of individuals based on mandibular form variation and dental growth pattern. The covariation between the developing teeth and mandibular form is then observed through linear regression. The main aim of the study is to identify the maximum correlation between phases of dental formation and mandibular alteration. The benefit of this research is to test the protocol in a well-known reference collection (in terms of sex and age-at-death) in order to be able in the future to apply the same protocol to fossil remain and then have better accuracy in age-at-death determination.

Key words: dental formation; mandibular morpho-variation; geometric morphometrics; age estimation; principal component analysis.

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New and standard approaches to cranial integration during ontogeny

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Integration refers to the coordinated change of morphological traits in anatomical structures. In this context, a region exhibits modularity when it demonstrates a higher level of within-region integration compared to between-regions. Modularity and integration are often explored in studies of cranial growth and development to better understand the underlying driving forces and hierarchies of interactions that lead to cranial variation in adults. However, despite the large number of studies on integration and modularity, it is challenging to compare and generalize results due to the partially arbitrary definition of a priori modules. Indeed, the same cranial modules have been defined, in literature, in a variety of ways in terms of their boundaries and structure, which complicates comparison between studies.

To address this issue, we conducted an experiment comparing analyses derived from a priori anatomical modules versus a cluster analysis approach during ontogeny. Using a set of 88 landmarks and 250 semilandmarks, we first divided the cranium into three a priori modules (cranial vault, face, and base), as described in literature. We applied this division to an ontogenetic dataset of 70 individuals ranging from 0 to 15 years old, and tested and visualized their integration using Partial Least Squares (PLS). We identified the variance/covariance ratios, comparing covariation patterns among the three cranial regions at different age stages.

Next, we used a cluster approach to overcome the limitations of using a priori anatomical modules. For each semilandmark, we selected a cluster of the 20 closest semilandmarks and performed a 2-block-PLS against the rest of the semilandmark configuration, after running an individual Generalized Procrustes Analysis (GPA) for each block. We repeated this operation for all semilandmarks and plotted a colour map to represent the average covariation strength for each semilandmark. We repeated the operation for progressive age categories and compared the results.

Our PLS results using a priori modules indicate that the cranial vault-cranial base pair shows the highest degree of covariation in the early postnatal stages, which decreases significantly during later ontogeny. All covariation values converge progressively for the vault-base, vault-face, and face-base pairs during later development. The variance/covariance ratios suggest that a smaller percentage of the cranial vault and base is explained by their covariation with the face in the early stages, further supporting the idea of a modular behavior of the neurocranium in early stages.

Cluster analysis using a colour map at different ages suggests different modules from those classically defined. The nasal cavity, among all others, behaves in a strongly modular way throughout all development, particularly during adolescence. The neurocranium, after an initial modularity stage, behaves progressively in a more integrated fashion, with the exception of some possibly dimorphic traits, such as the mastoids and glabellar region, which retain a significant degree of modularity during adolescence.

Key words: Cranial Modularity; Integration; Covariation; Cluster Analysis.

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Session 5-1

Understanding connections between mines and other archaeological contexts

SESSION ABSTRACT

Understanding connections between mines and other archaeological contexts, procurement of flint, radiolarite and other extracted raw materials was an important economic asset and played a significant socio-cultural role amongst Pre- and Protohistoric societies. The attractiveness of raw and processed material from subterranean resources is illustrated by their long distance distribution, along with the variety of archaeological contexts they are recovered from, including settlements, burials, pits, caches, enclosures, etc.

How to interpret the discovery of those elements within various archaeological contexts and sites? Moreover, how could the discoveries of domestic or mortuary items in the vicinity of the mining site allow archaeologists to identify and characterize the communities involved in the extraction or processing of raw materials? Regarding the two previous topics, how to use the local and distribution data to interpret the social, cultural, economic, or territorial landscape of past societies without an overreliance on comparative ethnography?

The organizers wish to broaden the discussed topics to all types of knappable rocks and very early metal (i.e.: copper) during Pre- and Protohistory dependent that:

- the focus is put on the identification of communities involved in the extraction and/or processing of underground resources;
- the focus is put on the interpretation of the same category of artefacts found in various contexts.

Main Organiser

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Connection between mines: Middle Belgium at the turn of the 5th and 4th millennia

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Over the past 20 years, decisive developments have enabled us to clarify the circulation of mining products from extraction sites in Middle Belgium, divided into three complexes: the Mons Basin, the Hesbaye and Limburg.

More recently, a global approach of the first two has highlighted the structuring of mining activity since the late 5th millennium (Michelsberg Culture), based mainly on site complementarity, restricted access to the most crucial deposits as well as to specific knapping skills. The similarities between the Mons Basin and the Hesbaye raises a simple question: what if the technical and structural specificities associated with the mines and lithic products (large blades, large axes, etc.) were the manifestation of connections between mining complexes?

Key words: Neolithic; flint mines; mining complexes; Michelsberg; distribution.

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The mining complex of the Saint-Gond Marshes region (Marne, France): diffusion of mining productions in local collective burials during the Late Neolithic period (3650-2900 cal. BC)

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The Saint-Gond Marshes region (Marne, France) is an important mining complex which includes 43 excavated or surveyed Neolithic sites including 19 necropolises gathering 128 hypogea, 5 gallery grave, 7 flint mines, 8 earthfast polissoir and 4 settlements (Martineau et al. 2014, 2015, 2019). signs of Neolithic sites have been detected, including 59 mining signs grouped in 18 sectors covering a total of 440 hectares located on chalk and limestone hillsides, and more than 160 signs of settlements or knapping workshops. Some of these flint mines date from the Late Neolithic (3650-2900 cal. BC). For fifteen years, a research program (directed by Rémi Martineau) has been set up in this region, which corresponds to an area of approximately 20 km by 10 km. The objective of this program is to reconstruct the societal, economic, and territorial organization of Neolithic societies. It is a matter of studying the links between the occupations, the exploitations of the flint and the collective burials.

Geological surveys have been carried out in the region for more than 10 years. The lithothèque thus constituted contains nearly 200 samples which document in a very precise way the regional siliceous materials (Imbeaux et al., 2022a). The definition of the sedimentary facies of the flints of the Saint-Gond Marshes region was realised on the basis of samples from this lithothèque (Imbeaux et al., 2018; Imbeaux et al., 2022b). The lateral and stratigraphic variation of the sub-facies of the "Saint-Gond" facies has been mapped throughout the territory. This very detailed cartography makes it possible to define different mining sectors within the Saint-Gond Marshes region and whose productions are identifiable in the archaeological corpus. The study of the lithic corpuses of the hypogea of the region has made it possible to identify the local supply sectors of the populations buried in these sites (Imbeaux et al., 2018; Martineau et al., 2023).

Thanks to these fundamental results, it is possible to estimate the sectors in which flint mines were established in the Late Neolithic. It is also possible to identify the groups of people who have exploited them and/or who have received their productions. These results are part of a global framework of study of the Neolithic period in the region of the Saint-Gond Marshes region whose spatial, anthropological and material culture studies demonstrate concrete links between the populations buried in the hypogea and the mining activities (Martineau et al., 2023). These many works thus make it possible to discuss the economic and societal organization of a micro-territory in the Late Neolithic around flint exploitations. Different local communities can be suggested through the reconstitution of networks for the dissemination and exchange of mining productions. Indeed, diffusion limits of local siliceous materials can be established within the Saint-Gond Marshes region, which raises new research perspectives for understanding the organization of mining territories during the Neolithic period in France. To advance on these questions, new excavations of mines and settlements from this period are planned.

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Key words: flint mines; Neolithic; flint sedimentary facies; diffusion networks; hypogea.

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The wider environs of the Early Neolithic flint mines of southern England

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The southern flint mines date to the very start of the British Early Neolithic period, c. 4000 cal BC. Traditionally, studies on the mines have focused on the extraction horizon, including mineshafts and galleries, whilst little research has been carried out on the wider mining environs. This talk will present the results of research on a group of flint mines located in Sussex, including geophysics, analysis of flintwork assemblages, new radiocarbon dates, and assessment of material from other contemporary Early Neolithic sites. The presentation will expand the study of flint mining beyond the immediate mine workings and into the wider mining landscape, connecting mines to communities. It is proposed that flint mines were pivotal monuments to the creation, development and spread of nascent Early Neolithic practices and cultural identities from the very start of the period in southern Britain.

Key words: Flint mines; Neolithic; British Isles; Communities.

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Relationship between the settlements and the outcrops in the light of the extraction, exchange, and use of obsidian

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The exploitation of siliceous rock deposits played an important role in the everyday life of prehistoric communities, both in the economic dimension and in the social context. Raw material from the outcrops, generally in processed form, was a subject of conveyance (exchange) between mines, workshops, settlements and regions. Repeatedly in multiple directions and over long distances. Sometimes even transported over a distance of several hundred kilometers.

Obsidian sourcing, using and distributing studies have been conducted in various parts of the globe for over a century. This product of volcanic activity, due to its outstanding physical properties and aesthetic qualities, was widely used by prehistoric communities. A project on the sources and use of obsidian by Neolithic communities in Poland is underway, funded by the National Science Centre, grant no. 2018/29/B/HS3/01540.

There are no natural outcrops of obsidian in Poland therefore all artefacts made of volcanic glass were the subject of conveyance in the course of various forms of contact between prehistoric communities. In Poland, we know of over 150 Neolithic sites with the presence of obsidian artefacts, all together around 3000 items. According to geochemical analyses, undertaken so far, the most important is obsidian chemical type Carpathian 1. The outcrops are located in south-eastern Slovakia. It seems that it was the most important type of this raw material for prehistoric communities in East-Central Europe.

During the presentation, an attempt will be made to illustrate where, how and by whom obsidian was extracted. In addition, the diversity of its occurrence in the archaeological context will be demonstrated, along with the variety of forms in which it occurs in lithic inventories.

Key words: obsidian; exchange; mining; Neolithic; Poland; East-Central Europe.

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Modelling the human–lithic resource interaction in northern Hungary during the Stone Age

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The procurement of lithic raw materials was a key question for human groups and societies during the Stone Age. Studying this aspect of Prehistoric human life is a complex socio cultural problem. Former studies in Hungarian archaeology applied a provenience approach aiming to link archaeological sites with siliceous rock outcrops based on petrographic analytical identification. However, Prehistoric people weighed a range of factors against each other when deciding about the utilization of lithic raw materials, such as the availability and accessibility of outcrops, the exploitability of the sources, the appropriateness of the raw materials. Taking into account this, we study the relationship between human groups and the world surrounding them with a palaeoethnological approach. In Northern Hungary, the mountainous range, belonging to the inner Western Carpathians, is dominantly built up from Mesozoic and Tertiary rocks of sedimentary and volcanic origins, containing different types of siliceous rocks. Its foothill regions, especially the Mátralja and the Bükkalja areas, are rich in human occupation sites from the Stone Age. As a result of field surveys and archaeological analyses, we built up the occurrence–source–archaeological site (OSA) model which helps to describe the interaction between siliceous rock resources and humans. Using this model, a diachronic tendency can be sketched with cultural changes in Northern Hungary.

Key words: raw materials; technical behaviour; outcrops; sources; Mátra Mountains; Bükk Mountains.

Note: The project is financed from the NRD Fund (K 124334).

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Siliceous raw materials of the Udorka Valley region (Kraków-Częstochowa Upland, Poland) and their use, on the example the Late Palaeolithic site in Kleszczowa 9, comm. Pilica, Silesian voiv

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The Udorka Valley region is located in the central part of the Kraków-Częstochowa Upland (southern Poland). This region seems extremely attractive in terms of living conditions for hunter-gatherers and early farmers. It offered some dwelling places (e.g., caves), high hill tops allowing a wide field of view, and many varieties of siliceous rock outcrops located close to the archaeological sites.

The authors want to present the use of local siliceous raw materials by the communities of the Magdalenian culture on the example of the Kleszczowa 9 site, comm. Pilica, Silesian voiv. The technological analysis of the products confirmed that this site is related to the advanced phase of raw material processing, with artifacts typical of the Magdalenian culture. The raw material selection was very diverse and is directly related to the site's location in the vicinity of several outcrops of good quality flint. The raw material analysis showed that the so-called chert from the Barańskie Mountains and chocolate flint were particularly appreciated and used to produce blades and tools.

A multifaceted analysis of the inventory from Kleszczowa allowed for a complete characterization of the site and its comparison with other Magdalenian sites in Poland. The speech will address the issue of the potential distribution of raw materials from the Udorka Valley area in Late Palaeolithic and the information that a researcher can obtain from this data.

The analysis of the distribution of the raw material in the Stone Age is, among others, the main premise for tracking the routes and directions of migration of prehistoric communities. The location of the Kleszczowa 9 site is directly related to the resource management of very good quality flints, and the region of the Udorka Valley could have played a role in the communication routes of the Magdalenian communities. Determining the scale of use and the role of good quality raw materials from the middle part of the Krakow-Częstochowa Upland may help determine the relationship between the Magdalenian sites in Poland and the neighboring areas.

Key words: siliceous raw materials; distribution; Late Paleolithic communities; southern Poland.

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An integrated landscape analysis of bedrock quarries and their related habitation sites, Western North Carolina

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Seniard Creek Mountain, Pisgah National Forest, North Carolina, U.S.A., supports a high elevation, quarry landscape on ancestral lands of the Eastern Band of the Cherokee Nation. The site consists of 20 acres of uplands occurring at elevations of 2800-3200 AMSL, on slopes exceeding 50 °to 65°, and underlain by the Proterozoic Ashe Metamorphic Complex. This unit bears several lithic raw materials; namely quartzites, quartzes, ultramafic serpentinites.

Quartz quarries occur in two groups, one situated at higher elevations (upper boudinage apron), and additional outcroppings at lower elevations (lower boudinage apron). Considerable numbers of flaked and ground elongate objects have been discovered. The objects are tapered and there are several types; namely conical, as well as plano- and bi-convex forms. The objects are thought to represent quarry picks (Holmes, 1897).

Throughout the landscape, numerous vacuoles are visible along the outcrops and show signs of heat treatment. Associated with the declivities are hammerstones which are ground and flaked, fashioned from a coarser grained quartz from the upper boudinage apron. The hammerstones are often rubified and vitrified, indicating repeated episodes of heating; and are also ground and resharpened between rounds of reheating. The application of heat treatment and curation signals highly organized quarry activity.

Throughout the lower boudinage apron, masses of coarse grained schist are visible. Based on studies at similar quarries (LaPorta, 2014), elongate, splinter shaped, and tapered fragments of schist are inferred to serve as pry bars and spatula-shaped digging tools. As the schist objects are relatively soft, they may have served as wedges that could be driven into joint surfaces, permitting expansion of the rock during freeze-thaw processes. This plug and feather will cause boudinage to burst during periods of prolonged exposure, increasing accessibility for extraction (LaPorta, 2000, 2016). This activity (late Autumn-early Winter) invokes a seasonality to the quarry extraction process (extraction would take place in the Spring) (LaPorta, et al., 2019).

Tools such as bifacially flaked cores, conical, block and polyhedral cores, as well as abraders, scrapers, flakes, perforators, adzes also occur in abundance. There are several types of adzes, suggesting a specialization towards woodworking practices. The presence of this population of stone tool suggests that the quarries may be locations of a broad spectrum of subsistence related activities (Bryan, 1950; Chappell and McBride, 1957). Evidence suggests that the quarry serves as a source of a variety of raw materials required by lithic based economies (LaPorta, 2004). Furthermore, the anthropogenically altered landscape slowly evolves into a political reference point, or frontier boundary (Hampton, 1999; Pétrequin and Pétrequin, 1993); as well as a place of ritual life and prayer (Barber et al., 1999; Hampton, 1999; LaPorta, 2004; Pétrequin and Pétrequin, 1993; Topping, 1997).

The duality of the quarry, the practical and the spiritual, indicates prolonged stays by visiting groups and the potential for specialized or ritual reuse (LaPorta 1996). Discovery of zones of

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cassiterite/rutile and possibly other localized mineral resources, and their presence in quarry backfill piles, hints to the possibility of “the giving back process,” (Uhla Nass of the Towanda Lenni Lenape, 2004, personal communication) which appears to be universal among Native American groups (Hampton, 1999; LaPorta et al., 1994; 2014).

Key words: prehistoric quarries; quartz; soapstone; boudinage; National Forest Service.

The petrofabric constraints on the development of pick and adze quarries in North Carolina

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Seniard Burn prehistoric quarry site is a high elevation (2800-3200 AMSL), steep slope (50-60%) landscape exposed by forest fires and logging enterprises. Quarries are situated within the Dunsmore Creek quadrangle, North Carolina. The area is underlain by the Proterozoic Ashe Metamorphic Suite, bearing chlorite/anthophyllite and chlorite/magnetite schists, micro-pegmatite, meta-pellite granulite facies; including migmatites and rocks of tronjhemitic affinity (hydrated ocean crust). The study area lies west of the Brevard Fault Zone.

Prehistoric quarries are developed within two aprons of deformation features bearing rods, mullions, and block boudinage; all rolled into a ductile, coarse grained, biotite/magnetite-bearing schist. Biotite foliation dips steeply to the W-E, N-S trending limbs are often overturned, and hinges are fault-bounded. Boudins are of two compositional types; meta-quartzites and mylonitized quartz veins. General bearing is 230°-285°, and both aprons porpoise gently, and are open to the west, where they are aligned with the regional lineament of 240°-270°. Quartz boudinage structures support areas of greater relief in the southern part of the study area, which is underlain by deeply weathered schists.

Preliminary excavations revealed two well-defined quarry tool and instrument types. These include large (10-15 kg), flaked, ground and vitrified extraction instruments; as well as elongate spatula-shaped objects with tapering edges. Quarry backfill piles abound in these two classes of objects. The first class has been interpreted as impact objects, fashioned from quartzite boudinage of the upper boudin apron. The second class of instruments are coarse grained biotite-schists and have been inferred as pry-bars employed as plug-and-feather wedges. Throughout the quarries, declivities exist where large block boudins were extracted. Many of the rock outcrop surfaces are rubified from repeated firing.

Quarry products include two classes of stone tools; varieties of adzes, and a range of picks. Four types of adzes exist; including elongate tapering plano-convex, bifacially flaked, rectangular to square tablet-shaped, and elongate tapering flaked lozenge-shaped. The picks are elongate, spatula-shaped, flaked and ground; thin, tapering, bifacially flaked; large and small percussion; and cylindrical flaked, ground and tapered.

Quarry backfill produces bifacially flaked objects, unifacial scrapers, flakes, and boudinage fragments. Analysis suggests that quarry tools are designed from a template, baked in the fabric of the various boudinage structures. Remnants of boudinage surfaces remain on resulting artifacts. The objects are fashioned along the long axis of the boudins, and flaked within the direction of foliation present in the original boudin.

Approximately 5 km southwest of the quarries, occurring at a lower elevation (1000-1500'), is an irregular swath of ophiolites, including hydrated tronjhemites. The rocks are weathered to a steatite/talc composition and the region supports several soapstone quarry complexes. Stream beds transecting the quarries contain quartz, quartzite, and mylonitized quartz picks. It is hypothesized that the quartz picks

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originate at the higher elevation quarries. Situated in close proximity to the steatite complex are habitation and subsistence-related sites; such as fish weirs and burials. At the junction of the Mills' Creek drainage, a petroglyph was discovered. The petroglyph may represent a partial map of the region, and/or a sign post to the high elevation quarries. Mass spectrometer analyses will differentiate quartz picks, and cosmogenic isotope analyses create an age-relationship to the steatite quarries.

Key words: prehistoric quarries; quartz; soapstone; National Forest Service.

Investigating possible links between Holocene environmental changes and cultural transitions across India

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Microblade technology in the Indian subcontinent has been observed as a marker of early modern human arrival. Microblade technology requires specific reduction strategies and cognitive and dexterous skills to manufacture. Due to the absence of required hominin fossil remains in the subcontinent, the study of these lithic tools provides crucial information about Prehistoric people, their behaviour, cognitive development and technological skills. The current research aims to access technological changes in Microblade production to understand the behavioural pattern of early modern humans across time and space in the Mandakini basin. Here the stratified microblade industry of Banke Sidha has been taken into consideration to understand evolutionary features and used to compare with the surrounding sites to see inter and intra-site variability in terms of microblade production and raw preferences. Within the Mandakini basin, the microblade industry of six different sites has been used for the comparative analysis. Among these sites, Chert has been identified as a preferential raw material for microblade production. Techno-typological transition in microblade and the reason for raw preferences of prehistoric community has been observed throughout the schematics and qualitative analysis including experimental knapping on local material. We employed a multidisciplinary approach, combining petrographic analysis, geochemical sourcing techniques, and typological examination of raw material to determine the prehistoric chert quarries and possible mobility patterns of prehistoric populations. We use portable X-ray fluorescence (p-EDXRF), Thin section and Raman spectroscopy to analyse the elemental concentration of the geological and archaeological samples. The result of this analysis helps in understanding whether the differential raw preference varies according to the distance between the Microblade sites and raw material sources (chert quarries).

Key words: Prehistoric Chert Quarries; Microblade Technology; Mandakini basin; Technological behaviour.

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Preliminary research on the connections between the prehistoric chocolate flint mine in Poręba Dzierżna 24 (Southern Poland) and other prehistoric sites, in the context of dating

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The prehistoric site in Poręba Dzierżna 24 (comm. Wolbrom, Lesser Poland Voivodeship), associated with the exploitation of chocolate flint, is located in the central part of the Kraków-Częstochowa Upland in southern Poland. From 2018 to the present research, financed by the National Science Center grant No. 2018/30/E/HS3/00567, is underway. One of the main goals is to identify the character of mining structures and to determine their chronological and cultural affiliation. The project aims to determine the role of this raw material for prehistoric communities in the long term.

The authors want to present the results of previous research and the broad context of the obtained absolute dates (radiocarbon and luminescence), indicating human activity at the site from the end of the Pleistocene to the early Holocene. There are many arguments that favour the enormous scale of human activity in order to extract chocolate flint from the Udorka Valley, dating back to the Mesolithic and Neolithic periods.

The discovery of the place of extraction and initial processing of chocolate flint in the Udorka Valley allows us to conclude that this raw material was of at least local importance. Further research will focus on assessing the economic importance of these deposits for prehistoric societies, both on a local and supra-regional scale.

Detailed identification of chocolate flint from the Kraków-Częstochowa Upland, macroscopically similar to that known from the Świętokrzyskie Mountains, will verify the current state of knowledge on the distribution of this raw material. The results will be necessary for future research on the Upland and other regions in Poland and neighbouring countries.

Key words: flint mine; chocolate flint; prehistoric communities; distribution; southern Poland.

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Mined flint versus surface collected flint at Michelsberg sites in The Netherlands

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Michelsberg sites in the Netherlands are best known through fieldsurveys. Only a few sites have been excavated. Although our knowledge is very limited, it is our impression that most flint tools of this period were made from rolled flint material collected from river terraces and from eluvial flint. Certain types of tools are made from mined or "exotic" (non-local) flints. At this point compositions of assemblages may differ. Moreover, the reuse and curation of tools is very common.

In the first phases of the Michelsberg culture, the mines of Rijckholt-St. Gertruid probably not yet exploited, but in later periods (from MK III) this was the case. How to explain that even in Michelsberg sites near these flint mines we more often find depleted flake cores and tools made from locally collected rolled flint than blade cores made from quarried flint? Were the people who lived here engaged in flintmining? Or even the communities involved in the extraction of flint and/or the processing of mined flint mainly use rolled flint material for domestic activities and is mined flint only used for special purposes? How do we distinguish sites from people who are involved in flint mining at all? Is it possible to distinguish them from other sites?

Key words: Michelsberg-culture; mined flint; settlement debris.

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Session 10-1

Archaeology in Banat

SESSION ABSTRACT

The archaeological research of the Banat region refers to a long tradition. Early milestones of publication, already around 1900, were the works of Felix Milleker and Gyula Kisléghi Nagy. Due to the First World War, the geographical Banat was divided into the present-day countries of Romania, Serbia and Hungary. Nevertheless, substantial archaeological work was carried out in the interwar period and during the socialist era. It was only with the opening of the political borders after the fall of communism in 1989, however, that completely new opportunities for large-scale cross-border research arose. Due to the geographical position of the Banat, it is a transit-region for peoples and cultures, and is extremely rich in prehistoric remains, starting with important Middle Palaeolithic sites. Along the Danube-corridor and its tributary rivers, one important immigration route of modern humans into Europe during the Upper Palaeolithic is attested, delivering important Aurignacian sites and early remains of modern humans. In the early Holocene, Mesolithic hunter-gatherers populated this region, constructing settlements like Lepinski Vir. From the beginning of sedentariness, the first Neolithic settlements appear in flood-free areas, which were also visited repeatedly in later times, either to resettle or to bury the dead. Numerous burial mounds are still visible landmarks in the flat landscape. In close proximity to the ore deposits of the Balkan-Carpathian region, very early finds of copper and gold objects are also evident in the Banat. The burials of the Copper Age are conspicuously richly furnished. During the Bronze Age, large-scale fortifications were built in the landscape, which are among the largest in European prehistory. These form important focal points in archaeological research. With a separate session, we want to outline the state of research in this European area. Where does archaeological research stand now and what are the future perspectives of research in this region?

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Cave archeology in Banat

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Western Romania, particularly the Banat region and the Apuseni Mountains, is a rich archaeological landscape. This region is subject to various archaeological investigations since the mid-19th century and delivered considerably rich remains from all prehistoric periods starting in the Middle Paleolithic. The Danube and its tributary rivers cross the region of Banat, and are part of the so-called Danube-corridor. It is one important immigration route of modern humans into Europe during the Upper Palaeolithic. Although, finds from the Paleolithic period are reported from caves in the region, like the famous finds of human remains from Peștera cu Oase, it is striking that the Paleolithic research in caves is practically not present. In this talk, we will give an overview of the research history and the investigations conducted in caves in the Banat region and present future perspectives.

Key words: Cave Archaeology; Paleolithic; Banat; Romania.

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14 Years of Joint Archaeological Research by the University of Tübingen and the National Museum of the Banat - Results and Perspectives

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After more than a decade of joint research, we would like to offer an overview of the various projects and their most important results. In addition to insights on the neolithisation processes, we were able to gain understanding also into the importance of the Banat for the spread of technologies and innovations from the eastern Mediterranean to Central Europe in the more recent cultural-historical periods. But what are the future challenges for international cooperation projects in the Banat? Different approaches in the application of new field archaeological methods will be discussed against the background of the specific administrative conditions in the countries of the working area.

As the local legislation and procedures concerning archaeological research have not changed since we started our joint projects, one can notice a certain stability in the way archaeological research can be developed. Still, the way the local authorities react to the presence and expectations of the research joint team on the field depend on a continuous promotion from the side of the project leaders. Not always the impact of an archaeological project to the local community is properly accounted for in the early stages of the research.

Nevertheless, the Banat archaeology benefits from a series of significant international cooperation projects in the last two decades and this development is visible in the way the new approaches are perceived. The language barriers are surpassed since long, the documentation is collected in a commonly used language and finally the publications benefit from this large dissemination of information.

Key words: Archaeological Investigation; International Cooperation; Future Challenges.

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Who and what we wear: Using peptide mass fingerprinting to reveal the animals behind Late Neolithic - Copper Age jewelry from Movila lui Deciov, Banat

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Osseous artifacts and the raw materials selected to produce them have the potential to reveal novel insights into cultural values, norms, and belief systems. Beyond the form or function of the artifact, understanding why bone was chosen over stone for particular artifacts and which species were selected can reveal the status, treatment, and relationship those animals had with past societies. The understanding of these relationships provides information about the value of the artifacts and vice versa. Since the processing of bones usually removes the diagnostic features that are otherwise used for the macroscopical taxonomic identification of faunal remains, heavily worked artifacts are usually not identified in terms of their raw material on a species level. Applying ZooMS (Zooarchaeology by Mass Spectrometry) can help identify such heavily worked osseous artifacts.

To deepen our understanding of jewellery production and the animal-human relationships in early agricultural societies of eastern Europe, this study analyses beads from two Late Neolithic/Early Copper Age graves at the site Movila lui Deciov in Romanian Banat (mid-5th Millennium BCE).

The initial microscopic examination showed that the heavily eroded surface often lacked technological traces and that taphonomic processes made stone and bone beads indistinguishable in many cases. Hence, FTIR-ATR (Fourier Transform Infrared Analysis using Attenuated Total Reflectance) was applied prior to ZooMS to avoid errors in material identification.

For the ZooMS analysis, non-destructive (eraser and ammonium bicarbonate methods after Fiddymment et al. 2015, and van Doorn et al. 2011) and destructive extraction strategies (acid base methods after Buckley et al. 2009) were applied and compared for their effectiveness.

The results of our FTIR-ATR analysis determined that the limestone-like beads were actually bone beads containing calcite deposits, which form a misleading crystalline structure. Overall, protein extraction for ZooMS analysis was largely unsuccessful, with non-destructive methods failing to produce enough collagen for taxonomic identification. Our results indicate a possible connection between calcite deposits and the degradation of protein in the archaeological record, which led to the failure of the non-destructive extraction methodologies. Further research on the relation between calcite deposits and ZooMS could enhance the method's success rate and our knowledge of related depositional processes.

The beads that could be successfully identified to taxon were made from deer (*Cervus elaphus*), goat (*Capra*), pike (*Esox lucius*), and perch (*Perca fluviatilis*). These species belong to the everyday life and subsistence of the associated people and correspond to the concept of raw material selection of subsistence-slaughter products introduced here.

These results deepen our understanding of human-animal relations and expand our picture of Late Neolithic/Early Copper Age grave goods.

Key words: ZooMS; FTIR; bone beads; Late Neolithic; Copper Age; jewellery.

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On “Besenstrich und Textilmuster” ceramic horizon. Observations on the research at the Foeni – “Cimitirul Orthodox” archaeological site

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More than 150 years ago F. Kubínyi, publishing the results of archaeological research at Gomba (Kubínyi, F. 1861), provided the first illustration of a ceramic fragment ornamented with the so-called textile decoration. Since then, defining this ceramic horizon that had been decorated with textile impressions has become one of the focuses of central European archaeology. In Romania a number of cultural names have been put forward for this horizon, but today the large spreading area of this vessel decorating technique that involves the existence of regional variants, a more generic name is ideal: the „*Besenstrich und Textilmuster*” ceramic horizon. For Banat, Transylvania and Oltenia regions, from a relative chronology standpoint, there’s a unanimous acceptance for the dating of the „*Besenstrich und Textilmuster*” ceramic horizon as part of the last stage of EBA (EBA III). In this study, we aim to discuss the characteristics and dynamics of this horizon. For this we will put together and we will analyze the available informations derived from archaeological researches conducted in areas where ceramics decorated by this technique are found. Furthermore, in order to outline the cultural and chronological realities at the end of the Early Bronze Age in the eastern area of the Carpathian Basin, we will also discuss the results of the archaeological research from Foeni-Cimitirul Ortodox which since the first published excavation reports became a benchmark for the period research in this area.

Key words: “Besenstrich und Textilmuster” ceramic horizon; Early Bronze Age; eastern Carpathian Basin; Banat region.

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Archaeobotanical evidence from the sanctuary Oarta de Sus - Ghiile Botii, Wietenberg culture, Middle Bronze Age

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The archaeological site from Oarta de Sus-Ghiile Botii is a cult complex, an open sanctuary located in Oarta de Sus, Maramures county, north Romania. During several archaeological campaigns, soil samples were recovered from pits with a special destination containing a lot of burnt and carbonized seeds, as well as osteological fragments. According to archaeologists the ecofacts are fitting to the Wietenberg culture, phase II.

The archaeobotanical analysis of the soil samples recovered from these contexts provide important evidence regarding the plant species cultivated by the communities that lived in this area improving our knowledge related to plant species used in ritual offerings.

The recent C14 analyses carried out on *Cerealia* seeds and osteological fragments recovered from two pits (pit18 and pit22) are providing important information regarding the chronological dating of the cereal species deposited in these cultic pits. The results can be compared with the older C14 results obtained in the past on samples from the sanctuary area.

Key words: charred seeds; *Cerealia*; sanctuary; Oarta de Sus; Wietenberg.

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The „Mega Sites“ of Cornești-Iarcuri and Cornești-Cornet – Twins or only related?

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The village of Cornești is located in the vast plains of the Banat, about 20 kilometers north of the large city of Timișoara. In the immediate vicinity to the north of the village, archaeological investigations were carried out between 2007 and 2017 on the huge Late Bronze Age fortification of Iarcuri. The Muzeul Național al Banatului in Timișoara, the Museum für Vor- und Frühgeschichte der Staatlichen Museen zu Berlin and the Goethe University in Frankfurt/M. were involved.

Since 2018, the Muzeul Național al Banatului in Timișoara and the Museum für Vor- und Frühgeschichte der Staatlichen Museen zu Berlin have been investigating the Middle Bronze Age settlement of Cornet in the southern surroundings of the village, only a few hundred meters from Iarcuri. Magnetic measurements and excavations identified three ditches, which also include a huge area of probably several hundred hectares. Although the exact extent is still unknown, we can already speak of a Middle Bronze Age "mega site".

The lecture will now present and compare the state of research. According to the current state of research, it seems that both fortifications existed in parallel at times.

Key words: Bronze Age Mega-Fortifications; Recent research; Settlement chamber with continuity.

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Dust to Dust: On the Problem of Detection and Interpretation of Bronze Age Solid Clay Buildings Based on the site of Cornești-Iarcuri (Banat)

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Solid clay buildings are among the most neglected feature types in the Bronze Age archaeology of Europe. The reasons for this are diverse, but the primary is the assumption that this was an unsuitable and unstable type of building for the climatic conditions in Europe. At the same time, clay is an omnipresent substance which is easy to process. In particular in the poorly forested (forest-steppe/steppe) and loess-rich regions of the Pannonian Plain, such as the Banat. In addition, both the traditional massive clay buildings, still in use today in the Banat, recent publications and the results of the excavations in Cornești-Iarcuri outline that such building types were probably more widespread in Central and Eastern European Bronze Age than supposed. These latest insights do show that the reason for the mentioned neglect is primarily the status of conservation.

Unlike the climate conditions in southwestern Asia, where whole palaces made of clay have been preserved, erosion by humidity, wind and rain in Europe can destroy abandoned buildings of this type within a few months.

The result is a pile of Dust that is nearly impossible to find or analyse using traditional archaeological methods.

In this study, I will discuss the problems, preconditions and conditions necessary for the investigation of massive clay buildings and further the most suitable methods for their detection.

For this purpose, soil types, recent palynological results, the excavation from Cornești-Iarcuri and building records of traditional types of construction in the Banat, moreover the specific properties of the possible building material will be presented.

These evaluations will show that, even if this building type seems lost to European archaeology, there are fast, effective and significant methods for examining such buildings. In addition, another approach has been developed based on the previous information acquired, which increases the knowledge gained many times over.

Key words: Bronze Age; Houses; Banat; Carpathian Basin; Architecture.

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As Above so Below: The Field Survey on the Late Bronze Age Palace of the Mega-fort from Sântana-Cetatea Veche, Arad (Romania)

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In 2018, there was a notable surge of interest in Bronze Age settlements in the region, which led to significant discoveries at the Sântana-Cetatea Veche mega-fort. To explore this prehistoric site, advanced technologies such as LiDAR and magnetometry were employed for precise measurement and investigation, unveiling four enclosures spanning an extensive area of 130 hectares, fortified with at least three defensive systems and adorned with numerous rectangular structures. Among them, the largest structure within enclosure I stood out, measuring a considerable 60 meters in length and 40 meters in width. In order to swiftly and non-invasively comprehend its historical context and internal characteristics, a comprehensive field survey was conducted. This research entailed the meticulous examination of collected materials and their spatial relationships, utilizing Q-Gis as a tool for analysis. This paper not only elucidates the employed research methods and divulges the remarkable findings, but also addresses the growing importance of non-invasive techniques in modern archaeological investigations.

Key words: Late Bronze Age; mega-fort; LiDAR; magnetometry; Q-Gis; field survey; non-invasive research.

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Animals in Celtic Society: Archaeozoological Research in Sites from Banat and Transylvania (Romania)

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Four Celtic settlements—Topolovăţu Mare, Timișoara-Freidorf, Giarmata, and Căpleni—all located in the Timiș County—have received the majority of attention from archaeozoological studies thus far. Hunting and animal husbandry were the mainstays of the Celtic economy. Celtic communities relied on hunting to obtain raw materials for processing (deer horns and bones), skins, and furs, as well as, in some cases, to reduce the predatory effect on crops. In Topolovăţu Mare, 6.82%, Giarmata, 2.46%, and Timișoara-Freidorf, 1.23% of the total were attributed to hunting. In the aforementioned settlements, domestic species account for more than 93% of the total. Cattle are common in the settlements of Giarmata (33.91%), and Căpleni (67.19%). Sheep and goats are the majority in Topolovăţu Mare and Timișoara-Freidorf, with percentages of 22.55% and 34.57%, respectively; however, in Giarmata, they have a slightly smaller share, of 20.15%, and only 7.81% in Căpleni. Pigs were widely exploited, with a prevalence of 23.09% in Giarmata, 25.93% in Timișoara-Freidorf, and 27.27% in Topolovăţu Mare. Only in Căpleni does it account for 17%. Obviously, the environmental conditions and certain community traditions supported an economy that was heavily focused on raising pigs as the primary source of meat. The chicken was a distinct feature of Celtic fauna, and its consumption was an important part of the diet.

Four graves were investigated at Sălcuța (M. 1, 3, 7, 10), eight at Fântânele (M. 3, 18, 19, 20, 23, 42, 52, 56), and one each at Sâncrai (M. 7) and Noșlac (Cx.1). For deposition, pigs, hens, and cattle were used. The tombs contained the remains of 23 individuals, including 14 pigs (60.87%), six fowls (26.09%), and three cattle (13.04%). A complete pig can be found at Sălcuța (M. 3S). The pattern of pig mortality profiles targeted animals aged one to two years. A single specimen less than six months was deposited within M. 56F. The pig males were preponderantly chosen, they appear in four graves and in one case, a sow. From eight funeral contexts, pieces of meat or quarters of a single specimen, cattle (two graves), or pig (six graves) were collected. Pieces of meat or quarters of a single specimen, cattle (two graves) or pig (six graves) were collected from eight funeral contexts. Six graves contained two or more individuals/species in the following associations: four graves with pig and cattle (M. 10S), pig and fowl (M. 3F, 23F, Cx.1). M. 56F had three individuals (two pigs and one hen) and M. 42F had four specimens (two pigs and two fowls). The fleshy parts of the limbs (without feet) and loins, as well as halved heads, were generally preferred. Only the wings of poultry are used.

Key words: Celtic sites; Transylvania; Banat; animal farming; hunting; offerings.

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Session 6-2

Traceology and its interdisciplinary approach to the analysis of wear traces and residues for understanding the evolution of human capacities

SESSION ABSTRACT

Traceology is one of the fields in archaeology that has been designed in an interdisciplinary way. With the interplay of microscopic, experimental, and ethnographic methods, it attempted since its inception in the 1930s to go beyond a solely typological approach to prehistoric artefacts and to give tools made of stone, bone and antler, hitherto regarded predominantly as "index fossils" for a relative chronology, an active role in the reconstruction and assessment of human behaviour, cognition and evolution. Traceology and the study of prehistoric tool functions and technologies is a rather complex task which requires the transdisciplinary interaction of different methods and fields in addition to the archaeological approach, such as microscopy, fracture mechanics, materials science, tribology, chemistry, environmental sciences, ethnography, and experimental archaeology, among others. Traceology is an encompassing research system based on a detailed data and information pool that enables the analyst to identify and interpret wear patterns, residues, and other surface alterations on artefacts. This 'traceological reference collection' is mainly supplied by experiments using tool replicas that imitate prehistoric working activities as realistically as possible as well as execute mechanical, automated processes under defined and monitored parameters.

Complemented by archaeological accounts, ethnographic observations and technical knowledge, this experimental framework is crucial for the reconstruction of prehistoric tool uses and human behavioural responses to changing environments. Although traceological analysis appears to be a straightforward method, its usefulness for the recognition of past human behaviour and human-environment interaction still depends on the understanding of tool use and mechanical processes as well as the research experience of the analyst. Optical microscopy using reflected-light and stereomicroscopes continues to be the methodological backbone of Traceology. In addition, technological innovations in microscopy and material analysis have been introduced in recent years, attempting to overcome specific problems and to achieve better results, among them scanning electron microscopy, laser or white light confocal microscopy, X-ray microanalysis, vibrational techniques as Raman and Fourier transform infrared spectroscopy, GC-tandem MS, and more to use-wear and residue analysis.

The UISPP Commission A17, 'Functional Studies of Prehistoric Artifacts and their Socio-economical Meaning', invites traceologists and archaeologists who work in the interdisciplinary field of microwear and residue analysis to present their latest research and the application of new techniques and instruments to contribute to the methodological debate, and to bring prehistoric tool uses in context with technological advancement, subsistence strategies and adaptation to different environments.

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New investigations on lithic use wear formation using controlled experiments

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The tribological fundamentals of lithic use-wear formation have been debated since the 1980s. However, to this day, we do not have an accurate understanding of how striations, polish, and other microscopic traces left by various materials in contact with stone tools actually form. Several theories have been proposed for the causal agent in the formation of these features. The ‘abrasive’ model states that what we visually perceive as polish on the edge of a stone tool is the result of physical abrasion of the stone surface by contact with the worked material, resulting in the smoothing of its natural roughness. Here, the relative hardness of the worked material should play an important role in the progression of abrasion. A variant of the abrasive hypothesis states that the causal agent in the abrasion is played by dirt particles or microscopic fragments of the tool itself incorporated into an interstitial powder. Finally, in the ‘additive’ or ‘silica gel’ model, polish on the tool is instead formed as a deposit on the chert surface. The newly deposited layer, or thin film, is in this case assumed to consist of amorphous silica that would be deposited via dissolution in water or melting because of friction.

We recapitulate here a series of studies carried out to test each of these hypotheses (Schmidt et al., 2020, Rodriguez et al., 2022, and work in progress). We performed a series of experiments using a pin-and-plate tribometer with a 20N load in sequential experiments rubbing flint bits against various materials (dry antler, bone, and wood). The bits were cleaned with a neutral soap in an ultrasonic bath. We documented the progression of abrasion by monitoring changes in the ISO parameters characterizing the microtopography. The interstitial dust collected from the experiment was analyzed with an SEM equipped with an energy-dispersive x-ray detector to identify the chemical composition and check if particles of flint were present. We used reflectance IR spectroscopy to check if the actual polished surface was covered by a thin layer of amorphous silica. Moreover, since rubbing against non-woody plants could not be tested with this setup, we followed up with a manual experiment testing the effect of silica-rich plants on the progression of abrasion. We present here the ensemble of results leading to a characterization of the progression of polish development and its relationship to worked material properties.

Key words: polish formation; controlled experiments; 3D microtopography; tribology; Infrared spectroscopy.

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Investigating the potential of basalt tools through use-wear experiments

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Basalt is a widely used raw material for tool manufacture at prehistoric sites, but a unified methodology for assessing how hominins used basalt in prehistory is lacking. A comprehensive experimental investigation of basalt tools is, thus, necessary to establish a reliable methodological framework that can be used to explore the functional properties of archaeological basalt assemblages.

Experimenting with basalt is a challenging task due to its tough nature and variability. This makes it difficult to control and characterize trace patterns accurately. This study aims to investigate the role of basalt variability in use-wear formation processes, specifically focusing on basalt varieties present in different Lower to Upper Pleistocene archaeological sites in Africa (Olduvai Bed 2 FC East and West in Tanzania, and Mieso Piedmont in Ethiopia), Asia (Bagratashen I in Armenia) and Europe (Abri du Maras in France).

Basalt varieties were characterised using SEM-EDS analysis. Sequential experiments were conducted, using the experimental basalt tools in different activities, including butchery, hide, bone, and woodworking to determine use-wear formation. Subsequently, the potential was evaluated of a multi-scalar integrated approach that combines optical and scanning electron microscopes to analyse macro- and micro-wear traces on basalt.

Our results provide useful information on how differences within the raw material affect the formation of use-wear on basalt. Additionally, the combined utilisation of various microscopes allowed us to gather comprehensive and complementary information on such a complex raw material like basalt and to characterise thoroughly the diagnostic features of the micro-wear traces (e.g., edge damage, rounding, polish).

This study represents a significant progress in comprehending wear formation on basalt tools and provides a reliable basis for functional studies of archaeological basalt assemblages.

Key words: Basalt; lithic artefacts; sequential experiments; micro-wear analysis; multi-technique approach.

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Investigating Cretaceous chert through experimental and multi-technique analytical framework

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Raw material preservation is an important factor in lithic micro-wear studies. However, poorly preserved assemblages often pose significant challenges for these studies. How to approach archaeological lithic assemblages that contain poorly preserved raw materials, especially when these raw materials are dominant or the sole source of information regarding the function of these lithic artefacts? The current study aims to address this issue by developing a comprehensive experimental and multitechnique analytical approach.

Presented here is our ongoing experimental study on Cretaceous chert from Sierra de Atapuerca (Burgos, Spain), which represents one of the primary raw materials found in the Middle Pleistocene assemblage of the TD10.2 sub-layer at the Gran Dolina site. The preservation of this rock has been significantly compromised due to dehydration processes that it has undergone over time (Font et al. 2010), resulting in substantial challenges for micro-wear studies on this assemblage. However, these studies are essential given the significance of this layer, which is interpreted as a kill-butchery site and as the first evidence of mass communal hunting practiced by pre-Neanderthal groups inhabiting the cave (Rodríguez-Hidalgo et al. 2017; Arteaga et al. 2023).

In parallel to the micro-wear studies of the archaeological assemblage, a reference collection composed of unretouched and retouched flakes of Cretaceous chert was created. These experimental tools were utilized in various use-related activities including butchery, hide, wood and bone working. Multi-technique approach, which involved optical (OM), 3D digital (3D DM), low vacuum scanning electron (SEM) and occasionally, confocal microscopy, was used to analyse the experimental tools.

The study is currently in progress, and while not all the aspects pertaining to the interpretation of micro-traces within the archaeological assemblage have been fully resolved, the experimental results and the application of multi-technique analysis have proven to be highly effective in overcoming the challenges associated with micro-wear observation and its recognition on this particular raw material. The utilization of multitechnique microscopic analysis method has demonstrated greater efficiency compared to relying on a single microscopic analysis method.

Key words: Cretaceous chert; experiments; micro-wear; microscopy; multi-technique analysis.

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Analysing Surface Texture Modification of GSTs in Sequential Experiments through Integrated Imaging Techniques

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Recent developments in imaging technology have enabled the traceology community to adopt a reliable and objective quantitative approach for the analysis of use-wear. Previous studies have focused on specific techniques and magnification scales, combining quantitative data with qualitative observations [e.g., 1-6]. Our approach employs multimodal morphological and quantitative analyses, utilising techniques from macro to submicron scales to measure geometry and surface texture of ground stone tools (GSTs) collected at various stages of replicative sequential experiments, including:

- photogrammetric acquisition of the GSTs geometry and 3D model elaborations taken at given times, by testing different setups;
- increasing scale and resolution microscopies – Dino-Lite, stereomicroscope, optical microscopy (OM), scanning electron microscope (SEM) – to acquire 2D images and qualitative observations; - profilometry for 3D acquisition of selected areas (850 μm^2) to measure the microtopography of the GSTs surface.

We tested our approach on 27 pebbles collected along the Racovăţ River, and used to pound and grind various plant materials, to create a reference collection tailored to research questions posed by the 114 pebbles retrieved in the lowermost cultural layer of the Brînzei I cave in NW Moldova [7]. The preliminary functional and residues analysis of the archaeological findings are hinting at their use as GSTs [8].

The replicative collection also includes cross-reference experiments on analogous cobbles collected along the Fiora River in Italy, selected on the basis of morphometrical and petrographic consistency with the items from the Moldovan archaeological and experimental GSTs [9-10].

Our approach integrates both magnification and resolution in 2D and 3D to identify significant features of use wear traces. The 3D techniques enable measurement and quantitative interpretation, while also revealing potential biases in data acquisition and elaboration [10-11].

Overall, our approach presents an innovative design that incorporates both magnification and resolution as discriminants in 2D and 3D analysis. This allows to create a reliable quantitative approach to use-wear analysis, facilitating accurate data collection and due reasoning on data interpretation.

Key words: sequential experiment; multiscale analytical strategy; photogrammetry; microscopy; quantitative analysis.

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Cleaning your tools doesn't mean that the tools are clean. A qualitative and quantitative prespective

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Use-wear analysis has traditionally been accused of relying heavily on subjective interpretation of the marks present on artifact edges. In recent years, confocal technology has made it possible to begin to quantify and partially resolve this subjectivity. However, certain methodological aspects of great relevance for the analysis, such as the cleanliness of the pieces, have been significantly underestimated. In fact, cleaning methods can mask or even mimic wear; therefore, accurately identifying dirt is a crucial element in analysis. This work aims to quantitatively verify whether qualitatively reliable - although not perfect- cleaning processes can modify the roughness readings of the surface of the tools.

For this, 3D ISO 25178 parameters were analysed on an experimental quartz sample to test for differences between cleaning stages. The parameters were computed from a surface representing (168,5 x 140,9) mm for all surface points with a confocal Sensofar Sneox 090 optical LED profilometer. Each point was randomly selected and assured to be exactly the same surface by a special designed platform. The parameters were calculated for the same point without cleaning the piece (stage 0), with the piece cleaned with H2O2 and acetone (stage 1), and with the piece cleaned again with only acetone (stage 2). The stage 3 corresponds to a measure replica of stage 2 to control the microscope replicability. Differences in ISO parameters between cleaning stages were tested using non-parametric one-way repeated-measures Friedman test, evaluating the null hypothesis that the k related parameters come from the same population. To know precisely which groups differ from each other Wilcoxon pair-wise test were used. All the parameters except Sal and Std showed significant differences among the cleaning stages. When differences are found, they can be seen between the not cleaned stage (0) and the stages with at least one cleaning procedure (1-3). In Smr1, Spk, Svk, Vmp, Sp, Sq, Ssk, Sv, Sz and Str parameters those differences are also seen between the first stage (1) and the second (2) and between the first (1) and the third (3). In Vvv values differences can be found between the first (1) and the third (3) stage and in Sku are seen between the not cleaned stage (0) and the second stage (2). No significant differences have been shown between the second (2) and the third stage (3) in any case. Therefore, the differences that we have found indicate the need not only to wash the pieces, but also to check the degree of cleanliness of the materials once they are washed, leading to the qualitative and especially quantitative importance of an adequate cleaning procedure before analysing the materials.

Key words: Cleaning; ISO; roughness parameters; confocal; use-wear.

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Still scratching the surface: Status quo and future directions of lithic use-wear analysis in Island Southeast Asia

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While Traceology as the scientific method for the identification of prehistoric tool use and associated activities can be applied to any lithic and some non-lithic materials in general, it plays in particular an important role in understanding the dominantly amorphous flake tools from Island Southeast Asia (ISEA). The absence of formal tool types throughout the Pleistocene and into the Late Holocene, including those that are considered as 'projectiles' or 'hafted' implements, may have hindered our views regarding the actual role these tools played in the development of cognition, behavioral capacity, and complex technologies in the region. Use-wear analysis of unretouched flakes, however, indicate that these were used in a variety of activities, beyond simple actions such as cutting or scraping. In this paper, we provide an overview of the beginnings and development of use-wear analysis in ISEA before we discuss its role in addressing issues such as the bamboo hypothesis, 'complex' lithic technologies, and chronological development of lithic technology and use. Although technological and traceological studies in the region often highlight the presumed presence of a bamboo technology in the past, there seems to be limited recurring microscopic wear traces that would allow to verify the hypothetical presence of a 'plant technology' that would make up for the seemingly simple lithic technology in ISEA. An evaluation of the current state of the art and future directions of use-wear analysis attempts to provide context for the current understanding of prehistoric technology in ISEA and examines the development of use-wear analysis as a specialization in the archaeology of the region that was established out of necessity.

Key words: Island Southeast Asia; use-wear analysis; traceology; prehistoric technology; composite tools; behavioral modernity.

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Interdisciplinary study of grinding stones preserved at the Archaeological collections of Georgian National Museum

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The scope of present paper is to study grinding stones (discovered at the Shulaveri Gora, Gadachrili Gora, Imiri Gora and Kvatskhelebi) preserved at the archaeological collections of Georgian National Museum. Typological, use-wear, petrographic and palynological analysis was carried out to determine type, function, raw material and organic remains on the grinding stones which were attributed to the different chronological period from Neolithic to Bronze Age period.

The studied grinders and querns were mostly oval, quadrangular and saddle shape with flat, concave and through shape working surfaces. As for the raw material, they were distinguished according to regional characteristics. Rhyolite, rhyodacite and basaltic rocks were used for making grinding stones from Kvemo Kartli Region (Shulaveri Gora, Gadachrili Gora, Imiri Gora archaeological sites) and Basalt and sandstone - for materials from Shida kartli region (Kvatskhelebi), selected raw materials are widely distributed in the vicinity of the archaeological sites.

Functional study of the above-mentioned materials showed traces of use such as intense smoothness and gloss, which, in my opinion, indicates grinding of plant (Digital microscope, Dino lite 50X). As for the identification of organic remains we applied for the palynological analysis. Analyzing plant pollen grains, we can say that grinding stones were actively used, both food and medicinal herbs were grind on them, which were used in diet and phytomedicine. According to the palynological analysis on the grinding stones from Neolithic and Bronze Age period, humans used such plants as food, for example: seeds, walnuts, hazelnuts, vines ash trees. And for the treatment of various diseases, they used such plants as: lime, oak, hemp and etc.

Key words: grinding stone; Neolithic; Bronze Age; use-wear; palynology.

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Bark foraging and seeds breaking empirical data and new insights into modelling past human behaviour

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This work presents an investigation into traceological analysis applied to controlled experiments performed using natural pebbles, calcareous and limestone tools used for breaking hard-shell seeds, among which almonds (*Amygdalus communis* L.), apricot kernels (*Amygdalus armeniaca* L.), nuts (*Juglans regia* L.) and hazelnuts (*Corylus avellana* L.) as well as used to extract the cambium under the bark of trees such as oak (*Quercus ilex* L.), wild olive (*Olea europaea* L. var. *sylvestris*), carob (*Ceratonia siliqua* L.). Archaeological and ethnographic data, also from bibliographic references, related to various sites around the Mediterranean and Asian areas containing pebbles potentially used for seed cracking and cambium collecting, served as the primary material for conceptualising the background of this research—lithic raw materials sources related to the experiment. Tools presented here are mainly from southeastern Sicily locations. The study employs an approach integrating archaeological, ethnographic, and empiric methodologies. The analytical techniques utilised in this study include virtual 3D modeling, microscopic use wear and residue analysis. The discussion on the results of the study of these experiments, conducted through several subsequent years, will pursue more comprehensive evidence for prehistoric vegetal food procurement/processing and a broader narrative on human potential dietary choices with specific needs and environmental areas adaptation.

Key words: Bark; seeds; empiric analysis; traceology; 3D modeling; stone tools; prehistoric human behaviour.

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Comprehensive Studies of Tools for Iron Ore Processing in South Siberia during the Second Half of the 1st Millennium BC

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The Early Iron Age sites in Eurasia exhibit a considerable number of tools made from lithic materials. However, the domains in which these stone tools continue to be actively utilized are few. One notable exception was metallurgy and the production of metal implements.

Southern Siberia stands out for its remarkable abundance of natural resources, including iron ore deposits. Numerous archaeological sites in this region have yielded a substantial number of diverse iron household items and weaponry, alongside locations of iron ore mining. Despite these findings, there have been very few studies of the equipment employed by miners and metallurgists during that time. This is especially the case for tools used for preparing iron ore for smelting, such as breaking and grinding. In this regard, the discovery of two large stone artifacts made from polymictic fine-grained pink sandstone at the multi-layered Zhelvak 5 site in the Republic of Tyva is of great significance. These objects, ethnographically identified as a grain grater (lower stone) and a chime (upper stone), were uncovered in close proximity to a substantial iron ore deposit. The lower stone, a well-crafted flat slab measuring 45×21×2.7 cm, exhibits thorough shaping and surface modification. Likewise, the upper stone, measuring 37×9×4 cm and boat-shaped, displays a similar craftsmanship. Traceological analysis carried out on these artifacts indicates that the lower stone was used for breaking down large fractions of rock and their subsequent grinding, facilitated by using a chime. Additionally, microscopic studies revealed the presence of iron oxides on the surface of the lower stone, which was confirmed by X-ray fluorescence analysis. Notably, iron slag was discovered in the same context.

Thus, the joint discovery of an anvil/grinder and a chime for iron ore processing provides compelling evidence that tools traditionally classified as grain grinders with upper stones were employed in metallurgical production. Consequently, the result of our study allows us to consider the Zhelvak 5 site as a location for the primary processing of iron ores.

Key words: South Siberia; Early Iron Age; iron ore processing; traceological analysis; X-ray fluorescence analysis.

Note: The research was carried out within the framework of the state task of the Institute for the History of Material Culture RAS, No. 0184-2019-0008 "Production and use of tools in the Paleolithic, Neolithic and Bronze Age (technological, traceological and experimental study of archaeological materials).

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Typology, Technology and Traceology A Functional approach to understanding Neolithic celts from Akwanga, Central Nigeria

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Ground stone axes are insignia tools/artefacts of the Neolithic era, a renaissance technology of a sort. This study is an attempt to examine the typological, technological and traceological attributes and complexities of a ground stone axe/celt assemblages from Akwanga in the Nok cultural area, central Nigeria. Majority of the materials are surface collections donated by farmers, hunters and from the area as well as collections by the author after carrying out a reconnaissance survey of the area. The collection is marked by the preponderance of ground stone axes of small, medium, large and broken sizes. These elements, mostly made by pecking, trimming and abrasion (ground) have been ascribed with different functions. Here, an integrated methodological approach that focused on the micro and macro examination of the use-wear marks on the materials using digital zoom microscope, light microscope and 3D scans were employed to study the artefact's edges and surfaces. The major aim was to know the functional relevance of the tools.

Key words: Ground stone axes; Use-wear Analysis; Tool function; Typology; Technology.

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The Techno-economic Role and Functional Life of Ground Stone Tools at Qintangshan Site, Jiangsu Province, China (4300-1000 BC)

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Ground stone tools are emblematic of the Neolithic period, and provide us important insights for assessing the nature of organic materials processed or consumed by prehistoric humans, especially for our understanding of plant utilization and the origins of agriculture. However, not enough attention has been paid, thus far, to the function of Neolithic ground stone tools in southern China; then, our current knowledge regarding the above mentioned technical system is not accurate enough. Overcoming this shortcoming, our study focus on the neolithic ground stone tools from Qintangshan, a pluri-stratified open-air site located in the Lower Yangtze River Region, containing a continuous archeostratigraphical sequence ranging from the Middle Neolithic to the Early Bronze Age period. Radiocarbon dates framed the site between roughly 4300 to 1000 BC. From 2013 to 2017, a joint archaeological team excavated over 756.5 m², yielding a large number of features structures (burials, households, etc.) and remains. In this study, we have studied a total of 320 ground stone tools, by way of a multiscale investigation, combining experimental approach, typo-technological analysis, petrology approach, use-wear and residue analysis. Our results are the following:

1. The inhabitants of the Qintangshan site had a well-developed manufacture and use system of ground stone tools and had a good understanding of the properties of the various stone raw minerals, thus using them to make different types of tools. Their design philosophy was reflected in the expedient and strategic design of the grinding stones.
2. Centred on lithic technology, the inhabitants were engaged in the production of bone, wood and bamboo implements using adze, chisel and grinding stone as a toolkit, the harvesting and processing of Job's tears, rice, Triticeae and millets using knife and handstone as a toolkit, and the processing and weaving of fibres from plants using adze, knife and spinning wheel as a toolkit.
3. The utilization of stone tools was characterized by functional diversity, for example, grindingstones could be used in various contexts to process stone, bone, wood, bamboo and grains, and one stone knife could be used for both harvesting grains and processing plant fibres.
4. The inhabitants extended the use of stone tools through maintenance (rejuvenation) and recycling, thus saving stone resources and labor. 5) Lastly, by comparing the stone tools belonging to the surface occupation with the one unearthed from the burials, it appears that the adze, yue-axe and chisel were the first to be recognized as special funerary objects compared to other tools, which could mean that they played both a functional role and a symbolical significance of prime importance.

Key words: Ground Stone Tool; Chinese Neolithic Archaeology; Typo-technological Analysis; Use-wear Analysis; Residue Analysis.

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Function based approach to the Middle Paleolithic lithic assemblages in Middle Tagus River basin

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The accidental finding of the Mousterian site of Lagoa do Bando unveiled a new biotope inhabited by Neanderthals in the Tagus basin. This lacustrine site, on the top of the quartzite crests, is at the western border of the Iberian Massif, a region with several Mousterian settlements in river banks but and caves.

Considering that different settings may have been related to the exploitation of different resources, but most Mousterian sites in the Tejo don't have fauna or flora preserved, questions remain about the reasons behind the location of each occupation.

In this poster we present our future PhD project, that aims to answer these questions by: 1) perform extensive functional analysis to these lithic assemblages of Lagoa do Bando, Ribeira da Atalaia, Santa Cita and Cadaval sites and 2) build a reference collection of use wear marks in stone tools made of local raw materials. In the end, we expect that our results will also contribute for the understanding of site formation processes and Neanderthal settlement patterns.

Key words: Middle Paleolithic; Tagus River; Functional analysis.

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Carinate endscrapers, cores or vice versa Analysis of Aurignacian artefacts from La Viña rock shelter (Asturias, Spain)

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Technology and functionality of carinate endscrapers, one of the most characteristic tools of the European Aurignacian period, have long been debated (Hays and Lucas, 2000; Nowak and Wolski, 2015). Classification of such artifacts according to typologists, technologists and traceologists criteria frequently causes difficulties focused on the question of the roles of these pieces. Analysed material from different sites with core-shape have been considered as cores for fabricating blanks for Dufour bladelets, as massive scrapers (tools) or as cores reused (cores/tools).

In this communication, we present the results of the functional analysis of these Aurignacian artefacts from level XII of the rock shelter of La Viña (Asturias, Spain), one of the most important Palaeolithic sites in the Cantabrian region. We have studied using use-wear analysis the tools previously classified from a techno-typological perspective as carinate endscrapers and atypical carinate endscrapers (Santamaría, 2012). In addition, we have analysed different types of bladelets cores present at this level. The raw materials for the endscrapers and the cores are different types of local flint (Piedramuelle and Piloña flint).

Our results show that not all carinate endscrapers were used. However, some of the artifacts classified a priori only as cores were used in different activities, e.g. scraping of hard materials. Through use-wear analysis, we have demonstrated that this type of pieces could have been used for several purposes.

These functional results can significantly contribute to the debate concerning carinated endscrapers and combined with available multidisciplinary data on paleoenvironment, subsistence, and chronology provide new information for reconstructing the socio-economic system of the Upper Palaeolithic hunter-gatherer groups (MIS3) in the north of the Iberian Peninsula.

Key words: use-wear analysis; endscrapers; Flint; Aurignacian; Cantabrian region.

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Inferring functional mobility of hunter-gatherer through use-wear analysis. The case of La Balma de la Vall (Montblanc, Northeast Iberia)

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Use-wear analysis allows discerning if a tool was used, on what type of material it was used, and for which activity. For different reasons, such as the lack of very developed wear, the distribution of the marks, or even the taphonomy of the pieces, it is not always possible to obtain data on all these aspects. Sometimes, there are the intrinsic properties of the material, and, above all, the scant development of the traces limits the interpretation.

In this work we propose a multiscale microscopic approach combined with the study of the wear distribution of the endscrapers from Final Upper Magdalenian site of La Balma de la Vall (Montblanc, Northeast Iberia). Late Magdalenian occupations have been identified along the sequence, with three consecutive layers dating back to 14 cal BP. This rock shelter is located in La Vall valley, very close to the homonymous gorge. Therefore, it is located in an ideal area to control the passage of wild animals.

The objective of this work is to identify all the functional evidence present in the artifacts to establish the useful life of each tool. Following this approach, different parts of the tools such as potential active and non-active edges, ridges, and of all the faces of the pieces were analyzed. In the case of the endscraper fronts, mosaic images were systematically made to allow an in-depth study of the wear distribution in search of possible resharpened events or superimpositions of worked materials. In parallel, an attempt was made to identify the hafting evidence, and the hafting system, as well as their relationship with the resharpening and abandonment of the artifacts.

The combination of the data from all the endscrapers of the site with previous studies regarding technology, raw materials, and the reduction and resharpening processes, has provided an accurate view of site functionality. In general terms, results indicate short occupations oriented towards hide processing activities treatment (a quite time-consuming one) present only in their initial phase, since the artifacts used on this material have always been used in fresh and without abrasives. However, there are significant differences in the use of tools along the sequence. Thus, at level II most materials are highly resharpened and a predominance of hide working is detected. In level III the pieces are abandoned after their use, also being very reduced, although the traces points directly to woodworking. Finally, level IV, with a very reduced assemblage, indicates significant hide work, but

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the materials are barely resharpened and there is clear use of unretouched tools as endscrapers. These data indicate a possible change in the directionality of the groups between the base camp and the Balma de la Vall itself, in which levels II and IV possibly show a return from hunting (hide working), while level III shows a possible preparation/arrangement of the wooden tools that were used for hunting.

Key words: use-wear analyses; multiscalar approach; mobility; human behaviour; endscrapers.

Evidence for plant technology in Prehistoric New Guinea: the Kiowa polisher

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Lithic industries from Papua New Guinea surprised the first Western archaeologists who excavated on this Northern part of Sahul. With a few exceptions, they are often characterized by a lack of standardization and simple operating sequences which lasted with little change for thousands of years. As in Southeast Asia, the region where the first colonizers of New Guinea came from, prehistorians attempted to explain these particularities by the “Bamboo Hypothesis”: if stone tools are scarce and often result from short or simple manufacturing sequences, it is because they were intermediary implements used to make bamboo tools. These would have been varied, at the center of the economy of an “Age of Bamboo”.

Here we present the functional analysis of a very unique polisher from Kiowa. The site is located in the highlands of Eastern New Guinea and was occupied from 12 000 BP. The polisher was found in layer 2, just above layer 3, dating to 5324–5707 cal BP. This exceptional tool presents a large, pointed groove which was interpreted as resulting from the manufacturing of a bamboo spear. We tested this hypothesis by conducting use-wear and residue analyses, using optical microscopes, Hirox, Scanning Electron Microscope, EDX analysis, residue extraction and PXRf. Our results show that it was actually a multi-function tool that was used for four different activities. One of them was the processing of flexible but silica-rich plants, such as the grasses that are used to make skirts nowadays in the region. In the very groove, use-wear points to the working of a semi-hard organic material such as bone or wood. The presence of a wood residue tips the balance in favor of the latter. The morphology of the groove also perfectly matches the shapes of experimental polishers we used to make wooden spears. This discovery echoes the finding of *Casuarina* wooden tools including burrowing sticks at the site of Kuk, on the same islands, in layers dating to 4600 BP to 2300 BP. In New Guinea, like in Southeast Asia, recent archaeological discoveries made possible thanks to use-wear and residue analyses open the Bamboo Hypothesis and show that a plant technology indeed existed during Prehistory, but that it was diverse and not focused exclusively on bamboo tools.

Key words: New Guinea; polisher; Bamboo Hypothesis; plant technology; use-wear and residues.

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Adhesive remains from the Palaeolithic site of Morín Cave: a multidisciplinary approach for residues identification

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Morín Cave locates 6 kilometres south of the Bay of Santander in Villanueva de Villaescusa, Cantabria (Spain). Various archaeological campaigns took place since 1915 and exposed a several meters deep stratigraphy with 22 occupational layers ranging from the Middle to the Upper Palaeolithic [1]. Previously, adhesive residues have been identified on three Gravettian and one Aurignacian stone tools [2] and the authors reported the potential presence of additional artefacts with similar residues. Because of its stratigraphy, spanning from the Mousterian to the Azilian, Morín Cave offers the unique opportunity to study the evolution of adhesive technology through time and across species.

To identify more adhesive residues, we sorted the complete collection of stone tools which consists of more than 25.000 implements. We studied the artefacts and residues with a multidisciplinary approach including optical and scanning microscopy, spectroscopy, and chemical analysis. Optical microscopy was employed to describe use-wear traces and to identify tools with potential adhesive remains. After this preliminary investigation, we selected 26 artefacts for more in-depth analyses. However, the residues on 10 of these tools were too small to be mechanically sampled for chemical analysis and optical microscopy alone is not enough to confirm their nature. Therefore, these residues were analysed with two non-destructive techniques: SEM-EDX and micro-Raman. SEM-EDX was used for the elemental characterization of residue and confirmation of their organic nature. Raman spectroscopy is used in chemistry to determine the vibrational modes of molecules that provide a structural fingerprint by which molecules can be identified. The other residues were sampled for gas-chromatography mass spectrometry (GC-MS analysis) which is the most reliable method for identifying archaeological unknown mixtures.

The SEM-EDX analysis confirmed the organic nature of the residues on four of the 10 tools. The Raman spectra of two of these artefacts showed indications of the analysed residues being organic, with multiple peaks assigned to organic molecular vibrations present in pine resin and birch tar. These potential adhesive residues were identified on a Châtelperronian point and a Protoaurignacian endscraper. The point displays fractures at the tip and base indicative of its use as a projectile and the endscraper was used for hide-working. The Raman spectra of the other two artefacts displayed a limited number of peaks assigned to organic molecular vibrations. The available evidence is not deemed enough to reliably conclude the organic nature of the residue. Additionally, we analysed the residues on an artefact interpreted as inorganic based on the SEM-EDX results and the Raman corroborated this interpretation.

The combination of use-wear and residue analysis with other methods derived from material science allowed the identification of potential adhesive remains on at least two additional stone tools from the Middle and Upper Palaeolithic layers of Morín Cave. These results strongly suggest that also Neanderthals used adhesives for hafting. GC-MS results are pending, but together with these results, we will contribute to additional baseline methods and data for a better understanding of the technological choices and behaviours of Neanderthals and modern humans.

Key words: use-wear; residues; adhesives; material analysis.

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The effects of diagenetic processes on residue analysis an update from the Aurignacian layer 24a1 of Grotta Paglicci, southern Italy

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In the study of the Palaeolithic, residue analysis is at the same time a powerful source of information and a tough operation of deduction, based on the remains of organic and inorganic compounds sometimes dating back more than 200,000 years. In this context, the acquisition of chemical data from the minute traces of substances that came into contact with lithic edges and surfaces during past human activities can be challenged by several factors, such as degradation processes, burial conditions, chemical exchange with soil minerals, microbial activity, natural deposition, and so on. In this contribution, we explore part of the vast field of 'residue taphonomy' proposing the results of the in-depth residue analysis of 13 lithic artefacts coming from layer 24a1 (Aurignacian – 32,112- 34,447 years cal BP) of Grotta Paglicci, Apulia, southern Italy, using Synchrotron Radiation Fourier Transform Infrared (SR-FTIR) microscopy. The presence of residues on the artefacts included in this work has been identified by 3D digital microscopy as part of a wider study of more than 80 implements from the same layer, having as a result a heterogeneous group and a representative sample of the general conditions of the lithic assemblage (6 backed bladelets, 1 unretouched bladelet, 2 unretouched blades, 1 burin, 1 scraper, 2 flakes). Thanks to the collection of two different samples of residue for each implement, SR-FTIR measurements have been performed in transmission mode on more than 20 samples of different residues, attesting high concentrations of carbonate hydroxyapatite – the main constituent of bone mineral – in the majority of them. This result, together with the already established poor preservation of the faunal remains in layer 24a1, has led to the supposition of a process of transfer of the carbonate hydroxyapatite from the burial environment to the lithic surfaces. The comparison of the archaeological residues with a sample of modern bone, samples of bones from layer 24a1 and a sample of soil from the same layer has then been performed to deepen our understanding of the processes of bone dissolution and hydroxyapatite re-deposition within the layer. This contribution represents an attempt to frame potential issues in residue proper attribution when non-functional residues are located in correspondence of worked edges, as well as a well-documented case of carbonate hydroxyapatite exchange in burial environments through infrared spectroscopic techniques.

Key words: Diagenetic processes; bone dissolution; carbonate hydroxyapatite; SR-FTIR microscopy; residue analysis.

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Multidisciplinary analysis of the backed pieces of layer O, Grotta della Cala (Campania, southern Italy) combining lithic technology and high-resolution chemical characterisation of Epigravettian residues

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Residue analysis is one of the most effective ways of directly inferring the technical expertise and adaptability of Palaeolithic human groups, as it can provide evidence of the use of natural resources that are not normally preserved in the archaeological record at a macroscopic scale. This kind of approach, when combined with the technological study and use-wear analysis, is capable of opening new perspectives on the production of complex tools, their use and more in general their 'life history' in an archaeological sense. Across a very wide range of applications aimed at responding to a plethora of scientific open questions, the study of hafting procedures of lithic armatures and the chemical characterisation of the adhesives used for this purpose has always played a role of particular significance, as well as a point of main interest for the understanding of both technical and cognitive skills of Palaeolithic hunter-gatherers. In this contribution, we present the results of a multidisciplinary study on the backed pieces of layer O (evolved Epigravettian, chronological terminus ante quem: 20, 8- 18, 9 years cal BP) of Grotta della Cala, Campania, southern Italy, with the aim of investigating the production systems of these kind of implements and their use. The in-depth analysis of the back of the implements through 3D digital microscopy enabled the identification of dark-coloured residues on four backed points, which were chosen for high-resolution chemical analysis through Synchrotron Radiation Fourier Transform Infrared (SR-FTIR) microscopy. Two samples of residue were analysed in transmission mode for each of the selected implements and an average of 23 spectra per sample were collected, for a total of 187 high-resolution spectra. Soil samples from layer O were also analysed by Attenuated Total Reflectance (ATR-) FTIR spectroscopy in triplicate as a negative control, to rule out the presence of intense organic signals within the burial context. The overall result led to the identification of two main classes of chemical compounds, with very different infrared features proper of proteinaceous materials, on the one hand, and degraded lipidic substances, on the other. Even though the use of fats and animal glues in hafting procedures cannot be assessed here, the high concentration of the two classes of signals, mainly in correspondence of the back of the implements, as well as their exceptional intensity, open compelling perspectives on the differential use of the backed pieces of layer O. This is the first multidisciplinary study targeted at investigating the occurrence of adhesives on Epigravettian backed pieces in southern Italy and represents the continuation of an ongoing project on the study of the Late Upper Palaeolithic lithic industries of this area.

Key words: Residue analysis; lithic technology; SR-FTIR microscopy; Epigravettian; southern Italy.

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Multidisciplinary approach to the analysis of residues on quartz tools from the Bronze Age Thessaloniki Toumba, Greece

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Our research focuses on the study of residues found on quartz chipped stone artifacts from the building M at Bronze Age Thessaloniki Toumba settlement, northern Greece. The lithic assemblage was considered as a representative case study for residue analysis as it derives from a specific context and it has been remained unwashed after the excavation. After a minimal gentle cleaning low-power optical microscopy was performed to the total of the 714 quartz artifacts using respectively a stereo microscope NOVAX with magnification range 10-30x. A total of 221 (30,9%) quartz tools preserve possible micro-residues. The residues were photographed with a Levenhuk DTX 90 USB digital microscope equipped with a 5 Mpx camera and magnification within 10x-300x range. They were documented according to their characteristics (colour, structure, position, distribution and possible co-occurrence of use-wear on tools). A selected sample of 33 quartz tools was additionally observed under a ZEISS Stemi 508 stereo microscope with 8:1 Zoom and magnification within 0,63x-50x range, equipped with a USB microscope Jenoptik Gryphax[®] camera. The documentation of residues adhered on the 33 quartz tools were further subjected to non-destructive energy dispersive X-ray fluorescence (EDXRF) in order to collect information regarding their elemental composition. Samples of residues on 17 of those tools were extracted and further examined under scanning electron microscope equipped with an energy dispersive X-ray spectroscope (SEM-EDS) and with micro-Fourier Transform infrared spectroscopy (micro-FTIR) using a 6Ax64 FPA detector. The results were compared and evaluated to referential archaeological and experimental published data. The synthesis of the data revealed residues of organic and inorganic provenance including plant, animal and mineral materials. Those results are in agreement with other studies placing multiple workshop activities at building M.

Key words: Residues; Quartz; Stone tools; Bronze Age; Microscopy; EDXRF; micro-FTIR; SEM-EDS.

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On the question of the hafting method of ancient Inuit ulu stone knives

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Ethnotraceological studies of ulu stone knives from the Chukotka and Alaska peninsulas have become promising research in archeology due to the fact that ethnographic artifacts represent a continuation of archaeological traditions both in terms of their manufacturing method and specific purpose. While the problems of raw materials, manufacturing technology, and the use of these knives were gradually resolved, the issue of attaching the ulu knife to the handle with glue remained an unresolved but important aspect in the reconstruction of both the manufacturing technology and handling of these knives, because the effectiveness of their use and, as a result, the formation of wear traces on the working blade depend on the quality of fixing the knife in the handle. American ethnologist O.T. Mason pointed out that the Inuit of Alaska used either isinglass or a mixture of seal blood, clay, and dog hair to fasten knife handles. At present, there are no data in the archaeological literature on the use of such glues in antiquity, since isinglass is subject to decomposition and it is not possible to detect it on ancient products, while for the second recipe for glue made of a mixture of seal blood, clay and dog hair experimental confirmation is still required, as the mixture of these ingredients does not provide satisfactory adhesion.

To clarify the composition of the glue used by both the ancient Eskimos and the people of the Bering Sea at the beginning of the 20th century, technical and technological studies of the adhesive were carried out for the first time on three examples of ulu knives originating from archaeological and ethnographic collections. Sample 1 is a dark powder from the resin of coniferous trees (plants). The studied sample does not contain mineral pigments. Sample 2 is a composition of organic material and mineral filler. The organic material is the resin of coniferous trees, the mineral filler belongs to the group of kaolinites. The sample also contains a small amount of carbon. Sample 3 is gum resin, a plastic organic substance, which can be identified with a high degree of probability as larch exudate. The studied sample does not contain mineral pigments.

Thus, the glue on ulu knives that has survived to this day is either pure resin of coniferous trees, or clay has been added to the resin of coniferous trees for faster hardening. Such glue was more practical both to make and to store than glue based on animal blood or isinglass. The use of the latter in the practice of the ancient Inuit is not excluded, but requires a detailed study of its manufacture.

The obtained data made it possible to fill a gap in our knowledge about the ancient technologies of the population of the Chukotka Peninsula and correctly simulate the experimental production and use of ulu knives.

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Key words: Chukotka; ancient Inuit culture; ulu knives; ancient technologies; ethnography; handles; glue; technical and technological research.

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New insights on Italian Neolithic and Copper age steatite ornaments: experimental and traceological approach

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This paper is focused on the various kinds of steatite personal adornments that were used in the Italian peninsula during the Neolithic and the Copper Age. Data highlight a reach manufacture activity focused principally on beads production, since the earliest phases of the Neolithic.

The scarcity of by-products in favor of finished ones often does not allow a clear understanding of the ancient manufacturing techniques adopted, which in literature are often hypothesized based on ethnographic analogies. Through an experimental and traceological approach, the sequence of actions involved in their production, as well as their use, were attempted to identify. For this purpose, an experimental protocol was developed to investigate the possible gestures of the craftsman, and the traces on the surfaces of the artefacts that could attest to it.

The results of our study underline differences in ornament type and production techniques reflecting the existence of various cultural traditions.

Key words: stone ornaments; Italy; Neolithic; Copper age; experimental archaeology; traceology.

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Session 8-1

Lower Palaeolithic all around the world: only Oldowan and Acheulean?

SESSION ABSTRACT

The Lower Paleolithic, while covering an extremely long-time span and large areas in Africa and Eurasia, is usually reduced to two main cultures: Oldowan and Acheulean (Mode 1 and Mode 2). Moreover, most of the features characterizing the Oldowan persist unchanged during the Acheulean. From a chronological point of view, the pathways appear to be heterogeneous for both cultures, and from a paleoanthropological point of view, multiple hominins are associated with similar cultures, and different cultures are associated with the same hominin. In such a fragmented context and, for some periods and geographic areas, often supported by a limited number of archaeological sites, can we define the Oldowan and Acheulean as cultural traditions or techno-complexes? Furthermore, if we define culture as "the complex of manifestations of the material, social, and spiritual life of a population" to what extent can we consider lithic industries to reflect the "complex of manifestations of material life"?

The session "LOWER PALAEOLITHIC ALL AROUND THE WORLD: ONLY OLDOWAN AND ACHEULEAN?" aims to highlight the different aspects of the Lower Paleolithic lithic complexes, highlighting all the peculiarities and peculiarities that characterized a very long-time span (about 3 million years).

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Oldowan and Acheulean Temporal Trends and the Question of Cultural Convergence

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The Oldowan and Acheulean last for exceptionally long periods and both have long been defined as unified cultural traditions. Such a definition is based on the cultural information responsible for expedient flake technologies (Oldowan) and bifacial LCTs (Acheulean) being maintained by social learning processes across their respective timespans. In the case of the Oldowan this is from c. 2.8 (but likely earlier) to 1.6 million years ago (Ma), while the Acheulean has been modelled to range from c.1.8 Ma to potentially < 0.1 Ma. This does not mean that all hominin populations would have successfully passed on the cultural knowledge responsible for flake technologies and bifacial LCTs, but rather, that the 'braded streams' representing the presence of cultural information in hominin lineages is never wholly broken. Morphometric and technological evidence supports such an understanding by demonstrating that although there is variation in the complexity and form of both technologies, neither displays divergence from a fundamental Bauplan or technological definition. Yet, it is possible that cultural convergence could be responsible for the replication of these similarities across time and space. Shared ecological (functional) requirements, alongside similar cognitive and/or ergonomic capabilities, could have created selective pressures favouring the 'reinvention' of technological solutions even if earlier similar traditions had ended. One of the few ways to test whether there were periods of cultural loss in the ESA and Lower Palaeolithic is through the investigation of temporal data. If chronological gaps between sequential archaeological records can be determined as substantial enough (on a relative basis) to infer cultural loss, then it is possible to assert that these later archaeological records could have resulted from an episode of cultural convergence. Here, I discuss the benefits and limitations of statistically identifying cultural loss using temporal records, present updated data concerning the absence of cultural convergence in the Acheulean record, and investigate the presence of cultural convergence during the Oldowan using the 'surprise test'.

Key words: Early Stone Age; temporal modelling; Lower Palaeolithic; cultural tradition.

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Human behaviour and environment at Pirro Nord site: Is it possible to define the influence of the environment on technical behaviour?

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The site of Pirro Nord (Apricena, FG, Southern Italy), in the specific the Pirro 13 fissure, represents one of the oldest evidence of the presence of Homo in Europe. Dated to 1,3-1,6 Ma by biochronology, the site is characterized by a large faunal assemblage found together with an Oldowan lithic complex (Arzarello et al., 2007; 2012; 2016; López-García et al., 2015; Giusti and Arzarello, 2016; Cheheb et al., 2019; Berruti and Arzarello, 2020).

Although the deposit is in a secondary position (transport of sediments, bones, and lithic industries within the karstic fissure), the presence of butchery's traces on bones, the taphonomic homogeneity, and technological consistency of the lithic industries attest to the homogeneity of the finds. Palaeoenvironmental reconstruction has made it possible to define how human occupation occurred in an open and dry environment characterized by seasonal wetlands.

The lithic assemblage is characterized by a core-flakes technology. The raw material, flint's cobbles, and pebbles have been collected in a secondary position in the surrounding of the site. The reduction sequences are relatively short and finalized to the production of flakes with different morphologies and sizes. The use-wear analysis, also if performed on a few implements, attests a preferential use in the butchering of animal carcasses.

In a broader view, we see that in the context of the first European population (between 1.5 and 1 Ma), the existing prehistoric sites are extremely rare and mostly located in southern Europe. This situation could be linked to several reasons: lack of sufficient surveys, conservation problems, and environmental restrictions on the spread of Homo in Europe.

Key words: First European Peopling; Pirro Nord; Environment; Human behaviour.

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Bilan des recherches effectuées dans la Grotte du Vallonet. Une industrie lithique archaïque associée à une faune épivillafranchienne datées d'un peu plus d'un million d'années

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La grotte du Vallonet, située sur la commune de Roquebrune-Cap-Martin, près de Menton, dans les Alpes-Maritimes, contient des dépôts sédimentaires de plus de 2 mètres d'épaisseur attribués au Pléistocène inférieur. L'étude stratigraphique, en prenant en compte les données sédimentologiques magnétostratigraphique et celles des faunes épivillafranchiennes de grands mammifères et de microvertébrés et des industries lithiques du Paléolithique ancien a permis d'individualiser plusieurs ensembles stratigraphiques, en allant de la base au sommet:

Ensemble stratigraphique I :

L'étude palynologique du plancher stalagmitique inférieur, bien cristallisé, daté d'environ 1,12 Ma ou 1,22 Ma, indique que lors de sa formation le paysage avoisinant était une forêt dense composée de platanes, de pterocaryas, de taxons méditerranéens et de pins.

Ensemble stratigraphique II :

Une plage marine littorale, riche en restes de poissons, en mollusques marins et en foraminifères et la présence du phoque moine (*Monachus monachus*), a été datée d'environ 1,07 Ma. La végétation dominée par les pins et les taxons méditerranéens, correspond à une forêt moins dense que celle de l'ensemble stratigraphique I. La présence, parmi les poissons, de *Chilomycterus* sp. cf. *acanthodes* (diodon), *Odontaspis taurus* (Requin taureau), *Chrysophrys aurata* (Daurade royale) et *Myliobatis aquila* (Raie « aigle des mers »), et parmi les mollusques de *Gryphaea cucullata*, caractéristique des mers tropicales, indique une température moyenne sur le littoral comprise entre 24 °C et 28 °C alors qu'elle est actuellement, dans la baie de Villefranche, de 15,9 °C.

Ensemble stratigraphique III :

D'environ 1,50 m d'épaisseur, composé d'argile limono-sableuse rouge-jaune emballant des blocs, des cailloux et des galets issus de pouding miocène juste au-dessus de la grotte, cet ensemble stratigraphique a été subdivisé en trois sous-ensembles stratigraphiques C, BII et BI. De polarité géomagnétique normale et situé entre les dépôts sous-jacents des ensembles stratigraphiques I et II et ceux sus-jacents de l'ensemble stratigraphique IV, cet ensemble pourrait être attribué à l'épisode de Jaramillo dont l'âge est compris entre 1,07 et 0,98 Ma ou celui de Cobb Mountain dont l'âge est compris entre 1,21 et 1,19 Ma.

En effet, des datations récentes par la méthode U/Pb appliquées au plancher stalagmitique supérieur (ensemble stratigraphique IV) de $1,13 \pm 0,19$; $1,14 \pm 0,5$; $1,17 \pm 0,00$; $1,18 \pm 0,05$; $1,19 \pm 0,07$; $1,22 \pm 0,09$ Ma, c'est-à-dire entre 1,13 et 1,22 Ma, permettent de proposer une date un peu plus ancienne que celle admise antérieurement, correspondant à l'épisode de Cobb Mountain (1,29 à 1,19 Ma) au lieu de l'épisode de Jaramillo (1,07 à 0,98 Ma).

Au cours des fouilles, les dépôts de l'ensemble stratigraphique III ont été subdivisés, en prenant en compte la répartition des ossements de grands mammifères en trois sous-ensembles stratigraphiques, en allant de bas en haut, C, BII et BI.

L'étude des pollens a mis en évidence, à la base de cet ensemble stratigraphique, correspondant aux sous-ensembles stratigraphique C, BII et à la partie inférieure de B1, une steppe très pauvre en arbres représentés par des pins maritimes, des oléacées et des chênes méditerranéens. Le climat devait être alors sec et relativement frais.

Dans les niveaux situés au sommet de l'ensemble stratigraphique III correspondant au milieu et à la partie supérieure du sous-ensemble stratigraphique BI, une forêt composée de pins, d'espèces de la chênaie mixte et de taxons méditerranéens, reprend progressivement le dessus, ce qui indique une période de réchauffement climatique.

La faune de grands mammifères comprend : *Macaca sylvanus florentina*, *Ursus deningeri*, *Xenocyon lycanoides*, *Canis mosbachensis*, *Alopex praeglacialis*, *Pachycrocuta brevirostris*, *Homotherium crenatidens*, *Acinonyx pardinensis*, *Panthera gombaszoegensis*, *Panthera pardus*, *Lynx spelaeus*, *Felis silvestris*, *Meles meles*, *Mammuthus meridionalis*, *Stephanorhinus hudsheimensis*, *Equus sp. non caballin*, *Hippopotamus cf. antiquus*, *Sus sp.*, *Bison schoetensacki*, *Praeovibos sp.*, *Ammotragus europaeus*, *Hemitragus bonali*, *Rupicaprini gen. ind. sp. ind.*, *Praemegaceros cf. verticornis* et *Pseudodama nestii vallonnetensis*.

Cette association de faunes est en bon accord avec les datations obtenues pour le site. Les carnivores comme *Pachycrocuta brevirostris*, *Homotherium crenatidens*, *Acinonyx pardinensis*, *Panthera gombaszoegensis*, et parmi les herbivores comme *Mammuthus meridionalis* et *Equus sp. non caballin*, sont bien caractéristiques du Pléistocène inférieur, *Xenocyon lycanoides* permet d'attribuer le site à la seconde moitié du Pléistocène inférieur. D'autres espèces comme *Ursus deningeri*, *Bison schoetensacki*, *Hemitragus bonali* et *Praemegaceros cf. verticornis*, annoncent déjà le Pléistocène moyen.

L'association de micromammifères, parmi les rongeurs de *Microtus (Allophaiomys) nutiensis*, *Ungaromys nanus*, *Mimomys cf. savini*, *Hytrix major* et, parmi les insectivores, de *Beremendia fissidens*, confirme l'âge du Pléistocène inférieur.

Treize unités archéostratigraphiques ont été individualisées dans les sous-ensembles stratigraphiques C, BII et BI de l'ensemble stratigraphique III à partir des projections d'objets sur des plans verticaux effectuées tous les 10 cm dans le sens transversal et dans le sens longitudinal (Echassoux A., 2001).

La caverne a alors essentiellement servi de repaire à de grands carnivores ainsi que l'attestent les restes de *Xenocyon lycanoides*, *Canis mosbachensis*, *Homotherium crenatidens*, *Acinonyx pardinensis*, *Panthera gombaszoegensis*, *Panthera pardus*, qui y apportaient des carcasses de grands herbivores. L'ours de Deninger (*Ursus deningeri*), l'une des espèces dont les restes sont les plus abondants, venait hiverner. L'hyène géante, *Pachycrocuta brevirostris*, fréquentait régulièrement la grotte pour y récupérer des carcasses abandonnées par les grands carnivores ainsi que le montrent les nombreux ossements qui ont été brisés par ses puissantes mâchoires. Des porcs-épics (*Hytrix major*) qui habitaient la caverne ont laissé les traces de leurs dents sur la plupart des ossements.

En l'absence des grands carnivores, c'est l'Homme, alors charognard, en compétition avec l'hyène géante, *Pachycrocuta brevirostris*, qui fréquentait la caverne pour avoir également accès aux carcasses et qui a laissé, dans plusieurs unités archéostratigraphiques, des percuteurs et des outils taillés : galets aménagés et petits éclats bruts de taille. Il y a, en revanche, peu de petits outils retouchés. Il y apportait également des bois de chute de cervidés qu'il ramassait à l'extérieur, vraisemblablement pour servir de percuteur (Lumley *et al.*, 1988).

Des fractures sur os frais, des encoches de percussion et des stries dues à l'utilisation des outils lithiques sur des ossements, notamment de cervidés, attestent de la présence intermittente des Hommes dans la grotte qui venaient y pratiquer des activités de boucherie (Echassoux A., 2001).

L'industrie de la grotte du Vallonet peut être comparée à d'autres industries lithiques archaïques de l'Europe méditerranéenne comme celle de Piro Nord (1,4 Ma) à Aprical dans les Pouilles, de Barranco León et de Fuente Nueva 3 à Orce en Andalousie (1,2 Ma), de la Sima del Elefante dans la Sierra d'Atapuerca près de Burgos dans la province de Castille-León (1,5 à 1,12 Ma). Nous attribuons ces industries à un Préoldowayen ou Oldowayen archaïque.

Ensemble stratigraphique IV :

Le plancher stalagmitique supérieur ou plancher stalagmitique de fermeture, bien cristallisé, qui a colmaté la région postérieure de la caverne, daté par la méthode de l'ESR entre 910 000 et 890 000 ans, ou par la méthode U/Pb de 1,194 Ma, de polarité géomagnétique inverse à son sommet, correspond à la période de Matuyama supérieur. La végétation, dont le couvert forestier est constitué de pins, de grands feuillus et de taxons méditerranéens, évoque un climat tempéré chaud et humide.

Ensemble stratigraphique V :

Constitué d'argiles limono-sableuses jaune-rouge, ces dépôts colluviés, se sont déposés en surface de la région postérieure de la grotte postérieurement à la formation du plancher stalagmitique de fermeture de l'ensemble stratigraphique IV.



Figure 1 : La grotte du Vallonet s'ouvre, près de Menton, sur le territoire de la commune de Roquebrune-Cap-Martin, à 108 m d'altitude, sur la rive gauche d'un thalweg qui débouche dans la baie de Menton. Elle est creusée dans un massif calcaire jurassique ennoyé dans le poudingue miocène de Roquebrune. Elle a été occupée alternativement, il y a un peu plus d'un million d'années, par des carnivores qui y installaient leur tanière, et par des Hommes porteurs d'une industrie archaïque qui venaient charogner, en compétition avec l'hyène géante, des carcasses d'herbivores abandonnées par les carnivores.

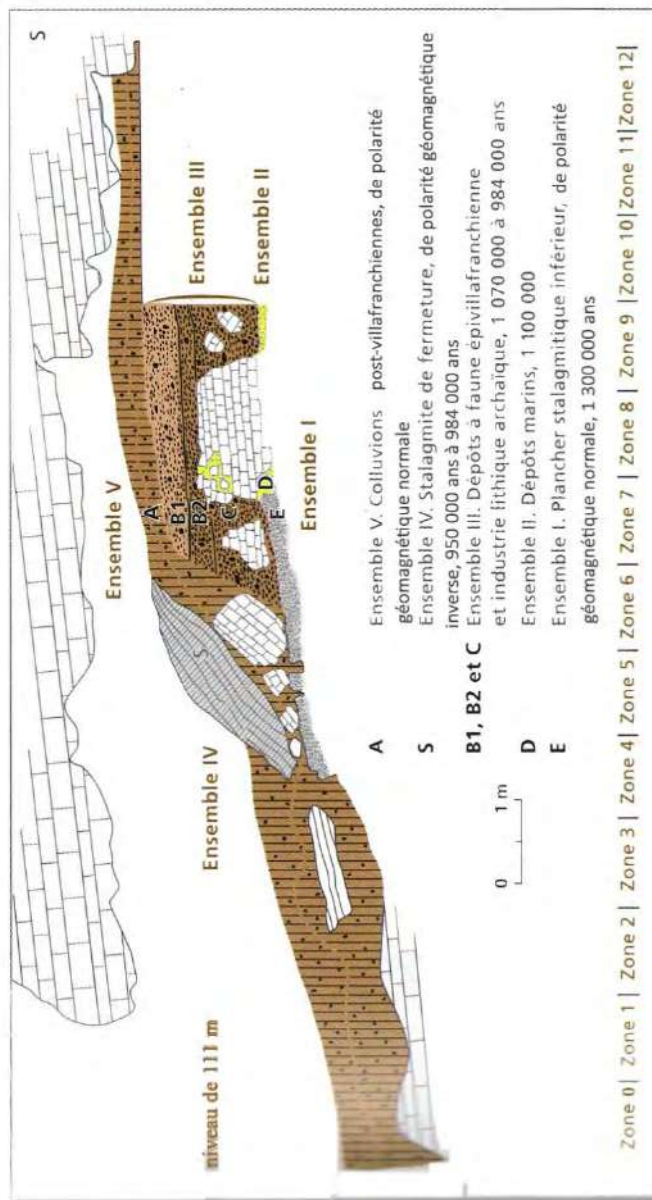


Figure 2 - Stratigraphie du remplissage de la grotte du Vallonet dans laquelle ont été individualisés cinq ensembles stratigraphiques :

- 1 : Ensemble stratigraphique I : Plancher stalagmitique inférieur, de polarité géomagnétique normale,
- 2 : Ensemble stratigraphique II : Plage marine littorale constituée de sables coquilliers,
- 3 : Ensemble stratigraphique III : Dépôts de sables argilo-limoneux contenant une faune épivillafranchienne et une industrie lithique archaïque, de polarité géomagnétique normale,
- 4 : Ensemble stratigraphique IV : Plancher stalagmitique supérieur de polarité géomagnétique inverse à son sommet,
- 5 : Ensemble stratigraphique V : Colluvion de sables argilo-limoneux post-épivillafranchienne, de polarité géomagnétique normale.



Figure 3 - Vue de l'ensemble stratigraphique III, daté d'un peu plus de 1 million d'années, renfermant des faunes épivillafranchiennes et une industrie lithique archaïque. Au premier plan, le socle calcaire érodé par la mer, il y a environ 1,07 million d'années.

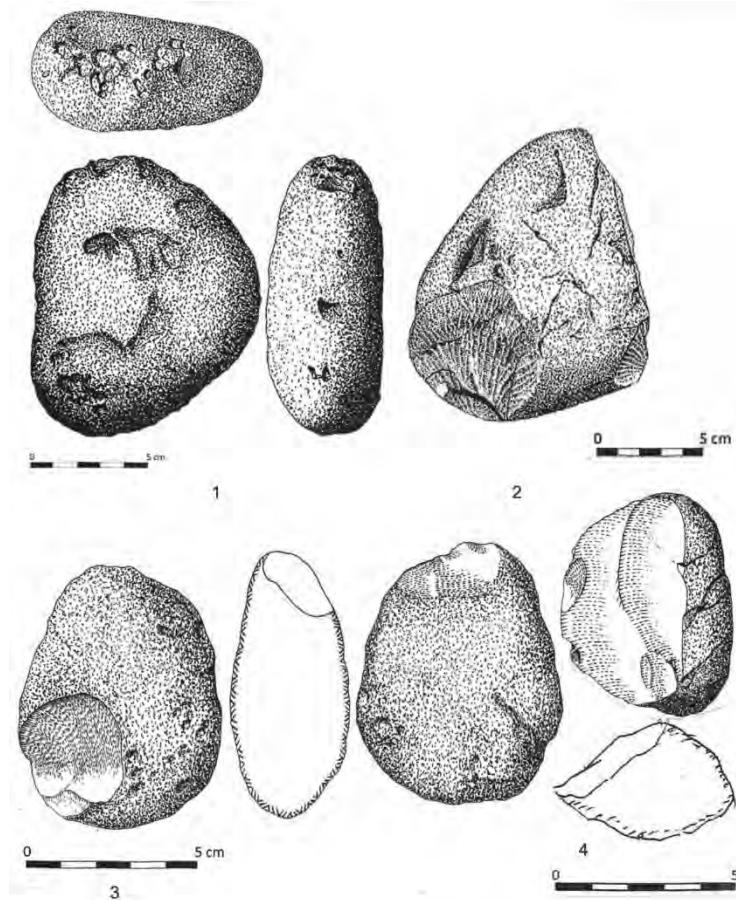


Figure 4 - Industrie lithique archaïque du Pléistocène inférieur de la grotte du Vallonet, associée à une faune épivillafranchienne, datée d'un peu plus d'un million d'années. 1 : Galet entier ayant servi de percuteur, présentant des

stigmates de percussion, 2 : Galet à enlèvement isolé à tranchant convexe (percuteur), 3 : Galet à enlèvement isolé à tranchant concave (chopper primaire) double, 4 : Chopper opportuniste

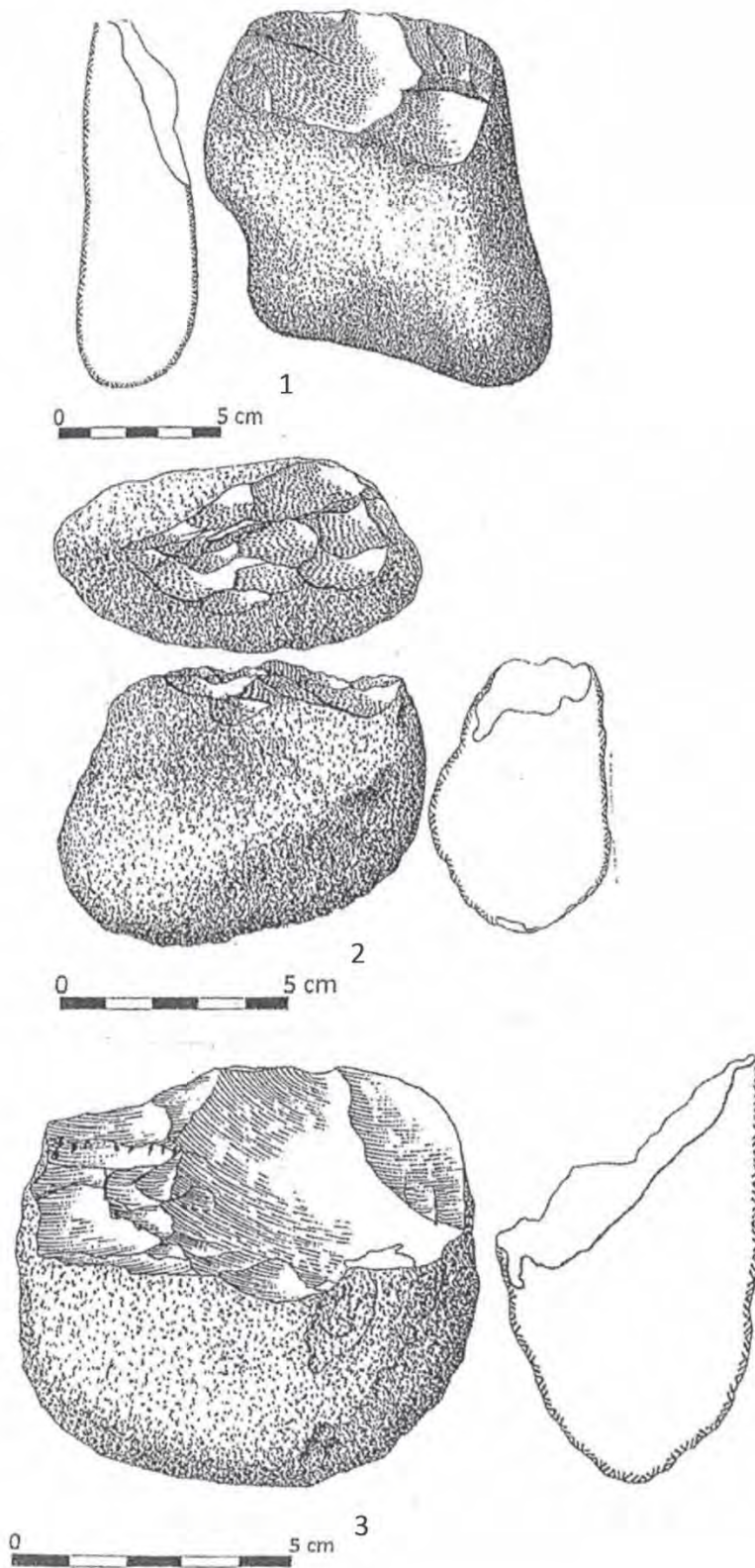


Figure 5 - Industrie lithique archaïque du Pléistocène inférieur de la grotte du Vallonnet, associée à une faune épivillafranchienne, datée d'un peu plus d'un million d'années.

1 à 3 : Galets aménagés (choppers) à tranchant aménagé par des enlèvements envahissants unifaciaux.

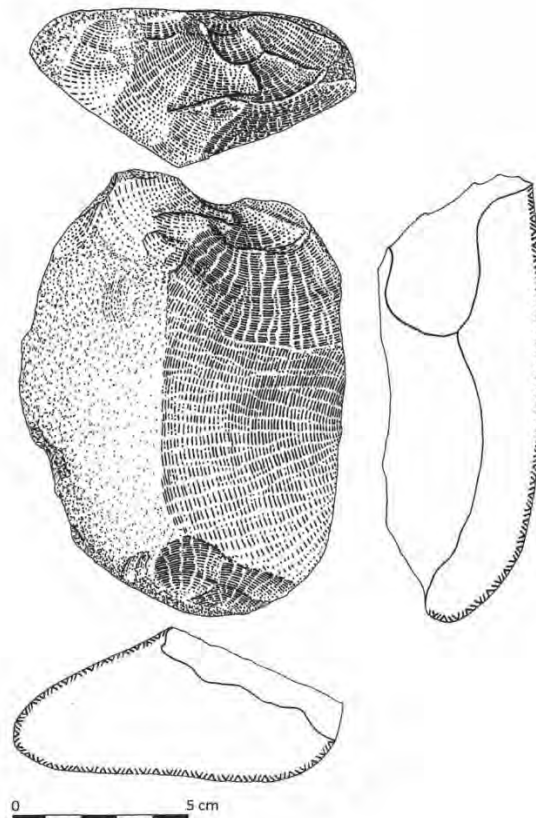


Figure 6 - Industrie lithique archaïque du Pléistocène inférieur de la grotte du Vallonnet, associée à une faune épivillafranchienne datée d'un peu plus d'un million d'années.

1 : Galet aménagé (chopper) à tranchant aménagé par des enlèvements semi-abrupts en bout de galet.

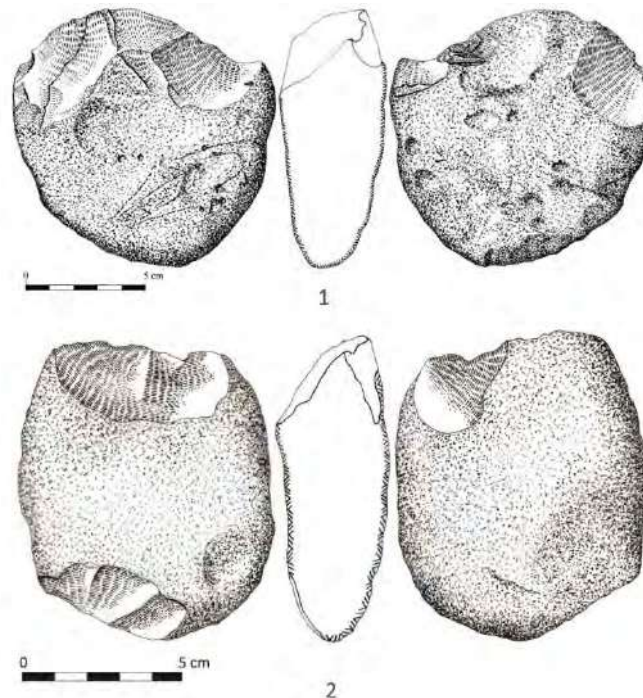


Figure 7 - Industrie lithique archaïque du Pléistocène inférieur de la grotte du Vallonnet, associée à une faune épivillafranchienne, datée d'un peu plus d'un million d'années. 1 : Galet aménagé (chopping-tool) à tranchant aménagé par des enlèvements envahissants bifaciaux. 2 : Galet aménagé (chopping-tool) à tranchant aménagé par des enlèvements envahissants bifaciaux opposé à un galet aménagé (chopper) à tranchant aménagé par des enlèvements envahissants unifaciaux.

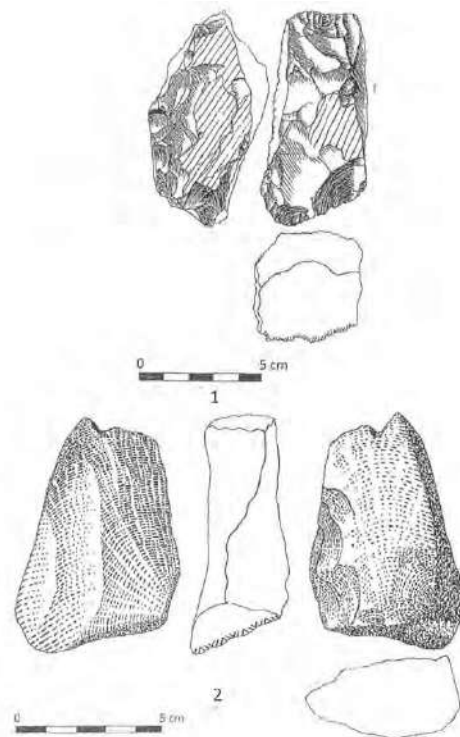


Figure 8 - Industrie lithique archaïque du Pléistocène inférieur de la grotte du Vallonnet, associée à une faune épivillafranchienne datée d'un peu plus d'un million d'années. 1 : Nucléus en silex. 2 : Racloir latéral sommaire aménagé par des retouches envahissantes sur la face plane d'un éclat.

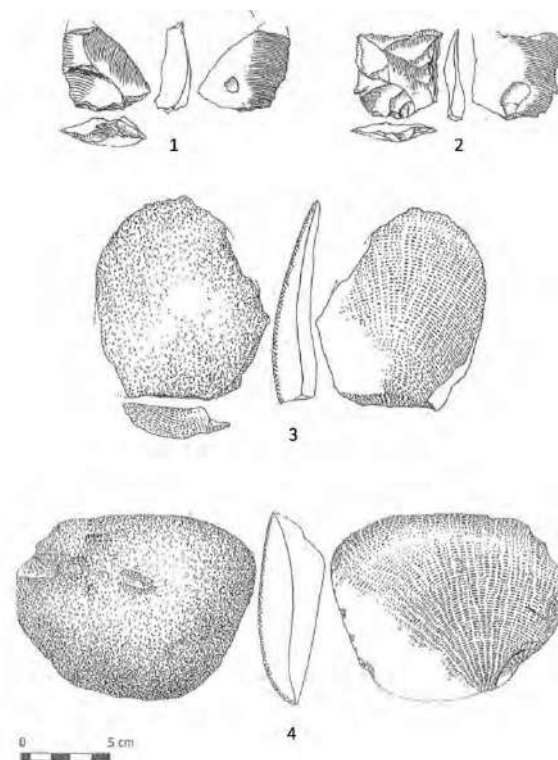


Figure 9 - Industrie lithique archaïque du Pléistocène inférieur de la grotte du Vallonnet, associée à une faune épivillafranchienne, datée d'un peu plus d'un million d'années. 1 et 2 : Éclats de plein débitage à enlèvements centripètes périphériques sur la face supérieure et à talon facetté, en silex, 3 : Éclat de chopper, à surface totalement en cortex et à talon lisse, 4 : Éclat de percuteur (galet à enlèvement isolé convexe), à surface totalement en cortex et à talon nul.

Lower Palaeolithic Sites in Ukraine Current views on Technological and Morphological variations

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The focus of this communication is the current state of interpretations for the technological and morphological variations of Lower Palaeolithic sites within the 1991 borders of Ukraine. In the past decade or so, numerous new sites have been discovered in various parts of eastern Ukraine, and previously known sites have been reevaluated. Notably, important new stratified Lower Palaeolithic sites have been found in Ukrainian Transcarpathia, which is in the central European region of the country. The Lower Palaeolithic records in Ukraine demonstrate the presence of hominins in mountainous areas, such as the Carpathians and Crimea, as well as in the valleys of major rivers, including the Dniester, Southern Buh, Dnieper, and Severskiy Donets.

Based on geological, geomorphological, biostratigraphical data, and ESR dates, the age of the Lower Palaeolithic assemblages in question is estimated to be between 1.2 and 0.4 million years. These sites are believed to correlate with a few warm phases between MIS 35 and MIS 11. Earlier sites are also reported and tentatively dated to around 2 million years ago, were found mainly near the seashore and in mountainous areas. Later sites show evidence of steady, albeit not continuous, colonization of fringe areas of the East European plain. Mode I and Acheulean industries are recognized in the Central European part of Ukraine.

The most important regularities of the morphological and technological characteristics of the Lower Palaeolithic sites in the Western segment of the East European plain are also discussed. The industries found in these sites are mainly categorized as belonging to Mode I, with core-and-flake industries present until the Holsteinian period. So late persistence of archaic technologies may be explained in terms of available resource limitations. Difficulties in obtaining lithic raw materials may have led to the developing of a unique pattern of technological behaviour, which primarily involved bipolar knapping and the widespread use of specific bipolar-on-anvil trimming techniques for shaping tools and manufacturing working edges.

Key words: Eastern Europe; Ukraine; Lower Palaeolithic.

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The lower paleolithic of the Zarqa Valley, Northern Jordan

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The fluvial Dawqara Formation, upper Zarqa Valley, Eastern side of Jordan rift, is chronologically constrained between 2.52 and 1.98 Ma. Several artifact-bearing outcrops display a core and flake industry, with no handaxes nor planned flaking. Herein, we describe the industry from the main sections of the formation, which is one of the oldest Oldowan complex outside Africa. Regardless the occurrence of basalts, all artifacts are made on chert cobbles with various degrees of abrasion due to fluvial action. The industry consists of thousands of flakes, cores, choppers and few trihedral picks, preferentially obtained on chert cobbles, unifacially and bifacially trimmed by multiple flaking events. The Dawqara Formation includes fossil remains of elephants, bovids, equids and rodents, in association with the industry. Middle Pleistocene outcrops, younger than Dawqara Formation, contain a rich Lower and Middle Acheulean industry, also presented in this work.

Key words: Oldowan; Jordan Rift; Lithic Technology; Paleontology.

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Middle Pleistocene Mode I Lithic Industries in the Western East European Plain

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There are several sites dated to the Middle Pleistocene within the western part of the East European Plain. We focus on the sites of Medzhybizh 1 and Medzhybizh A, which are located in the valley of the Southern Buh (Ukraine). The distance between localities is no more than 500 m. Medzhybizh 1 has two Lower Palaeolithic layers. These are layers III and IV, which correlate with MIS 11 and MIS 15–13 respectively. Medzhybizh A has three Middle Pleistocene layers: I, II (MIS 11), and III (MIS 15–13). The layers of these sites belong to the Zavadivian and Lubenian units. Layer I of Medzhybizh A and layer III of Medzhybizh 1 have ESR dates (approximately 400 000 years), which confirms the version of the Holsteinian age of these assemblages.

The lithic industries of the Middle Pleistocene layers of Medzhybizh 1 and Medzhybizh A are similar enough. Hominins used the same raw materials and processed it with identical methods. The industries consist of products of processed pebbles of flint, quartz, granite, quartzite, limestone, slate, and sandstone. Angular pieces of blocks of the same types of raw material were used less often. We have preliminary data on the tendency to select larger flint pebbles. At the same time, the collections also include products of processing small pebbles (15–30 mm). In most cases, it is quartz and slate.

Assemblages have an archaic structure. It consists of knapped pebbles and angular pieces, their fragments, flakes, and small production waste (chips and splinters). Cores and products with secondary processing are few. The majority of objects show signs of the use of the bipolar on anvil technique during both primary and secondary processing. The freehand technique is represented by single artefacts, but not in the core category. These are pebbles with edge flaking (sometimes alternative) and flakes with retouching. We notice products with traces of trimming on anvil at all sites. This specific technique is present during both the knapping of pebbles and the secondary processing of flakes. Trimming was used to make opportunistic working edges or to test stone raw materials.

The stoneknapping strategy aimed to reduce pebbles (mainly) through short operational sequences to form objects with sharp edges in all Middle Pleistocene layers of Medzhybizh 1 and Medzhybizh A. That is why the processing products are quite similar morphometrically, technically, and technologically. However, the complexes differ in individual components that ensured the functioning of such a technological strategy. Isolated single removals cause mainly unidirectional scar organization on both knapped pebbles and flakes. The low intensity of utilization of raw material blanks excludes the need for the formation of striking platforms and therefore makes it impossible to use bifacial and other volumetric methods of knapping surfaces control. There is no standardization of stone processing products because of this organization of the technological process.

Key words: Middle Pleistocene; Lower Palaeolithic; lithic technologies; bipolar on anvil technique.

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An initial insight into the early Lower Paleolithic of the Central Balkans investigations of Petrovac 1 site on the Radan Mountain in southern Serbia

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Based on the premise that Lower Paleolithic sites in the Central Balkans can be expected in the vicinity of primary and secondary deposits of raw materials, intensive explorations have been carried out in the last decade in the area of the spread of the Vardar geotectonic zone with pronounced Miocene volcanism and rich opal and chalcedony deposits formed under hydrothermal conditions. At the largest of these deposits - in the area of the Radan Mountain - we identified a large number of lithic scatters with numerous artifacts from the Lower Paleolithic. At one of them - at the location of Petrovac 1 - test excavations showed that there are at least two layers with Paleolithic artifacts. The deepest layer (3) contained unipolar, bipolar and irregular cores, very small, often elongated flakes, and a small number of slightly modified tools on flakes, as well as massive chopper-like tools made from fragments of pyroclastic rocks. The upper layer (2) contained an industry characterized by SSDA, centripetal and preferential cores, but without elaborate Levallois products. Although attempts at radiometric dating have not been successful so far, the assemblage from the layer 3 can be attributed to the core and flake (Mode 1) industries that occurred in the Balkans from more than a million years ago (Kozarnika) until 500-300 thousand years ago (Marathousa, Dealul Guran). The findings from layer 2 do not have close parallels with other sites in the Balkans, since so far only a few Chibanian (previously Middle Pleistocene) sites with the small tool assemblages have been identified. The Radan site has a great potential for studying the development of Lower Paleolithic technology in this part of Europe.

Key words: Lower Paleolithic; Balkans; Radan; core and flake industries.

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Understanding the technological variability and prevalence of cleavers in the Acheulean

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The Acheulean techno-complex dates back to approximately 1.7 Ma, with its earliest evidence originating from eastern Africa. A substantial typo-technological diversity among different Acheulean occurrences can be observed throughout the globe. The Acheulean phase is primarily recognised by notable usage of bifacial tools such as handaxes and cleavers, through their frequencies vary considerably from region to region. A substantial amount of current academic research addresses the typo-technology of handaxes and their role in early hominin cognition. On the other hand, cleavers, despite being highly prevalent at Acheulean sites, remain poorly understood and are academically underrepresented. Also, unlike handaxes, which persist in the Middle Palaeolithic period, cleavers are exclusively associated with Acheulean technology (with some exceptions). The current paper examines the typo-technological variation in Acheulean cleavers across the central Narmada Valley (India) and compares the findings with those from Africa (northern, eastern, and southern), Europe (primarily England) and Asia (western, southern and south-eastern). The information on global Acheulean sites was primarily collected from Marshall et al. (2002) and Sharon (2007) databases. Across all the studied sites, andesite and quartzite are the most frequently utilised raw material, and primarily flake blanks are used for shaping cleavers. In the central Narmada Valley, cleavers are the dominant typology among bifaces, and their analysis suggests size standardisation. The prevalence of cleavers over handaxes is also observed at several other Acheulean sites in South Asia. The high percentage of cleavers could be linked to the functional aspect of the Acheulean. The comparison of dimensions among different sites around the globe suggests that there are significant differences. Similar results emerge when comparing cleavers' refinement index, indicating significant global differences. The results from the comparative analysis of sites from different continents provide deeper insights into the technological variations. This study will also shed significant light on cleavers' prevalence and technological aspects in the Acheulean.

Key words: Acheulean; Cleavers; Comparative analysis; Typo-technology.

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Homogeneity and diversity. The Acheulean Culture in Western Europe through time and space

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In the last decades it was recognised that there was no simple linear development of technology and that different types of assemblage or industries could co-exist. But the concept of culture implies grouping similar assemblages, and at the same time, paying less attention to secondary variation. Besides, there are important spatial and chronological gaps in the archaeological record, as well as real palimpsests, which create great difficulties in recognizing cultural traits and isolating cultural groups during the Middle Pleistocene.

Lithic technology, as a well-preserved archaeological element frequently present when a new site is discovered, offers us the possibility to compare and analyse diachronically and synchronically similarities and differences between sites, areas and times. The main goal should be to distinguish common technological strategies and identify new techniques, allowing a better understanding of the origin and evolution of traditions of practice.

This work is focused on two chronological periods: before MIS16 and after MIS12, both significant glaciations in Western Europe. Before MIS16, we explore materials from Barranc de la Boella, Notarchirico, Moulin Quignon and La Noira stratum a. After MIS12, we will work with La Noira stratum c, Menez Dregan, Cagny-la-Garenne, St.Pierre-lés-Elbeuf, Elveden, Swanscombe and Galería. We compare the technological shaping strategies and morphometrical shapes of final large tools, considering different geological contexts (available raw materials) and biomes (southern, middle and north-western latitudes), other occupational factors (e.g. site function and situation) or even the function of tools. Through this data we will develop a regional discussion about what exists behind the classical umbrella of the "Acheulean techno-complex", a concept which obscures different cultural traits. If chronological patterns can be identified, are they suggestive of innovations by new populations, or in situ regional development of technology? If geographical patterns can be identified, are there non-cultural factors, such as raw material differences, that might explain the variation?

Key words: Middle Pleistocene; Western Europe; Acheulean; technology; diversity; culture.

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Barranc de la Boella (Tarragona, Spain): new data on the onset of the Acheulean in Western Europe

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At the Barranc de la Boella site (Tarragona, Spain), continuous fieldwork has been carried out since the earliest known Acheulean evidence in Europe was found in its Early Pleistocene archaeological deposits (0.99-0.78 Ma; Vallverdú et al., 2014). This resulted in a significant increase in the collection of lithic and faunal remains, allowing us to make progress in the interpretation of the hominin behaviors in an open-air fluvial-deltaic sedimentary environment. The site includes examples of cumulative palimpsests at the localities of La Mina and El Forn, in which hominins only had a minimal role as modifying agents, as well as the extraordinary mammoth butchery site recorded at the Pit 1 locality (Mosquera et al., 2015).

Besides providing a brief overview of the ongoing excavations, this paper seeks to enhance the presentation of the lithic assemblage. More specifically, we will report on the collection of large shaped tools in order to assess its significance in the framework of the earliest occurrence of the Acheulean in Europe (Ollé et al., 2023). Large shaped tools appear in the three localities explored in the Unit II of Barranc de la Boella, including choppers (unifacial and bifacial), picks, knives, and cleaver-like forms. Techno-typological and morphometrical analyses revealed a basic heavy-duty component obtained through simple shaping sequences coupled with significantly more elaborate tools produced on various large blanks (cobbles, slabs, or flakes). The complete bifacial and bilateral shaping have yet to be documented, but the present specific tool assemblage attests to the Early Acheulean technological threshold.

Such a technological assemblage is unique in the known late Early Pleistocene archaeological record from Europe, and exhibits differences from the early Middle Pleistocene Acheulean sites in this continent. Thus, Barranc de la Boella contributes relevant data for reconstructing the first phases of hominin settlement in Western Europe. In technological terms, it sheds light on the apparent technological gap between the earliest (Mode 1) and later Acheulean hominin populations, and provides clues to addressing wider technological questions, such as the origin of the Acheulean in Europe in terms of local evolution (innovation), out-of-Africa dispersal events, and convergence phenomena.

Our data lend support to the hypothesis that Barranc de la Boella may represent a previously unrecognized Early Acheulean dispersion out of Africa connected to its first evidence at the gates of Eurasia, potentially moving over the northern Mediterranean coastal road to reach Western Europe.

Key words: Early Acheulean; large shaped tools; trihedral pick; early Europeans; Barranc de la Boella.

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Between identity and alterity in the Lower Palaeolithic of southwestern Europe: the case of La Rominguière site (Garonne Valley, France)

Entre identité et altérité au Paléolithique ancien de l'Europe du Sud-Ouest : le cas du site de La Rominguière (vallée de la Garonne, France)

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The Garonne valley has been at the heart of research on the earliest periods of prehistory since the emergence of the prehistoric discipline (Noulet, 1860; Breuil, 1937; Breuil and Méroc, 1950). Indeed, this area presents a sequence of fluvial terraces that provide numerous testimonies of early human occupations. In the beginning of the 2000s, various archaeological operations revealed several sites within the middle terrace. These lithic assemblages were attached to the technocomplex known as the “Acheuléen Pyrénéo-Garonnais” (Mourre and Colonge, 2007; Colonge et al., 2010; Jarry, 2010), a northern variant of the Iberian Acheulean. In the context of renewed research, we are conducting a technological review of some of these Lower Palaeolithic sites in southwestern Europe. The pebble as a quasi-exclusive source of raw material leads to a production of flakes mainly resulting from bipolar on anvils and sometimes centripetal knapping. Nevertheless, La Rominguière site shows a combination of typical characteristics of technocomplexes of these period and original elements. This is reflected in the various “chaînes opératoires” for knapping that can be combined, but also in the diversity of macro-tools associated with some flake tools and large flake tools. Between identity and alterity, what does La Rominguière site represent? How is it part of the lithic assemblages of the south-west of the European continent? Through this presentation, we also aim to explore the criteria that allow us to determine what is characterised as Acheulean in this geographical area between the Pyrenees and the Mediterranean. In this context, regional and extra-regional comparisons with lithic assemblages are proposed in order to improve our understanding of the variability of technical phenomena over the long period of the European Lower Palaeolithic.

La vallée de la Garonne est au cœur des recherches sur les périodes anciennes de la Préhistoire depuis la naissance de la discipline préhistorique (Noulet, 1860; Breuil, 1937; Breuil et Méroc, 1950). En effet, elle présente une séquence de terrasses fluviales qui livre de nombreux témoignages d'occupations humaines anciennes. Au début des années 2000, diverses opérations d'archéologie préventive ont mis au jour plusieurs sites au sein de la moyenne terrasse. Ces assemblages lithiques ont été rattachés au technocomplexe nommé Acheuléen Pyrénéo-Garonnais (Mourre et Colonge, 2007; Colonge et al., 2010; Jarry, 2010) variante septentrionale de l'Acheuléen ibérique. Dans le cadre d'un renouveau des recherches, nous menons une relecture technologique de certains de ces sites du Paléolithique ancien du sudouest de l'Europe. Le galet comme source quasi-exclusive de matière

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première induit une production d'éclats majoritairement issue d'un débitage bipolaire sur enclume et quelque fois centripète. Néanmoins, le site de la Rominguière témoigne d'un mélange de caractéristiques typiques des technocomplexes de cette période et d'éléments originaux. Cela se manifeste par diverses chaînes opératoires de débitage qui peuvent être combinées, mais également par une diversité de macro-outils associés à quelques outils sur éclats et grands-éclats. Entre identité et altérité, de quoi le site de la Rominguière est-il le témoin ? Comment s'insère-t-il dans les assemblages lithiques du sud-ouest du continent ? À travers cette présentation, nous souhaitons également interroger les critères qui permettent de déterminer ce que l'on caractérise comme Acheuléen dans cette zone géographique entre Pyrénées et Méditerranée. À ce titre, des comparaisons régionales et extra-régionales avec des assemblages lithiques sont proposées afin de mieux percevoir la variabilité des phénomènes techniques sur le temps long du Paléolithique ancien européen.

Key words: Technological analysis; Lithic tools; European Acheuleans; Garonne Valley; Diversity.

Mots-clés: Analyse technologique; Outils lithiques; Acheuléens européens; Vallée de la Garonne; Diversité.

Hominin lifeways and Middle Pleistocene landscape archaeology as seen from the lakeside sites in Schöningen, Lower Saxony, Germany

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In 1992 Hartmut Thieme of the State Heritage Office of Lower Saxony discovered Paleolithic artifacts in Middle Pleistocene deposits on the edge of a large open-cast coal mine in Schöningen in northern Germany. This exceptional context in water-saturated lakeside sediments, led to outstanding preservation of botanical, osseous and lithic artifacts. Thieme's research led to the remarkable discovery of multiple wooden tools including throwing spears, a thrusting spear and a throwing stick found in association with lithic artifacts and numerous butchered horses and other animals. These discoveries refuted the then popular hypothesis that archaic hominins were obligate scavengers and demonstrated that they were instead at the top of the food chain. This work led to a paradigm shift in Paleolithic archaeology and human evolution.

Since 2008 a team from the University of Tübingen has led excavations at Schöningen and has focused its attention on the lakeside sediments of the Reinsdorf Interglacial complex, which correlates with MIS 9 and dates to roughly 300,000 years ago. Over the years, it has become increasingly clear that Schöningen must be viewed as an archaeological landscape rather than a single site or a small number of sites. We have studied more than two dozen concentrations and scatters of archaeological materials. This paper presents an overview of our research within a general context of landscape archaeology and highlights a wealth of new information documenting the lifeways of Middle Pleistocene hominins in northern Europe.

Key words: Middle Pleistocene; Lake shore sites; Botanical; osseous and lithic technology; Early hunting economies.

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Hominins and elephants in Schöningen; varied interactions or mere hunting?

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At Schöningen, Lower Saxony (Germany), hominin presence is attested to over a period ranging from at least ca. 320,000 to ca. 300,000 years (MIS 9).

The lithic technology found here is neither Oldowan nor Acheulean. Baltic flint is the dominant raw material. Bifacial or Levallois technology is absent. The retouched blanks are of a very diverse nature. The spectrum of the tools is dominated by scrapers and indeterminate retouched pieces, followed by denticulates, notched and pointed pieces.

Remains of various large mammals from more than 20 archaeological sites provide a valid basis for analyzing the relationship between hominins and several animal species as e.g. *Equus mosbachensis*, *Bos primigenius*, *Homotherium latidens* and *Ursus deningeri* / *spelaeus*.

However, in recent years, we have had the opportunity to excavate and study remains of more than ten individuals of the Eurasian straight-tusked elephant (*Palaeoloxodon antiquus*) from different layers. In addition, from 2016 to present, we are excavating a nearly complete skeleton of a Eurasian straight-tusked elephant from layer 13 II-2a / 13 II-3bc. The context suggests that hominins scavenged and finally exploited this naturally dead elephant. There is nothing to support that this individual died as a consequence of specialized hunting activity.

All these remains along with numerous elephant footprints indicates clearly that these giant herbivores were not exotic in the hilly landscape around the paleolake, but they were part of the fauna of Central Europe at that time. They did not roam this region as loners or occasionally, but were native here in their thousands. Elephants were therefore a relatively common potential source of food and resources for late *Homo heidelbergensis* in Schöningen.

The studies in Schöningen can help to address some important scientific topics that are also relevant for numerous Lower Palaeolithic sites in Africa and Europe: did hominins regularly hunt elephants? Was the hunting of elephants necessary for the hominin groups, or should we consider less heroic but perhaps more realistic alternatives?

Key words: Lower Palaeolithic; MIS 9; Eurasian straight-tusked elephant; *Palaeoloxodon antiquus*; Footprints.

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Session 24-1

The Critical and Evolving Role of Preventive Archaeology in Creating Cultural Heritage Knowledge

SESSION ABSTRACT

Preventive archaeology accounts for a large proportion of the knowledge produced about our common heritage. Its practice, however, is beset by myriad and unevenly applied legal codes, varying levels of quality, and often results in the commodification of scientific research. This paper serves to highlight this situation as well as to suggest strategies for reform that may result in a more globally unified, standardized practice.

Main Organiser

Sławomir Kadrow

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Ashley A. Dumas

Cultural, economic and legislative interferences. Contribution of the contract archaeological research in the implementation of investment projects and legal provisions in force in Romania

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In the last two decades in Romania, numerous investment projects of public or private utility have been implemented (infrastructure, historical monuments, various constructions) that have directly and indirectly interfered with the tangible, movable or intangible cultural heritage. In such cases, according to the national legislation (sometimes interpreted differently and applied unevenly) a certain type of archaeological research is required: archaeological diagnosis and / or preventive archaeological research on cadastral plots with the status of archaeological site and / or historical monument, archaeological diagnosis and / or archaeological survey in the protection areas of archaeological sites and / or historical monuments.

Archaeological sites are officially registered in the National Archaeological Register and historical monuments are officially registered in the List of Historical Monuments. However, there are many such areas with cultural heritage that are not officially registered and therefore outside the protection of the law.

Cultural heritage projects are managed by the Ministry of Culture through the territorial Directorates for Culture, the Directorate for Cultural Heritage and the special commissions: the National Commission for Archaeology (in an advisory role), the National Commission for Historic Monuments and its special sections and the Regional Commissions for Historic Monuments (the latter in a decision role).

Archaeological research is carried out by certified archaeologists (beginners, specialists and experts, only the latter having the right to coordinate archaeological research projects) from institutions accredited by the Ministry of Culture (museums of history and archaeology, faculties of history and archaeology in universities, institutes of history and archaeology of the Romanian Academy).

Key words: Romania; cultural heritage; investment projects; national legislation; archaeological research.

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Analytical study the unique icon of St. Joseph with the Child at Virgin Mary Church in Haret Zuwaila , Cairo, Egypt

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In the neighborhood of al- Qurunfish in the Fatimid section of Cairo, there remain the ruins of an old Monastery and some important churches, there ruins occupy the place where according to tradition the Holy Family sojourned and where a woman's Monastery is established today. One of the Churches is dedicated to the Holy Virgin.

And inside the Virgin Mary Church, there are many icons, but there is a unique icon representing YOUSSEF (JOSEPH THE CARPENTER) with the child dating back to 19 century and was painted by Anastasi Al-Romi (Jerusalem painter lived in Egypt)

The Study aim to evaluate the state of icon through characterization of the icon layers (Ground, paint, varnish layer) and to provide the tools for assessment the impact of aging and environment condition in order to produce some solution for conservation of the icon. Analysis techniques used in this study were attenuated total reflection – Fourier transform infrared spectroscopy (ATR FTIR), field emission scanning electron microscope-energy dispersive XRY Spectroscopy (SEM EDX) to identify of pigments and Binding Medium. The identification of pigments on painting Coptic is necessary to profoundly understand the material and technique used also.

Key words: Pigments; Coptic Icons; XRF; SEM; FTIR; Conservation.

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Dwellings from the second Iron Age discovered during the modernization of the railway infrastructure. Preventive research at Tărtăria-Pietroșița

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The investments in the Romanian transportation infrastructure cause the organisation of certain archaeological investigations aimed to preserve the archaeological artefacts. Such investigation was conducted in October-December of 2014, on the occasion of modernization of the railway on the Pan-European corridor IV (Fig. 1).

The research was coordinated by a larger team consisting of archaeologists from the Museum of Dacian and Roman Civilization Deva and from the West University of Timișoara.

One of the sites provided diverse findings from multiple ages and cultures: Neolithic (Starčevo-Criș Culture), Eneolithic (Coțofeni Culture), Second Iron Age (La Tène and Dacians) and the Middle Ages. The site is located on a place called Pietroșița, on the Tărtăria village lands, Săliște Commune, Alba County. The railway sector investigated by us (Fig. 2) had approximately 500 m long and 18 m wide (in the South-Western sector) respectively about 5 m wide (in the North-Eastern sector).

Geographically, the site is placed on the middle sector of the Mureș River, specifically its left, approximately 850 m South-East of the southern bank, on a terrace averaging 215 m high from the sea level, about 1 km East of Tărtăria Creek (Fig. 2, Fig 3). There are many fountains still active today in the terrace's slope that represented an excellent source of drinking water. The terrace itself provides a very good visibility towards the Mureș meadow.

On this occasion, we aim to present the discoveries from the second Iron Age, in the archaeological and historical context of the era in which they belong.

Key words: preventive archaeological research; Romania; railway infrastructure; second Iron Age; Tărtăria-Pietroșița.

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Preventive archaeological researches in the historical area of Timișoara. Evolution, discoveries and heritage conservation

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The very first preventive archaeological research in Timisoara's historic area was initiated back in 2006, and since then, the preventive projects that followed have been crucial in uncovering the various vestiges and remnants of medieval Timisoara, particularly structures from the end of the Middle Ages (during Ottoman rule) and the modern period. By combining the archaeological results with available cartographic materials, it's possible to reconstruct the medieval and early modern city's topography. Given the rapid pace of urban modernization, this is an essential endeavor to ensure the protection, conservation and study of the historical and archaeological heritage that has yet to be discovered and that is still found under the modern-day city of Timisoara.

Every each and one of these projects presented a unique set of challenges from a methodological and bureaucratic perspective, both in regard to conducting a preventive excavation in an urban area, as well as highlighting and conserving the various vestiges and finds unearthed. In order to better illustrate these challenges and the solutions found, we will provide specific case studies, selected from various excavations that took place within the current "Cetate" neighborhood and its surrounding areas.

Key words: preventive archaeology; Timișoara; heritage conservation; bureaucracy.

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Preventive archeology of linear infrastructure experience of Rescue Archaeological Service in Ukraine

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Great excavation works for construction linear infrastructure every year leads to loss thousands archaeological heritage sites.

Rescue Archaeological Service (est. in 1991) is one of the biggest executors of preventive archaeological researches in Ukraine with experience and methods comparable to the best international practices. To reduce the negative impact on cultural heritage our scientists participate at all stages of investment projects as idea development, design and construction.

Almost 4,000 kilometers of planned and existing routes of linear infrastructure has been archaeological surveyed by Rescue Archaeological Service. As result there was from 0.5 to 1.5 objects for every kilometer of linear infrastructure.

Problem setting. Firstly, the crisis of state policy of Ukraine in the field of cultural heritage protection (cultural heritage protection bodies, law framework). Secondly, tendency towards the commercialization of preventive archaeological researches. Thirdly, Ukraine suffers huge destruction of cultural heritage sites in war zones. The war is a challenge to both international political and scientific community. Its consequence will also be a change or adjustment of the principles of protecting culture heritage.

Key words: Preventive archaeology; archaeological surveys; protecting cultural heritage; Ukraine; heritage sites in war zones.

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The 2014 preventive archaeological research in the Mureş Valley

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Numerous road and rail infrastructure development projects in the middle of the Mureş River Valley have led to the discovery of a large number of archaeological sites, in addition to those already known. Although Pandora's Box has been opened by archaeological pioneers Zsófia Torma, Téglás Gábor, Márton Roska, later by Nicolae Vlase and others, the Mureş Valley still offers surprises. One such surprise is the conventionally named Tărtăria-Site 9, discovered in 2014 during the modernisation of the local railway sector. The rescue archaeology digs carried out involved investigating an area of 0, 19 hectares. The digs unearthed a settlement from the developed Middle Neolithic (Vinča culture), a settlement and three burial graves from the Late Neolithic (Turdaş culture, phase II), a settlement from the Early Eneolithic (Petreşti culture, phase A), one from the Late Eneolithic (Coţofeni culture, phase I), a settlement from the Middle Bronze Age (Noua culture) and a medieval settlement (12th century AD).

Key words: preventive archaeology; Mureş valley; railway infrastructure development; Tărtăria.

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Large-scale rescue investigations in Poland and the issue of cultural heritage protection

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At the beginning, the sequence of legal acts regulating the operation of conservation services in the field of archeology is outlined in order to demonstrate their relationship with the changing (not always for the better) doctrine of cultural heritage protection or with global economic (2008/2009 crisis) and socio-political events on the scale of our country (corruption scandal). The changing level of organization of rescue services and their financing did not directly translate into an increase in popularization of the need to protect the archaeological/cultural heritage. The lack of a broader and consistently implemented concept in this area was an obstacle. To date, it has not been considered advisable to adapt the working philosophy of preventive archaeology. It still adheres to the principles of reactive salvage archaeology, focusing on solving detailed, unrelated, atomized problems. Large-scale rescue research in Poland and the issue of protecting cultural heritage.

Key words: preventive archaeology; protection of cultural heritage; Poland; conservation services; legal acts.

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Session 13-2

Interdisciplinarity in Prehistoric and Protohistoric Archaeometallurgy

SESSION ABSTRACT

Archaeometallurgy is one of the fields that has best benefited from interdisciplinarity. Research aimed at studying the origin of metals, the identification of old mines, the dating of ancient extractions, the circulation of metallic materials and the identification of the techniques used and that of production workshops have thus use of various tools and methods borrowed from other sciences. In addition to field archaeology, these studies require cross-cutting approaches that draw on space archaeology, cultural archaeology, experimental archaeology, elementary and isotopic chemistry or even the analysis of artifact manufacturing stigmas, on a macroscopic and microscopic scale. Thus, the joint work of archaeologists, geologists, geochemists, geophysicists, statisticians, geomaticians has proved fertile in developing new approaches for the study of mining and metal remains. The objective of this session is to show fruitful collaborations of various specialties in this particular and pilot field of interdisciplinarity in Prehistory and Protohistory.

Main Organiser

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Co-Organisers

Olivier Lemerrier

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Mines et métallurgies: creuset ou athanor de la recherche archéologique?

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Interdisciplinarités, pluridisciplinarité sont souvent brandis en étendard de la recherche et cela vaut tout particulièrement pour les domaines de la mine et de la métallurgie qui ont servi de fer de lance pour le développement de ce que l'on a appelé l'archéométrie. Il est vrai que ces contextes s'y prêtent tout particulièrement, car la chaîne opératoire qui s'étend depuis l'extraction jusqu'à la mise en forme des métaux met en œuvre des connaissances techniques et scientifiques qui sont celles des érudits et des ingénieurs. Ainsi, avant même d'être des objets d'études pour l'archéologie, mines et métallurgies ont toujours été des supports d'intérêts pour les géologues, les chimistes, les physiciens mais aussi les cartographes et cela quels que soient les noms que l'on a pu leur donner à travers le temps. C'est donc bien naturellement que ces domaines sont intrinsèquement liés à la recherche à l'exploitation, la transformation et la diffusion des métaux. Au cours de ces dernières décennies, le socle disciplinaire de l'archéologie des métaux s'est enrichi d'une part par les sciences de la datation et d'autre part par des changements d'échelles qui se sont illustrés par la généralisation d'observations nanométriques. En devenant un creuset de la recherche, l'archéologie des mines et de la métallurgie a connu des avancées remarquables mais n'a-t-elle pas été parfois juste un athanor duquel sortent d'épaisses fumées. Après avoir présenté, dans une approche historiographique, le panel des disciplines de l'archéologie convoquées autour de l'archéologie des mines et de la métallurgie, les auteurs s'interrogeront sur les biais et les difficultés induits notamment par l'interdisciplinarité et les changements d'échelles.

Mots-clés: Historiography; Epistemology.

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Experimental study of Late Bronze Age palstaves hardness of Southern Iberian Peninsula

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Palstaves are very common in the Atlantic Europe during the Late Bronze Age, being located in the Iberian Peninsula mostly in the NW. A significant number of these axes were never used, as they retain their productive stigmas (casting sprues and burrs) and some have very high lead values (up to 60%) and very flimsy structures incompatible with their use as weapons/tools. On the contrary, in the Mediterranean territory from the Iberia, especially in the South, they are very scarce and generally are finished pieces, ready for use.

This work focuses on the study of these pieces from the south of the Iberian Peninsula, given their interest as long-distance exchange products. In order to understand the potential functionality of these displaced specimens, a study is carried out through Experimental Archaeology, with the archaeological and archaeometallurgical background as a basis.

Three copies of palstaves have been produced following the model of one recovered in Baza (Granada-SE Spain) with different alloys, based both on the specimen from Baza itself and on two others recovered in Totana (Murcia-SE Spain) and Fuente-Tójar (Córdoba-S Spain). Their alloys are clearly different from each other, which were, a rich tin-bronze, a poor tin-bronze with some lead and another about 20% lead.

Different heat and mechanical treatments have been applied to these reproductions (cold working and annealing), consistent with the archaeologically documented, samples were taken after each new operation. On these samples, metallographies were made, to check how thermo-mechanical operations are reproduced in the microstructure of the different metal alloys, and micro hardness analysis, to compare them with those of synchronous archaeological metals.

The aim is to assess the functional potential of each archaeological specimen as a weapon / tool from the different thermo-mechanical applicable recipes, in order to improve the understanding of the long journey made by these specimens. They could have ranged from the mere exchange of metal in this format, to the exchange of effective tools, or might have been a materialization of long-distance political relation in the Iberian Peninsula in terminal phases of Prehistory.

Key words: Experimental Archaeology; Chaîne opératoire; Metal Microstructure; Vickers Microhardness Testing; Iberian Late Bronze Age.

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Études de spectrométrie de fluorescence de rayons X sur des objets métalliques préhistoriques de la vallée de l'Alto Guadiato (Córdoba)

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Dans cet article, nous présentons une étude archéométallurgique, plus précisément une analyse de la composition élémentaire par spectrométrie de fluorescence de rayons X (pXRF) d'un ensemble de 33 objets métalliques en cuivre. Ces matériaux proviennent de la vallée de l'Alto Guadiato, une vallée située dans la partie nord-ouest de la province de Córdoba (Andalousie). Ces matériaux proviennent de trois villes attribuées au III millénaire av. J.-C.

Avec cette étude de spectrométrie de fluorescence de rayons X, nous appliquerons la méthode d'Oxford, qui consiste à établir une classification de présence/absence des 4 éléments minoritaires les plus courants, dans ce cas il s'agit de l'Arsenic (As), de l'Argent (Ag), du Nickel (Ni) et Antimoine (Sb) obtenant un total de 16 groupes de cuivre. Le choix d'établir ces 4 éléments est basé sur le fait qu'il s'agit d'éléments détectés avec une précision suffisante dans la plupart des études intégrant l'analyse chimique des métaux en cuivre. Nous comparerons les différents groupes de cuivre obtenus de la vallée de l'Alto Guadiato avec les données obtenues d'autres d'objets provenant de divers sites chalcolithiques du sud de la Péninsule Ibérique tels que Cerro Jesús (Baena, Córdoba), Valencina de la Concepción (Séville), Cabezo Juré (Alonso, Huelva), Los Millares (Santa

Fe de Mondujar, Almería) et Almizaraque (Almería), auxquelles nous appliquerons également la méthode d'Oxford.

Avec cette étude, nous pourrions caractériser les modèles de composition élémentaire au sein d'un groupe ou d'un ensemble de données, permettant des arguments par rapport au type de minéraux utilisés à l'origine, observer s'il existe des modèles communs, si les objets sont autochtones ou allochtones et voir les choix technologiques effectués par ces populations. Tout cela nous fournit une série d'informations qui nous permettent de nous rapprocher aux activités économiques de ces groupes de population.

Key words: Archéo-métallurgie; spectrométrie de fluorescence de rayons X; métal; cuivre; chalcolithique; vallée de l'Alto Guadiato.

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Origin, duration, and decline of North America's 'Old Copper' Culture: Recent developments using Experimental Archaeology and Optimal Linear Estimation (OLE) Modeling

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The discovery and development of copper as tool media is a topic of global interest. Although, this phenomenon is generally associated with sedentary, agrarian-based societies around the world, in North America, there is well-documented millennia-scale exploitation of copper as tool media by small, seasonally mobile, hunter-gatherer groups in the western Great Lakes. For millennia, Archaic Period hunter-gatherers regularly made utilitarian implements out of copper, only for these items to decline in prominence and frequency as populations grew and social complexity increased during the Archaic to Woodland transition. Here we review our recent work, which uses a variety of methods—including experimental archaeology and optimal linear estimation modeling—to clarify the origin, duration, and decline of copper as tool medium. The results of our OLE models show that the invention of copper as a tool media likely occurred shortly after the first pioneering populations encountered copper sources around Lake Superior during the Pleistocene-Holocene transition ca 9000 BP. The results of an extensive experimental program comparing replica copper tools to analogous tools made of stone or bone, shows that relative functional efficiency was likely a contributing factor to the decline of utilitarian copper implements ca 3500 BP.

Key words: Copper; Experimental Archaeology; OLE Modeling; North America.

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Assessment of an exploratory approach for the study of prehistoric copper in the Southern Alps: contributions and constrains

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The Southern Alps are rich in small copper deposits that were exploited in prehistory. The first copper extractions in the Queyras and Oisans valleys date back to the last centuries of the Neolithic and the Early Bronze Age. In the Dôme de Barrot (Alpes-Maritimes), the native copper mine of Roua has yielded stone hammers that testify to mining exploitation during the Protohistory, although the extent and chronology of the work are not specified. Further down the mines, bronze artifacts referring to a protohistoric Alpine cultural sphere and metallurgical casting waste have been found, outside of any stratigraphic context.

An exploratory approach was applied to the study of prehistoric copper in the Southern Alps, using different disciplines such as mining archaeology to identify ancient excavations, archaeomagnetism for dating, lead and copper isotope geochemistry for provenance, and microstructure analysis to characterize the manufacture of bronze artifacts. This communication presents an assessment of the contributions and hindrances encountered in the application of these methods.

Archaeomagnetism was used to obtain an age for the walls of the Roua mine carved by firesetting, notably by creating local directional curves for the Neolithic. The ages were confirmed by radiocarbon and OSL analyses. The use of lead isotopes to establish the correspondence between protohistoric bronze artifacts, metallurgical waste and local ore did not provide conclusive results, mainly due to the absence of a reference for French copper mines. Copper isotope analysis also did not adequately distinguish sources, but this method provides additional information to lead isotope analyses for Alpine mineralizations. Finally, microstructure analysis provided information on the alloy recipes and copper work practices, revealing different technical traditions and craft workshops.

The combination of methods has provided a partial picture of the use of prehistoric copper in the Southern Alps, particularly for the study of the diffusion of early metallurgy. However, this approach requires close collaboration between archaeologists and experts to obtain usable results, and some constrains persist for the generalized application of these methods, such as access to machines and the creation of reference databases.

Key words: Prehistory; copper; dating; provenance; mine; metallurgy; archaeomagnetism; isotopes.

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The provenance of the Middle and Late Copper Age copper artefacts of the Carpathian Basin

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The transition between the Middle and Late Copper Age was associated with complex socio-cultural changes in the Carpathian Basin, affecting all life areas. Significant differences between the two periods regarding metallurgy and the use of metal artefacts can be found. Several explanations have been raised, e.g. the exhaustion of easily accessible sources of copper ore and the loss of the metals' social significance and prestige role. However, until now, there has been a lack of scientific analyses that would serve as evidence of what kind of raw material the Middle and Late Copper Age copper objects were made and from which source they derived.

Our project's framework covers the period from the Late Neolithic to the Late Copper Age (5000-3000 BCE) and aims to study the spread of the products and technology of metallurgy. We are investigating by applying a combination of lead isotope and chemical compositional analyses how the exploitation of individual sources and access to them has changed within the territory of Hungary.

In our presentation, we examine the question by analyzing copper artefacts and crucibles found in the Furchenstich and Hunyadihalom sites of the Middle Copper Age (Tiszalúc-Sarkad, Zalavár-Mekenye, Budapest-Növény u.) and copper objects found in the Late Copper Age Baden sites (Tikos-Nyárfás, Balatonlelle-Rádpusztá, Sármellék-Égenföld, Budakalász-Luppa csárda). The examination of the archaeological objects was supplemented by the measurements of potential geological copper ore sources that had not yet been investigated. A complex picture emerges by comparing them, which significantly contributes to understanding the transformations between the Middle and Late Copper Ages.

Key words: Copper Age; copper; metallurgy; provenance; lead isotope analysis; chemical compositional analysis.

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Session 8-2

Lithic-based approaches to understand site formation processes, economy, and technological behaviours during Palaeolithic

SESSION ABSTRACT

The aim of the session is to present interdisciplinary and comprehensive studies of Palaeolithic lithic assemblages. The results obtained from different disciplines focusing on lithics allow to have a quite clear image of the modalities of site frequentation, of the exploitation of the natural environment, of the activities completed in the site and of the post depositional processes that affected the lithic assemblage. The identification of the supply areas of lithic raw materials (both primary and secondary deposits) is a key element to determine land mobility and to eventually distinguish between short-range movements linked to subsistence activities during the periods of site frequentation, and long-range movements eventually linked to seasonal displacements. The technological study gives many information concerning the aims of lithic production, the technological investment, the presence in the assemblage of techno-typological categories eventually referring to the production and use of mobile toolkits, the use of technological expedient or adaptation to the raw materials available, etc. Functional studies are fundamental to recognize the activities carried out during the human frequentation of a site and strongly contribute to the general interpretation of a Palaeolithic context. Finally, the identification, through an accurate taphonomic study, of the post depositional processes that affected a lithic assemblage is pivotal to gain a reliable interpretation of the site under study. Through the different contributions, this section wants to emphasize how an interdisciplinary approach to lithic studies leads to understand the variability of settlement dynamics and technological organization and can strongly contribute to the identification and better definition of site formation processes.

Main Organiser

Gabriele L.F. Berruti

Co-Organisers

Sara Daffara

Multidisciplinary approaches to the study of lithic industries. Two examples from the Italian peninsula: Pirro Nord and Ciota Ciara cave

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A multidisciplinary approach to the study of lithic industries is essential to reconstruct in detail the characteristics and dynamics of human Paleolithic occupation; moreover, it allows to answer precise questions about the single context. Our presentation discusses the results of different studies about lithic assemblages from two Italian Paleolithic contexts: the sites of Pirro Nord 13 and the Ciota Ciara cave.

Pirro Nord 13 is a Lower Palaeolithic site located at the north-western edge of the Gargano promontory (southern Italy). The lithic assemblage consists of flints collected in secondary deposits at a maximum distance of 7 km from the site and exploited according to opportunistic and centripetal reduction strategies. The assemblage has recently been subjected to use-wear and taphonomic analysis.

The taphonomic study made it possible to assess that the entire lithic industry underwent the same taphonomic processes and, consequently, that the fissure acted as a pocket into which all the materials, referable to one or more occupations that took place in a relatively short period, were transported. The functional study of the lithic industries, in synergy with the archaeozoological analysis of the fossil remains, indicates that the lithic tools were used for slaughtering activities, which have also been observed on the faunal remains. The studies carried out have contributed to the understanding of the site's formation processes and are further evidence of the integrity of the Pirro Nord 13 site.

The Ciota Ciara cave is a Middle Palaeolithic site located in north-western Italy. The lithic assemblage of the atrial sector was studied in terms of technology, use-wear and areas of lithic raw material supply. The results obtained make it possible to hypothesise different ways of frequenting the site, to define the large- and small-scale mobility of the Neanderthal groups, and to reconstruct the technological choices made by these Middle Palaeolithic groups according to the characteristics of the raw materials.

The two case studies considered here are excellent examples of how approaching the study of lithic industries from different perspectives provides fundamental data for the interpretation of archaeological contexts.

Key words: use-wear analysis; taphonomy; raw materials; technological analysis; Lower Paleolithic, Middle Paleolithic.

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A Typo-technological Analysis of Cleavers from the Sites of Berach Basin, Chittorgarh District, Southeastern Rajasthan, India

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Archaeological surveys in the vicinity of Chittorgarh, located on the eastern margins of the Thar Desert, have revealed the highest concentration of late Acheulean sites in the Indian subcontinent. Most sites here are cleaver dominant and exhibit a high degree of planning and complex reduction sequences employed. The Cleavers are one of the distinctive tool types of the Acheulean techno-complex and present substantial morphological and technological variability across time and space. These tool type exhibit evidence that suggests that they were produced using a sophisticated and complex reduction sequence and reveal significant evidence that points towards planning and exhibiting remarkable knapping skill. The criteria for typological classifications of the cleavers adopted so far are relatively vague and vary with different research. Further, the factors governing variability within and between these types remain controversial, resulting in several competing and non-comprehensible hypotheses. This paper presents the results of our studies on the cleavers recovered from 55 sites in the Berach Basin, Chittorgarh District, and Southeastern Rajasthan. It focuses upon various aspects of their technological characteristics which are further compared with data sets derived from other cleaver-dominated sites in the Indian subcontinent.

Key words: Cleavers; Large Flake Acheulean; Secondary Flaking; Morphometric analysis; Cores.

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Use-wear analysis of allochthonous lithic industry of S.U. 14 at the Ciota Ciara site, Borgosesia (VC): the toolkits in the subsistence strategies of mobile groups of huntergatherers of the Middle Palaeolithic

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This work deals with the functional analysis of the allochthonous lithic industry of the US 14 of the Ciota Ciara cave: rhyolite and radiolarite. The cave is located on the western side of Monte Fenera (Borgosesia, VC), and is a fundamental site for the reconstruction of the population of North-Western Italy during the Middle Paleolithic.

In particular the US 14 has been the subject of numerous multidisciplinary studies that have helped to reconstruct a phase of intense frequentation corresponding to a medium-long term occupation of this level. The contribution of functional analysis is important for the understanding of interaction mechanisms between human activities and the ecological context and environmental, in fact through the identification of use-wear left by the materials worked on the active margins of the lithic tools is possible to identify the activities carried out and the economic processes of which they were part. The study of use-wear on allochthonous raw materials of US 14 is added to that already carried out on local raw materials (quartz) to identify, or to exclude, preferential strategies in the exploitation and management of raw material.

After the description of the methodology, through history of the studies of the discipline, the description of the experimental method applied and the comparison collection created for this study, will be introduced the Ciota Ciara site, and finally will be illustrated the results of the functional analysis to which are added those of the taphonomic analysis.

The results obtained confirm the seasonal frequentation of the cave of Ciota Ciara with a complementary management of resources lithic, already hypothesized by the previous technological study, in fact the activities of processing identified for rhyolite and radiolarite are the same identified for quartz artifacts: the processing of animal carcasses and the exploitation of plant resources. In addition, functional analysis contributes to the definition and recognition of mobile toolkits. Technological analysis had already hypothesized the existence of toolkits, in radiolarite and rhyolite and the study of usewear confirmed the presence of these intensively exploited tools, either through retouching both with the use of flakes of dimensions also very small. The hypothesis of multifunctional tools has been verified in fact, different traces have been identified on the same object, in different areas of use, this allows to make assumptions about a specialized use of the toolkit, which may only be intended for certain activities, in the case of the US 14 of Ciota Ciara, the hypothesis has not been confirmed.

Key words: Use-wear analysis; Toolkit; Middle Palaeolithic; Northern Italy.

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Use-wear analysis of the lithic industry in the S.U. 15 of the Ciota Ciara cave (Borgosesia, Italy)

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Goal of this study is the comprehension of the technological and economic context in the behaviour of the human population inhabiting the Ciota Ciara cave, specifically in the situation disclosed in Stratigraphic Unit 15, through the use wear analysis on the lithic products of the SU.

Research on the artifact use wear allows to determine the specific usage they were made for, on the various resources exploited by the human group.

Other than the data about the lithic industry itself, this kind of analysis, especially when supported by data from different disciplines, bears a great usefulness in getting a rather precise “picture” of the human behaviour in a context usually bare of economical sources, as it is the Middle Paleolithic. These data, and the reasoning derived from them, allow to travel backwards from the end of a tool’s life toward how, when and where (and to a less extent, in a usually hypothetical way, why) specific techno-economical behaviours happened.

Ciota Ciara cave bears great archeological importance, for various kind of studies and disciplines about Middle Paleolithic; the cave itself has been studied since the ‘60 of the last century, and today is target to a series of sistematic excavations from the University of Ferrara, since 2010. Moreover, the cave is, at the moment, the only Middle Paleolithic site excavated stratigrafically that gave back a trustworthy stratigrafy of the north-western Italy context.

The considerations gathered from the study of the lithic assemble, and the proportions of the raw materials it is made of, as well as the data from the nature and quantity of use wears on the tools, allow to compare the settlement modality of the site, and the relative exploitation of resources, of this SU and the previous ones, giving integration to the studies about SU 13 and SU 14.

In the case of SU 13, the settling modes are considered to be seasonal and sporadic, relative to butchering and exploitation of animal resources, using local raw materials for the lithic assemble; SU 14 instead is tied to a time relative to longer and more intense periods of frequentation, with a clear increase in processed resources, in a time period seeing a climatic oscillation leading to cooling.

Key words: middle paleolithic; Ciota Ciara; pedmont; use wear analysis; quartz.

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Differences in variability and use of Levallois and Non-Levallois laminar blanks in the late Middle Paleolithic of the central Balkans

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Despite the abundance of publications in the last forty years, as detailed studies on reduction processes, the existence and co-existence of Levallois and non-Levallois laminar strategies and their variability in the Middle Paleolithic in Europe still need to be better understood. Many reasons could influence the appearance of these two types of laminar products: technological traditions, land use strategies, subsistence, mobility, and raw material availability, but also different ways of utilization of lithic products. The wider research scope of our study covers all the listed factors; however, we have chosen to focus on the function of the tools and their relations to the behavioral patterns of the Neanderthal communities in the late Middle Paleolithic of Central Balkans.

The analyzed material comes from five archaeological sites, dating in MIS 3. Totally 15 Levallois and 65 non-Levallois laminar blanks are studied technologically and functionally. The complexity of activities obtained with those tools is viewed and discussed with raw material procurement data and metrics as indicators of their potential for carrying and reshaping with an aim to represent the fundamental differences between curated and expedient technological strategies.

Key words: laminar blank; Middle Paleolithic; functional analysis; technological behavior.

Note: Research conducted with the support of the Science Fund of the Republic of Serbia, 7746827 Neanderthal and Early Modern Human interactions in the Central Balkans-NEEMO.

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Diffusion and exploitation of flint from the Oligocene basin of Mont-les-Etrelles (Eastern France) during the Palaeolithic by Neanderthals and modern humans

Diffusion et exploitation du silex du bassin Oligocène de Mont-les-Etrelles (Est de la France) au Paléolithique par les Néandertaliens et les Hommes modernes

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The North Franche-Comté region is a crossroads in France between the eastern part of the Paris Basin (sedimentary deposits), the southwestern Vosges (metamorphic deposits), the northeastern Massif Central (metamorphic deposits) and the northern Jura (sedimentary deposits). The Saône and the Ognon are the two major rivers that criss-cross a hilly landscape at around 200 to 1200 m. The mineral raw materials from these very different sedimentary formations are therefore varied (sandstone, limestone, quartzite, flint from the Jurassic, flint from the oligocene) and people have made their choices according to the daily activities and achievements they had to carry out. In this topographic and geological complex, in the heart of the Haute-Saône department, is the Mont-les-Etrelles tertiary basin, which is made up of a paleo lake that has yielded more than 7 types of flint with a cortex, matrix (biological content) that is different from the surrounding secondary formations. It has always been a major source of mineral resources for Neanderthals and modern humans. While the interest and diffusion of the materials has been demonstrated during the Neolithic period, studies concerning the Middle and Upper Palaeolithic only began in 2005. The aims are therefore to demonstrate the differential management of materials by Neanderthals and modern humans and to enhance the data by also comparing procurement, circulation and performance strategies between open-air and cave sites.

La région Nord Franche-Comté est, en France, une zone carrefour entre la partie orientale du Bassin parisien (terrains sédimentaires), le sud-ouest des Vosges (terrains métamorphiques), le Nord-est du Massif central (terrains métamorphiques) et le Nord du Jura (terrains sédimentaires). La Saône et l'Ognon sont les deux cours d'eau majeurs qui sillonnent un paysage vallonné autour de 200 à 1200 m. Les matières premières minérales issues de ces formations sédimentaires très différentes sont donc variées (grès, chailles, quartzites, silex des assises secondaires, silex des assises tertiaires) et les Hommes ont réalisé des choix selon les activités quotidiennes et les réalisations qu'ils devaient mener. Dans cet ensemble topographique et géologique et en plein-cœur du département de la Haute-Saône se trouve le bassin d'effondrement tertiaire de Mont-les-Etrelles constitué d'un paléo-lac qui a livré plus de 7 types de silex au cortex, matrice (contenu biologique) différents des formations du secondaire alentours. C'est de tout temps un haut-lieu d'approvisionnement en ressources minérales par les Néandertaliens et les Hommes modernes. Si l'intérêt et la diffusion des matériaux a été démontrée pendant le Néolithique, les études concernant le Paléolithique moyen et supérieur n'ont débuté qu'en 2005. Les buts sont donc de démontrer la gestion différentielle des matériaux par les néandertaliens et les Hommes modernes et d'augmenter les données en comparant aussi les

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stratégies d'approvisionnement, de circulation et de réalisation entre les sites d'habitat de plein-air et ceux de grottes.

Key words: raw materials; flint; non-flint resources; acquisition; provisioning; circulation; Middle, Upper Palaeolithic; humans.

Mots-clés: matières premières minérales; silex; ressources non-silex; acquisition; raw materials; flint; non-flint resources; acquisition; circulation; exploitation; Paléolithique moyenne et supérieure; hominidés.

How many techniques to apply a microburin blow? An experimental approach for exploring the microburin blow technique variability

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The microburin blow technique is a crucial element in the chaîne opératoire that involves the production of geometrics. In Europe, it sporadically appeared at the end of the Upper Paleolithic but reached its maximum diffusion during the Mesolithic. The discussion concerning when this type of fracture transformed from an unintentional breakage into a deliberate method (Krukowski microburin vs ordinary microburin) is still open. Microburins were first identified by G. Chierici in 1875, who could not understand their technical connotation. Later, several pioneers faced this production waste, but it was only in 1980 that J. Tixier explained in detail the technical process behind this blank segmentation technique. Past works proposed two force application modes for obtaining a microburin fracture: percussion and pressure. Whether few observations on their efficacy and mode of operation have been published, micro-, meso- and macroscopic criteria for differentiating them have never been discussed.

To answer this question, we propose a first experimental attempt to distinguish different microburin blow techniques by applying several combinations of retouchers (mineral vs organic), force application modes (pressure vs percussion) and types of anvil (mineral vs organic). A low- and high-power approach was carried out to encompass all manufacturing traces and identify a high range of diagnostic criteria. If the former proved to be effective in reconstructing the force application mode (pressure vs percussion) and the type of anvil (mineral vs organic), the second one allowed more reliable identification of the retoucher raw material (mineral vs organic). This combined approach applied to the Early Mesolithic assemblage from layer 8 of Mondeval de Sora (BL, Italy) turned out to be a consistent methodology highlighting the existence of a common and normalised technical procedure for applying the microburin blow during the Sauveterrian.

Key words: Microburin blow technique; High and low magnification analysis; Experimentation; Mondeval de Sora.

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The lithic economy of the hunter-gatherer communities of the Côa Valley in the Middle Palaeolithic: first steps towards its knowledge

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Cardina Salto do Boi site in the Côa valley (Portugal) contains one of the most important stratigraphic sequences of the region, covering information on the occupation of the valley by human groups from MIS 5 to MIS 3. Having proved to be of substantial importance for the understanding of the Upper Palaeolithic territorial and resource management (Aubry, Luís, Llach, & Matias, 2012; Aubry, et al., 2022) by AMH in relation to its conceptualization through rock art, Cardina's archaeological site has provided data to similarly comprehend the ways by which Neanderthals dwelled therein.

With this poster we sum up the initial results of the typo-technological analysis of the archaeological materials of the excavated areas H/I, N/O and A/Z of the site pertaining to the neanderthal occupation and the assessment of the completeness of its chaîne(s) opératoire(s).

Our approach to the archaeological materials was based on the chaîne opératoire approach, with particular regard for the typo-technological and experimental procedures as investigative tools. Henceforth, we inquired to what extent the classical scheme for studying flint artifacts was useful for understanding quartz based collections of archaeological materials, as it had been done in previous works (Driscoll, 2010; de Lombera Hermida, 2009; de Lombera-Hermida & Rodríguez-Rellán, 2016; de la Peña, 2015; de la Peña, 2022; de la Peña & Wadley, 2014). Our hope was to articulate our research with the discoveries made on that subject.

This work integrated a master's degree dissertation founded by FCT through a scholarship and aimed at contributing to increase the knowledge of Neanderthals' economy in the Côa Valley, having been articulated with the existing project CLIMATE@COA - Clima e adaptação humana durante o último Período Glaciar na região do Vale do Côa (Portugal).

Furthermore, taking into consideration the extension of the stratigraphy of the site, although there is no direct evidence for the MP/UP transition, we believe a thorough description of the technology and resources used by both species can add to the understanding of the character of such transition.

We recognize the existing faults in the work being presented, however we understand it to be a starting point from which to further our inquiry, underlining the educational background in which such work has been developed.

Key words: Middle Palaeolithic; Lithic technology; Lithic raw material; Côa Valley; Methodology.

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Addressing the issue of “pitted” aspects of obsidian surface at Dadong site, China. A preliminary experimental approach

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Preliminary use-wear study of the obsidian artefacts from Dadong site (China), in loessic context, became difficult because of post-depositional surface modifications (PDSM), particularly the countless pits present on some pieces. These PDSM slightly hindered the microwear analysis. Yet to this day, a single hypothesis has been suggested to explain the mechanisms of formation of «hemi-spherical pits» on obsidian surface, which states a natural chemical attack (Hurcombe 1992). The competing hypothesis, which should state that a mechanical process could also be responsible of the pitted surface, has not been assessed thus far. Almost nothing is known about the correlation between natural mechanical processes and traceological features such as pits. In order to overcome this shortcoming, we conducted two different experiments aimed to reproduce natural abrasion of obsidian artefacts by mobile particles at the ground surface : shaking (i.e. slight friction) phenomena and aeolian phenomena. We used coarse sand for the former, and very fine sand for the latter. These two experiments created two different morphological types of pits on obsidian surface. The former created “partial Hertzian cracks traces”, oval or circular, irregularly, distributed in line. The latter created amorphous craters of impact, covering all the surface. Thus, the traceological signatures of both phenomenon are characteristic and very different than the “hemi-spherical pits” related to the acid-etching experiment by Hurcombe. Finally, the circular micro-pits on some artefacts from Dadong are more comparable with those produced by the chemical attack experiment. We therefore assume that a weak chemical etching process may have occurred in the soil after the artefacts had been buried. Further study will be needed on-site to determine what factors in the sediment led to this chemical attack, and to what extent this phenomenon has affected the preservation of use-wear traces on the artefacts.

Key words: Traceology; Taphonomy; Experiment; Obsidian.

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Session 10-2

Current research on the Upper Palaeolithic of Eurasia

SESSION ABSTRACT

New discoveries and the large number of recent research results on the Upper Palaeolithic in Eurasia demand an integrated approach that allows correlation and comparison of data over large areas. Substantial contributions have been made regarding multiple aspects, e.g. chronology and dynamics of occupations, climate, environment, technical behaviour, artistic manifestations, etc., and all of these require a framework for updating and discussing new information. This session aims to integrate and synthesize the last results of archaeological excavations in reference sites, recently discovered sites, scientific advances, datings, models and interpretations that are contributing to go further with our knowledge of the Eurasian Upper Palaeolithic. Furthermore, regional syntheses and comparisons between sites are welcome. The session will be organized within Commission 8 «Upper Palaeolithic of Eurasia» of the UISPP.

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New fieldwork on the Upper Paleolithic of the Inner Asian Mountain Corridor, Kazakhstan

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The foothills of the Pamir, Tian Shan, and Dzhungarian mountains trace a biogeographic corridor that connects two important areas for human evolution: the Fergana valley and the Siberian Altai. This so-called Inner Asian Mountain Corridor (IAMC), located mostly within Kazakhstan, may have provided an area of connected refugia from harsh climates during the Pleistocene and should provide a good record of hominin dispersal throughout the region. To date, this region contains very few secure, dated Pleistocene sites. To remedy this gap in knowledge, since 2017, the PALAEOSILKROAD project has been systematically searching for new Palaeolithic sites in the region (Cuthbertson et al., 2021; Iovita et al., 2020), as well as re-evaluating known sites in order to improve the density of dated archaeological sequences.

Here, we present a general outlook on the distribution and chronology of known Upper Palaeolithic sites in Kazakhstan and the history of their occupation in their environmental context, followed by a report on our new field discoveries from several new cave sites in the Qaratau Range (Southern Kazakhstan) and new open-air, loess sites in the Almaty region (Southeast Kazakhstan). Additionally, we report on the ¹⁴C dating and characteristics of the only previously known cave site situated in the Kazakh (southern) Altai, Bukhtarma Cave.

The cave records allow us to extend the chronological range of stratified Palaeolithic occupations to nearly 50 ka, corresponding to the Middle to Upper Palaeolithic transition. We compare our results with the records of two better-studied regions (the Siberian Altai and the Fergana Valley). Furthermore, we also discuss the occupation of the region during the Last Glacial Maximum (LGM), which remains a matter of debate due to the extreme cold and dry conditions thought to characterize it.

Key words: Central Asia; caves; rockshelter; loess; survey; piedmont.

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Climate variability across the Armenian Highlands and the Caucasus as the backdrop of Neanderthal extinction and modern human expansion 50–25 ka

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Late Pleistocene acute climate oscillations may have combined with volcanism and the extremely diverse terrain of the Caucasus Mountains to impact modern human and Neanderthal population dynamics in that region, potentially acting as a barrier and/or refugium in different human evolutionary contexts. Testing different scenarios about expansion, adaptive response, intra-population interactions and extinction in this important region at the pivotal transition time between c. 50 and 25ka critically necessitates local on-site paleoclimate data found in association with the cave occupations. However, this approach has been held back by the surprising dearth and highly uneven spatiotemporal coverage of paleoclimatic data retrieved from prehistoric sites across the region.

Multiple assemblages of fossil micromammals from late Middle Paleolithic Lusakert-1 (2 fossil-yielding strata; >45ka) and Upper Paleolithic Aghitu-3 (4 fossil-yielding strata; ~39–24ka) caves were analyzed by geometric morphometric-aided taxonomic analysis, used to quantify the representation of different species among the highly abundant and diverse arvicoline genera (*Microtus* and *Chionomys*; mean=58% of assemblages). This approach was combined with quantitative species-level paleoclimate reconstructions (bioclimatic and habitat weighing methods; 17 rodent taxa) to determine changes in habitat composition and temperature and precipitation shifts across the MP/UP transition. Taphonomic analysis was conducted to establish isotaphonomy among the assemblages. The results are further evaluated by comparison with fossil data from 25 additional MP and UP stratigraphic units

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(Hovk, Kudaro, Mezmaiskaya, Satsurblia and Dzudzuana caves), widely distributed across the Caucasus region.

The analysis demonstrates extreme variability across the MP/UP transition, between a final MP severe warm-dry phase at Lusakert Layer 4 and a warm-wet early UP Aghitu Levels VII–VI, with the reconstructed precipitation values deviating from present-day measurements by 50% at Lusakert and >200% at Aghitu. The earliest assemblage in the dataset (MP Lusakert Layer 5, c. 50ka) corresponds most closely to present-day climatic conditions, with the cave occupations seeming to align with relatively short-term climate excursions against a global MIS3 background of a severely oscillating climate.

Key words: Small mammals; Taxonomy; Taphonomy; Palaeoecology.

Palaeodemographic estimates for the Upper Palaeolithic in Europe – a diachronic view on population dynamics in light of environmental and cultural change

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The number, density, and connectedness of contemporaneously living people seem to have an important impact on the cultural evolution of human societies (Maier et al. 2022a). At a larger temporal and spatial scale, palaeodemographic parameters seem, in turn, to be influenced by environmental factors, such as changes in temperature and solar insolation (Maier et al. 2022b). Palaeodemography thus meaningfully connects environmental development to cultural developments. This is, of course, no deterministic 1:1 relationship (Maier et al. 202). Instead, the varying interplay of specific environmental, demographic and social factors create historically contingent situations to which human societies respond in different ways. In this contribution, I will present results of palaeodemographic estimates according to the Cologne Protocol (Schmidt et al. 2021) for the Upper Palaeolithic in Southern, Western, Northern, and Central Europe on a subcontinental and regional spatial scale. These estimates are discussed against the background of long-term environmental change, size and connectivity of social networks, and change in artefact diversity.

Key words: palaeodemography; social networks; artefact diversity; environmental change.

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The Iron Gates Gorge: a corridor or barrier in the spread of modern humans from Lower to Middle Danube

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Recent research into the transition from the Middle to the Upper Paleolithic in the Lower Danube has shown that there is a concentration of sites from the early phase of the settlement of modern humans in the area. The Initial Upper Paleolithic was confirmed at sites in northern Bulgaria, while several (Proto) Aurignacian sites were recently identified in northeastern Serbia - at the exit from Iron Gates Gorge. All these layers pre-date the CI eruption (42-40 ka cal BP). In contrast, all of the sites located on the other side of the Iron Gates and the Carpathian-Balkan mountain range in eastern Serbia are dated to the period after the eruption. The geographical distribution and chronology of the Aurignacian sites supports the hypothesis that the Danube was an important corridor at this time, especially since the sites that could be linked to the IUP and proto-Aurignacian have not yet been recorded deeper in the interior of the Balkans. This suggests the possibility that in the period before, and especially after the eruption, there was aggregation and social and cultural integration of the Aurignacian groups in the southwestern Carpathian Mountains. The richness and variability of Aurignacian industries in Banat, as well as the appearance of cave art in Coliboaia and (perhaps) Selačka Pećina 3, may indirectly attest to this.

Key words: The Iron Gates Gorge; Middle to Upper Paleolithic transition; Balkans; Aurignacian.

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Refined chronologies and technical behaviors of prehistoric hunter-gatherers in Central-Eastern Europe: the DYNASTY project

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The understanding of how archaic humans have reacted to past extreme weather events, where they survived during periods of climatic deterioration, and when they repopulated, abandoned areas is a crucial topic in human evolution for exploring the processes of adaptation and extinction of hominins. The project DYNASTY aims to achieve an accurate and highly resolved time scale to reconstruct scenarios of human-environment interactions within the interval ~130–35 ka BP and contribute to current debates in Paleoanthropology on demographic contraction and expansion of archaic humans through the solid cohesion of different disciplines. In the project, sedimentary sections from Marine Isotope Stage 5e (MIS) to MIS 3 from Poland and Hungary will be studied at high-resolution scale combining up-to-date methodologies in magnetostratigraphy, optically stimulated luminescence (OSL) dating, and radiocarbon (¹⁴C) dating with lithostratigraphic, paleopedologic, micromorphologic, and geochemical data. Then, key Middle and Upper Paleolithic sites from the same regions will be investigated by reassessing the technical behaviors and the chronologies. Combining the new data will contribute to understanding the chronometric and ecological relationships between paleoclimatic fluctuations and technologies of Neanderthals and *Homo sapiens* in Central-Eastern Europe.

Key words: Chronology; combination of dating methods; paleoclimate; human evolution; lithic technologies.

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Recent research on the Upper Paleolithic in the Bistrița valley (Eastern Romania)

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In recent years, the increased number of archaeological research on the Bistrița valley (Eastern Romania) resulted in the discovery of new settlements, a better chronological framework by performing new datings in several representative sites, along with the recovery of impressive collections of lithic or osteological materials. Most of the occupations have been dated between 30 and 20 ka cal. BP, therefore overlaps almost the entire Gravettian and Early Epigravettian periods. Our presentation will include a synthesis of recent results in this area, and the focus will be three multi-stratified sites located at Piatra Neamț, of which Poiana Cireșului remains a key settlement for this region, preserving a long chronostratigraphic succession as well as the oldest Upper Paleolithic occupations in this area. These sites provide a good opportunity to understand the technical behavior and the environment exploitation by different Paleolithic communities over a long period.

Key words: Upper Paleolithic; Bistrița valley; Romania; new Paleolithic sites; recent archaeological research.

Note

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The Transition from the Middle to the Late Upper Paleolithic in the Center of the Russian Plain: recolonization or autochthonous development?

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The presentation is devoted to the problem of transition from the Middle to the Late Upper Paleolithic in the central part of the East European Plain during the Last Glacial Maximum. The comparison of radiocarbon dates, typological characteristics of stone industries, as well as some ivory and bone artifacts suggests that the hypothesis according to which the area in question was depopulated after the beginning of the Last Glacial Maximum and recolonized again only after its end should be questioned. The author puts forward and substantiates an alternative hypothesis that the Upper Paleolithic culture of the Central East European Plain continued to develop during the LGM, as is evidenced by cultural continuity between Gravettian and Epigravettian.

Key words: Upper Paleolithic; East European (Russian) Plain; Gravettian; Epi/Final-Aurignacian; Epigravettian; Late Glacial Maximum (LGM).

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Resilience, innovation and human response to the Last Glacial Maximum in Central and Southeast Europe – a large-scale view from palaeodemography

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The number, density, and connectedness of populations seem to have an important impact resilience and innovation dynamics in human societies (Maier et al. 2022a). At a larger temporal and spatial scale, palaeodemographic parameters seem, in turn, influenced by environmental factors, such as changes in solar insolation (Maier et al. 2022b). Palaeodemography thus meaningfully connects environmental development to cultural developments. This is, of course, no deterministic 1:1 relationship (Maier et al. 2021). Instead, the varying interplay of specific environmental, demographic and social factors create historically contingent situations to which human societies respond in different ways. In this contribution, I will present results of palaeodemographic estimates from around the Last Glacial Maximum in Central and Southeast Europe using the Cologne Protocol (Schmidt et al. 2021) against the background of the long-term environmental change and compare them to estimates of the size and connectivity of social networks, change in artefact diversity and inferences of human resilience.

Key words: palaeodemography; social networks; artefact diversity; resilience; innovation; LGM.

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L'Europe moyenne au dernier maximum glaciaire : abandon, occupation saisonnière à la bonne saison ou peuplement permanent?

Middle Europe at the last glacial maximum: abandonment of territory, seasonal occupation at the best season or permanent settlement?

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Le climat du dernier maximum glaciaire est à l'origine d'un processus d'effondrement des sociétés de chasseurs-cueilleurs paléolithiques. Le modèle généralement accepté depuis une trentaine d'années est celui de l'abandon de l'Europe moyenne, et la migration progressive et le refuge des populations dans les régions méditerranéennes. A la fin du dernier maximum glaciaire, la recolonisation progressive de l'Europe moyenne par le Magdalénien à l'Ouest et le Mézinien à l'Est est également bien établie. De 22 000 à 17 000 BP, cependant, des variations climatiques sont à l'origine de contextes favorables aux déplacements saisonniers à la bonne saison ou de réadaptations par des peuplements permanents en Europe moyenne. La présente communication a pour objectif de préciser les modalités et les moments de ces réoccupations.

The climate of the Last Glacial Maximum is at the origin of a process of collapse of Paleolithic hunter-gatherer societies. The model generally accepted over the last thirty years is that of abandoning middle Europe, and the gradual migration and refuge of populations in the Mediterranean regions. At the end of the Last Glacial Maximum, the gradual recolonization of Middle Europe by the Magdalenian in the west and the Mezinian in the east is also well established. From 22,000 to 17,000 BP, however, climatic variations are at the origin of contexts favorable to seasonal movements at the best season or re-adaptations by permanent settlements in middle Europe. The purpose of this paper is to clarify the modalities and timing of these reoccupations.

Key words: LGM; Middle Europe; settlements.

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A glimpse on a moment of nomadic Gravettian hunter-gatherers

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Around 30 thousand years ago, a small group of nomadic hunter-gatherers was roaming on the northern Italian Apennines. They were travelling light surely carrying with them at least six blocks of jasper of considerable size to obtain tools and long blades. Likely, they had been circulating from long distances, as Provence or northern Italy, as showed by the raw material. The site of Piovesello is a unicum of a temporary camp site on the northern fringes of medium-height mountain characterised by a low steppe, as pollen analysis demonstrates.

The lithic assemblage consists of around eight hundred items, all related to blade manufacturing: cores, broken blades and bladelets, flakes to maintain and prepare the volume of the cores are amongst the most common items found at the sites. Many of them refitted with both long and short sequences, allowing us to understand the main goal of production of these nomadic hunter-gatherers: blades long up to ten centimetres, thin bladelets from burin-cores, rarely retouched in few end-scrapers and backed points. Thanks to refits, techno-typological analysis, and the elaboration of the data with statistics, we concluded that these nomadic hunter-gatherers were all highly skilled knappers with one exception. The variables considered for the study were: raw material selection; organization of the exploitation (number, preparation, trimming of striking platforms, orientations of removals); aim of production and percentage of cutting edge; reiteration and severity of knapping accidents; precision of blows (size of the striking platforms, number and location of impact points); adequate use of strength (type of breaks, morphology of the bulb and features of the ventral face, crushed striking platforms); hints of insistence (face battering, smashed striking edges). These nomadic hunter-gatherers were able to perform long reduction sequences with double crested cores and long blades which took with them, leaving at the site the broken ones. However, on a refit were observed signs of lower precision and quality of the debitage, along with a different exploitation of the available volume. These knappers stopped at the site for a short time, probably to take a rest from the travel and produce blades and tools to bring with them. They did not need to make many of them since they left at the site not exhausted cores and few tools. The study of lithic skills enriched the picture of this small group of nomadic hunter-gatherers and revealed that amongst these travellers not all of them were expert knappers.

Key words: lithic; Gravettian; skills; refits; nomadic.

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An integrated geoarchaeological record of human occupation at Lapa do Picareiro, a reference site for the Upper Paleolithic in western Iberia

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Across Eurasia, abrupt climate shifts during the Late Pleistocene impacted human and natural systems. For the Iberian Peninsula, our knowledge of human adaptive responses during the Upper Paleolithic has improved in recent years with the development of new radiocarbon techniques that have increased the temporal resolution of cultural chronologies. At the same time, high-resolution paleoclimatic records from Greenland ice cores, deep-sea sediment cores, speleothems, and microfaunal assemblages have permitted detailed paleoenvironmental reconstructions. Integrated with the archaeological record of culture change, these data sets allow for a better understanding of the nature of human socio-ecological systems during the Upper Paleolithic. Here we present new data on the Upper Paleolithic occupations at Lapa do Picareiro, a cave site in central Portugal with a long continuous stratigraphic sequence spanning MIS 3 and 2. Each Upper Paleolithic occupation horizon is marked by distinct changes in raw material preference and technological organization reflecting different land use strategies in synchronicity with abrupt climate shifts during the Late Pleistocene. Lapa do Picareiro has become an important reference site for the Upper Paleolithic in Portugal. The ongoing excavation has produced an intact stratigraphic sequence of about 11 m with archaeological occupation layers from the Bronze Age to Middle Paleolithic. A complete Upper Paleolithic sequence from the Aurignacian to Magdalenian occurs in a roughly 6 m thick section of the cave deposits. The cave features the earliest known modern human occupation in the region during the early Aurignacian, dated ~41.1-38.1 ka cal BP in Levels GG-II. The lithic assemblage displays typical carinated scraper/core reduction to produce small twisted bladelets. Subsequent Aurignacian occupations in Levels FF, DD, and BB dated between ~37-34 ka cal BP are based primarily on large flake production. The Gravettian is represented in Levels X-T dated ~31-25 ka cal BP. The earlier Gravettian in Level W is marked by a preference for large flakes produced from quartzite nodules. The Terminal Gravettian assemblage contains a remarkable emphasis on bladelet production using rock crystal. This was followed by a transition to blade production during the Proto-Solutrean and Solutrean in Levels T-O. The Solutrean levels have characteristic bifacial points. The Early and Middle Magdalenian phases are largely absent in the regional archaeological record, but recent excavations yielded lithic and osseous artifacts from Levels N-K dated to this time frame. These assemblages are small and limit any purely typological attributions. Nevertheless, they demonstrate the presence of human populations on the landscape, but the earlier Magdalenian occupations were more ephemeral than the later ones. Rich occupations are evident from the Late and Final Magdalenian phases in Levels J-E.

Key words: Portugal; Upper Paleolithic; Aurignacian; modern humans.

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Rhinoceros in Paleolithic art

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The woolly rhinoceros (*Coelodonta antiquitatis*, Blumenbach 1799) was the main representative of the Mammuthus–Coelodonta faunal complex, which consist of more or less cold-adapted large Pleistocene mammal assemblages with similar or identical faunistic structures known from their transregional expansion in Eurasia (Kahlke, 2014). Research has usually focused on the remains of this herbivore through a series of type analyses, such as morphometric analysis, radiocarbon dating, DNA analysis, and isotope studies. It will be thus extremely valuable to compare for the first time the aspects of the woolly rhinoceros' natural history in Eurasia revealed by these results with their representation in art.

To achieve this goal, this paper will scrutinize the data on rhinoceri in Paleolithic art from Pleistocene Eurasia. Cave paintings, worked bones, figurines, and others will be reviewed from Europe on a Spain–Poland transect, through Czech Republic, France, Germany, Italy, Moldova, Netherlands, Romania, Spain, and United Kingdom, for evidence of the involvement of rhinoceros in the Paleolithic world.

Key words: rhinoceroses; paintings; worked bones; Pleistocene; Eurasia.

Note: This study was performed under a grant entitled 'Unraveling the chronological, geographical, and taphonomic complexities of the occurrence of the woolly rhinoceros in the Pleistocene contexts of Poland (WOOLRHINOPOLI) and Europe' from the National Science Center, Poland (2021/43/B/ST10/00362) awarded to Kamilla Pawłowska.

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Epigravettian bone industry from the Vlakno cave (Dugi otok island, Croatia): some preliminary results

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The site of Vlakno is a small cave (rock shelter) situated at the island of Dugi otok in the northern Dalmatia region in Croatia. It was first excavated in 2004, and since 2011 systematic excavations are being carried out by University of Zadar. Although the cave is rather small, and the excavated area is approximately 40 m², the excavations revealed a rich, multi-layered site with remains from the Mesolithic, Epipalaeolithic and Palaeolithic period. The stratigraphic sequence at Vlakno does not have visible hiatus, but contains the layer of tephra from volcanic eruption that happened in the Naples Bay 14,900 years ago, thus making Vlakno particularly important for studying the Pleistocene / Holocene transition. The excavations yielded rich portable finds, including chipped stone artefacts, bone tools, ornaments produced from shells, animal teeth and other materials, faunal remains, etc. The bone tool assemblage is rather small, however, since the bone industry is overall insufficiently explored in the eastern Adriatic, the finds from Vlakno provided some important data. The raw materials used included diverse bones and antlers. Techno-types include projectile points, pointed tools, burnishing tools, as well as retouching tools. Several projectile points were found, some of them almost completely preserved, with only their tips damaged from use. They were produced from large long bones, carefully produced by cutting and scraping with chipped stone tools. Pointed tools, made from long bone segments, were most likely used for making items from leathers or hides. Small antler tines, usually with modified tips by scraping and cutting, were used as small percussion tools and as retouching tools, most likely for repairing chipped stone tools. Manufacture debris was not abundant, showing that the production of bone tools took place elsewhere, perhaps on some other camp site, or perhaps outside the cave. Further researches will provide information on possible temporal trends within the bone industry.

Key words: Epigravettian; Adriatic coast; bone industry; projectile points; prehistoric technology.

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Session 12-1

Chalcolithisation

SESSION ABSTRACT

While the term still sometimes designates the development of copper metallurgy alone, it is most often associated with a much broader phenomenon of significant changes in Neolithic societies in terms of the development of social hierarchies, fortifications, trade networks, sanctuaries etc. between the 5th and the 3rd millennium according to the regions of Europe and the Mediterranean. Today, however, this Chalcolithisation does not seem to correspond to a stage of systematic evolution. It would rather be scenarios, different and more or less rapid trajectories depending on the regions, their history, and their relationships. At the same time, Neolithic archeology is increasingly pushing back the dating of certain practices in certain regions. The proposed session aims to explore what is called Chalcolithisation in different regions and to compare the concepts to collectively draw some lessons.

Main Organizer:
Olivier Lemerrier

The concept of Chalcolithisation: a few introductory words

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The term Chalcolithisation is already old, but above all used differently depending on the region and the researchers. It covers very different realities in terms of chronology and concept itself. As a result, he wants to designate, but sometimes hides, all kinds of developments, some of which are very important, which occur after Neolithization between the 5th and 3rd millennia in Europe.

Key words: Neolithic; Chalcolithic; Chalcolithisation; metallurgy; social hierarchies; fortifications; exchanges; sanctuaries; trajectories; concepts; chronology; Mediterranean; Europe.

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Chalcolithisation and social complexity: The case of the Chalcolithic societies of the southern Levant

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It is common in archaeological interpretation to relate social complexity to inequality, assuming that once upon a time, people lived in small groups characterised by equality before complex societies developed. Perceived this way, equality appears to be a natural state, unstructured by the ever-increasing complexity of social evolution. And while the archaeological theory has to some extent, moved on from such a neo-evolutionary view of social dynamics, complexity and inequality remain inextricably linked, while equality is rarely critically discussed and problematised. In such a neo-evolutionary paradigm, Chalcolithic societies are commonly perceived as either the first of the complex societies or the last of the egalitarian. In the present paper, I use the example of the Chalcolithic societies of the southern Levant to question such an understanding of the social organisation and to show that the absence of rank in a society does not mean the absence of complexity. The Chalcolithic societies in the southern Levant offer an opportunity to examine how societies with no apparent hierarchical organisation navigated technological innovations and changes in ritual practices. The period's material culture, which is relatively uniform across the southern Levant, testifies to shared subsistence strategies, organisational principles and ritual practices, significant technological innovation, and long-distance exchange networks, all in societies described as egalitarian. The present paper aims to explain the complex social mechanism that enabled these communities to interact and coexist in a way that appears to have resisted the formation of a social hierarchy.

Key words: Chalcolithic; social complexity; Levant; heterarchy; egalitarian.

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Chronology and rhythm of changes in Mediterranean France in the 4th and 3rd millennia BCE

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In Mediterranean France, the 5th millennium seems to be a time of cultural, technical and economic stability where only a few transformations can be observed apart from the development of enclosures and the occasional appearance of collective burial. It was during the 4th and 3rd millennia that more significant transformations took place: cultural instability, diversification of habitats such as burials, monumentalisation, appearance of large statuary, metal objects and then metallurgy, etc. It remains, however, always difficult to use the term Chalcolithisation, because all its transformations do not occur at the same time and do not affect the whole of the region or the populations: an original regional trajectory among many others in Europe.

Key words: Neolithic; Chalcolithic; Chalcolithisation; Mediterranean France; 4th millennia; 3rd millennia; metallurgy; fortifications; monuments; chronology.

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The Urukian cone mosaic (Mesopotamia, 4th mill BC): a technique of architectural decoration between Neolithic heritage and Chalcolithic innovation

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The World's first cities emerged during the 4th millennium BC in Southwest Asia. One epicentre of this process was South Mesopotamia, where the city of Uruk represents one major and most likely the largest urban centre of the Late Uruk period (c. 3500–3250 BCE). The new social order is archaeologically attested through monumental buildings of unprecedented dimensions that are variously interpreted as places of power or religious centres. They stand out from domestic architecture, among other things, by their size and the richness of their decoration, as a comparison with household architecture from sites like Habuba Kabira/Tell Qannas further north on the Euphrates indicates. Architectural decoration and especially cone mosaics are limited to monumental constructions of a public, religious or collective nature. Cone mosaics are known from Uruk but also from neighbouring regions, from southwestern Iran to northern Syria and south-eastern Turkey. The cone technique is emblematic of the monumental architecture of the second half of the 4th millennium BCE, but only at Uruk were mosaics documented in situ.

In this paper we will present the technique of the cone mosaic and its characteristics, the results of recent and ongoing work that has allowed the identification of the colouring materials and the colouring techniques of the cones (research initiated in 2019 by the Vorderasiatisches Museum Berlin and continued since in 2023 by the Idex MOSAIK of the University of Strasbourg). We will see that certain traits can be observed as early as the Pre-Pottery Neolithic of the Syrian Middle Euphrates (9th mill. BC), in particular the use of polychromy in the context of communal (Neolithic) and monumental (Chalcolithic) architecture. We will discuss another specificity of the cone mosaic, more delicate to grasp, which is the use of a single module (a coloured cone) in the construction of more or less elaborate geometric decorations. This phenomenon also finds parallels with certain decorations of the Pre-Pottery Neolithic in Syria.

These comparisons with some neolithic decors will make it possible to understand and discuss the innovative character of the cone mosaic, currently perceived as emblematic of the Late Chalcolithic of southern Mesopotamia.

Key words: Mesopotamia; Uruk; Polychromy; Monumental architecture; Cone mosaics.

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La technologie et la circulation des matières premières au Néolithique récent – Chalcolithique ancien : étude du cas de site de la culture de Lengyel Kotlina (Croatie)

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La culture de Lengyel était répandue dans la région de Hongrie, Croatie, Autriche, Tchéquie et Slovaquie en 4ème millénaire avant J.-C. La culture de Lengyel peut être placée à la fin du Néolithique et au début du Chalcolithique vu qu'on y trouve sporadiquement des objets de cuivre. Dans la période de la fin du Néolithique et du début du Chalcolithique on peut observer des changements économiques, technologiques, sociaux et culturels. Dans cette communication, on va présenter les résultats préliminaires sur la technologie et la circulation des matières premières sur le site de Kotlina. Le site de Kotlina – Nagy Hegy est situé en Croatie de l'est, dans la région de Baranja, près de Beli Manastir. Le site a été découvert en 2009, pendant la prospection au sol. En 2018 le Musée archéologique de Osijek a commencé le projet des recherches archéologiques "Kotlina, le site préhistorique". Le projet comprend la prospection géophysique et des fouilles systématiques, qui sont toujours en cours. Les fouilles ont révélé un site très riche, avec des restes des maisons, des fosses et des enterrements. La culture matérielle est aussi riche : céramique avec la décoration peinte rouge, autres objets en céramique, industrie osseuse, industrie de pierre taillée et industrie de pierre polie. Les analyses des caractéristiques principales des industries lithique et osseuse, notamment des matières premières, ont montré un modèle intéressant de l'acquisition des matières premières. L'obsidien et Spondylus étaient arrivés des distances éloignées ; peut-être comme matières premières ou comme objets finis. L'obsidien aux autres sites de la culture de Lengyel est d'origine de l'Europe centrale. Les autres matières premières lithiques (comme cornéenne et amphibolite) étaient arrivés probablement de la région des montagnes Slavoniques, tandis que l'os et le bois de cerf étaient acquis localement. On a trouvé aussi un objet en cuivre très fragmenté. Les communautés de la culture de Lengyel dans la Croatie de l'est sont très intéressantes parce que cette région est l'endroit de mélange des cultures différentes (celles de Sopot, Vinča et Lengyel), et les recherches du site de Kotlina ont fourni des données sur les aspects divers de la vie quotidienne, de la technologie, de l'économie et des rapports entre les communautés différentes.

Key words: Néolithique; Chalcolithique; culture de Lengyel; technologie; matières premières.

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Individuals and communities, social networks and innovations in the Copper Age of the Carpathian Basin

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The Copper Age (4500-2800 BCE) in Central and South-eastern Europe was a period of innovation. These innovations such as metallurgy, the wheel and the wagon, the plough, wool and the increased consumption of dairy products fundamentally shaped the later history of humanity and rapidly spread across Europe. In our multidisciplinary project, we combine the latest research methods of the 21st century archaeology to understand how different types of social relations between individuals influenced the spread of information, knowledge, and innovation.

Due to its geographical location, the Carpathian Basin is an important link between South-eastern and Central Europe and therefore offers an ideal place for examining the social factors that might have influenced the spread of innovations. Small-scale communities engaged in productive farming lived in a dense network of hamlets in the Early and Middle Copper Age (4500-3700 BCE) in what is now Hungary. Formal cemeteries with richly furnished graves were established on the Great Hungarian Plain. Early Copper Age was the heyday of Copper Age metallurgy, however, there is no evidence for that these objects were locally made, and evidence for possessing the know-how of metallurgy is known only from the Middle Copper Age. Similarly to this, the technology of making large stone blades and bifacial points is unknown in the preceding periods in this territory. Our analysis aims to reveal the social connections that allowed certain individuals to have access to high-value objects. We also seek answers to the question of how and what Copper Age communities living in what is now Hungary provided in exchange for these objects, which process eventually led to the acquisition of technological knowledge.

Studies on the spread of innovations usually focus on knowledge transfer processes either on a regional scale or between individuals. However, there is yet no methodology for investigating how interactions between individuals and then communities lead to changes on a regional scale. Therefore, our new multidisciplinary project combines biosocial archaeology (kinship, residence, animal mobility) and various technological research methods with social network analysis examining what made the Copper Age so special.

Key words: Copper Age; innovation; metallurgy; social networks; biosocial archaeology; technological analysis.

Note: The analyses of copper artefacts is financed from the NRD Fund (NKFI FK 124260, ‘The spread of the products and technology of metallurgy in the Carpathian Basin from between 5000 and 3000 BC’ PI: Zsuzsanna Siklósi) by the National, Research, Development and Innovation Office.

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Session 15-1

Mortuary Practices and Human Sacrifice in Prehistory and Protohistory in Eurasia

SESSION ABSTRACT

The study of mortuary practices and of human sacrifices provides valuable insights into the social, cultural, and religious beliefs of past societies since the beginning of the humankind. Funerary monuments and the vestiges which can be linked with the practice of human sacrifice may reveal aspects concerning the social structure and religious beliefs of communities, but also the cultural strategies and agency of individuals or groups, applied in shaping their identity or enforcing power relations.

During the session, we will examine a wide range of funerary discoveries - from the period of 5th - 1st millennia BC - and across the vast territory between the Pacific and the Atlantic. The discussion will highlight both common and unique aspects of mortuary beliefs, practices, and mentalities among the civilizations of Eurasia during this time period. In addition to classical approaches, the session will examine the role of human sacrifices in relation to mortuary practices and how these were used to express religious beliefs and cultural customs. Our goal is to deepen our understanding of the intricate relationships between society, religion, and culture through the study of mortuary practices and human sacrifices.

Topics of the proposed communication and of the expected discussion may include, but are not limited to: a. the role of mortuary practices and human sacrifice in constructing social identities and power relations; b. the significance of mortuary rituals and human sacrifice in religious beliefs and practices; c. the examination of specific regions and cultures in prehistory and protohistory in Eurasia where human sacrifice was practiced; d. the impact of environmental and ecological factors on mortuary practices and human sacrifice; e. revisits and reinterpretations of seminal old funerary and human sacrifices findings in search of new light on the ways in which individuals and communities exercised agency in the past, providing a deeper understanding of the complex relationships between society, religion, and culture.

Authors who wish to present findings on funerary monuments and/or evidence of human sacrifices from other geographical regions (Africa, Americas, Asia-Pacific) are encouraged to approach their topics through a comparative study with similar discoveries from Eurasia.

Main Organizer:

Valeriu Sîrbu

Co-Organisers:

Cristian Schuster

Dan Ştefan

Maria-Magdalena Ştefan

Călin Şuteu

Spare no one/No one was spared – Eneolithic violent behaviour in Alba Iulia - Lumea Nouă Foeni communities

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Violent behavior in prehistoric period is a reality that surfaces with recent advances in archaeological research. The level and the characteristics of these practices varied greatly depending on the specific cultural and environmental contexts. The link between them are the traces left on the skeletal remains that point to an unfortunate demise.

The Alba Iulia-Lumea Nouă (Transylvania, Romania) funerary discoveries are an important part of the puzzle that contours the realities and general distress that these communities faced.

This paper aims to present the perimortem cranial fractures associated with individuals buried in mass graves from the mentioned site. Both sexes and all age categories display a variety of blunt force traumatic injuries, with different shape patterns indicating multiple weapons and thus multiple aggressors. There are no indicators of care in the disposal of the bodies, most of the mass graves displaying commingled human remains, traces of exposure to high temperatures, faunal remains, pottery, and adobe fragments.

C14 data for these funerary discoveries offered a timeframe between 4550-4360 BC.

Key words: Eneolithic; Alba Iulia-Lumea Nouă site; Transylvania; perimortem fractures; violent practices.

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The Bronze Age Populations from Southern Romania between two Worlds: The Dead and the Living

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Southern Romania comprises the space between the Meridional Carpathians and the Danube, meaning the historical provinces of Muntenia and Oltenia. During the Bronze Age, these regions were occupied by various communities, some of them of local origin, some others being allogeous ones. These latter populations came either from the east, namely from the north-pontic zone, either from the west, along the mentioned river. Even a superficial analysis could document the fact that some of the cultural manifestations had expressed themselves mostly by funerary monuments (Zimnicea, Yamnaya, Horizon of the stone cist burials, Zimnicea-Plovdiv) and some others by settlements (Odaia Turcului, Radovanu). Even in the case of those (Coțofeni, Glina, Tei, Verbicioara cultures) which were documented both by cemeteries/burials and settlements there were unbalances regarding the weight of each of these categories. There were investigated burials, flat necropolises, as well as tumular ones. In this latter case, main burials, but also secondary burials could be excavated and studied. Just in few cases, the interments had funerary constructions, like stone cists, or wooden structures, while other were endowed with niches, steps, or dens. The burials contained inhumed, or cremated human skeletons. In some of those containing inhumed individuals, they were found in anatomical connection, while in others, just part of their bodies could be recovered. Some of the burials had rich grave goods – ceramics, polished stone, or flint items, harness pieces made of bone, antler, or metal, adornments and rarely weapons, while others were poorer, or their grave goods were completely missing. The skeletons were male, female, adults and children. Unfortunately, just a small part of them was anthropologically studied. Few aspects are also known about the report between necropolis-settlement, this pair being discovered just in few cases. Our attempt is meant to create an image as close to reality as possible, with regard to the prehistory of the mentioned territory and to integrate it into the larger landscape of the Lower Danube. Also, we will try to explain the mechanisms which generated the different cultural manifestations, by referring to the reports and relations existing between the two worlds – the one of living and the one of the dead – during the Bronze Age in Southern Romania.

Key words: Bronze Age; Southern Romania; burials; weapons.

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Cremated Bodies and Memory of Quondam Bodies: Late Bronze Age Funerary Practices of Southwestern Serbia

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Southwestern part of Serbia - namely the Pešter plateau and neighbouring regions - are characterised by tumular necropolises, which started to be erected in the Bronze Age. The burial horizon initially connected with the final phase of the Middle Bronze Age and the beginning of the Late Bronze Age is represented by some graves with inhumed deceased in mounds at the sites of Gračanska Polja in Gračane and Latinsko Groblje in Glogovik. A different approach to these skeletal graves connects them to the necropolises of the Late Bronze Age Brnjica culture and recognises their restriction to the westernmost zone of spread of the culture. The bearers of the Brnjica group, who settled the studied region of southwestern Serbia in the last centuries of the 2nd millennium BC, practiced cremation of the deceased. Their standard funerary practice included placing bodily remains in urns covered with large bowls, well protected by stone constructions inside smaller tumuli with peripheral stone enclosures. Such necropolises were discovered at the sites of Humpa in Dojeviće, Igralište in Novopazarska Banja, Utrine in Delimeđe (where three inhumed graves can be cautiously positioned slightly later than the Brnjica graves with cremations), and Latinsko Groblje in Glogovik, and more recently at two sites - Vlaško Groblje and Grčka Crkva - in the village of Pružanj. Some uncertain finds from the sites of Tabačina and Novi Pazar – Ras, the site of St. Peter and Paul church, and also unsystematically excavated sites in Miščići, Seosko Groblje in Dojeviće, and Mali Divič in Dunište, can be added to this burial horizon.

Comprehension of funerary practices sheds light on the Bronze Age communities, their mutual influences and connectivity during the second half of the 2nd millennium BC. As is the case with inhumation graves, the body was central in cremation graves, but through the process of cremation it became an unstable and hardly recognizable substance. The cremated body existed only as matter or was considered a sign of the memory of the body. Funerary practices, including the choice of whether to bury a body after death or to cremate it, are normally associated with long-standing traditions and regulations. The change from inhumation to cremation can be considered in terms of how it may have been related to beliefs. Beliefs need not be connected and consistent. There is a possibility to hold mutually conflicting beliefs - with circumstances determining which beliefs will be prioritized at a given time. In this interpretation framework one can comprehend the mortuary record of the Late Bronze Age communities in the region. Potentially bi-ritual necropolises in Delimeđe, Glogovik and Gračane, where some deceased were inhumed side by side the of majority incinerated graves, can testify to regional characteristic in development of the Brnjica communities. This westernmost territory, separated from its original zone in the South Morava Basin and the main Central Balkan communication routes, was under strong influence from the neighbouring regions and different funerary traditions.

Key words: cremation; inhumation; Late Bronze Age; necropolises; Southwestern Serbia.

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Mortuary practices in Western Serbia between 11th and 8th century BC – case study of Mojsinje necropolis –

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Western Serbia, whose eastern periphery includes the necropolis in Mojsinje near Čačak, is characterized by the developed burial practices during the Bronze and Iron Ages and the exclusive use of tumuli. In this large area, a complete chronological sequence has not been established, but in certain phases burials are more intense, and there are also periods without known funerary rituals. We have such a case for the first half of the 2nd millennium BC, about which we still have no data. On the other hand, until the research in Mojsinje, there was no knowledge of the method of burial at the beginning of the last millennium BC. After the discovery of more than 25 skeletal graves, some of which contained bronze and iron objects and ceramic vessels, a certain group was identified in 9/8th century BC. On the basis of ceramic forms and decoration, it is associated with the Kalakača phase of the Bosut culture from the Serbo-Croatian part of the Middle Danube Basin. Analogies for iron objects from Mojsinje were not found at the sites of the Kalakača phase in the Sava Basin. The closest parallels for the large fibula are from Albania and Slovenia, while the iron bracelets have analogies with anklets from the Vajuga-Pesak necropolis in eastern Serbia. Bronze hairrings are known from Glasinac, south-eastern Bosnia, from the 13th/12th centuries BC, but many finds from the Danube Basin still identify them as jewelry specific to the Kalakača horizon of the 9th/8th century BC.

In addition to the above facts, an even clearer chronological limitation of this group is provided by three recently obtained 14C dates from representative graves from Mound 5 in Mojsinje. These are graves 1, 3 and 4, which are distinguished by their rich offerings of bronze, iron and ceramics, and the absolute dates obtained from human osteological material indicate that the earliest date is the middle of the 11th century BC, and the latest the first quarter of the 8th century BC. The group of graves of the so-called Kalakača phase from Mojsinje, as already assumed, represents a local group that continued the strong tradition of skeletal burial of the deceased. Strong cultural influences on this community came from the north and are primarily reflected in local imitations of ceramic forms and decorations known from the Kalakača phase sites of the Bosut Group. According to these parallels, the term Kalakača phase, in terms of chronology, was unofficially accepted for skeletal burials in western Serbia at the beginning of the 1st millennium BC. However, bronze and iron objects have analogies in the south, east and west, which should represent a factor that will influence the formation of the definition and final name of this cultural group.

In addition to Mojsinje, the graves of this group are also known from Stapani near Užice. Both sites contain a sufficient quantity of materials on the basis of which the funeral customs of the Early Iron Age in western Serbia can be relatively accurately described, and the new absolute dates determine it more clearly in time.

Key words: Western Serbia; Mojsinje necropolis; mortuary practices; 11st-8st c. BC.

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Following the River. First Iron Age Funerary Practices in South-Eastern Serbia

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There are a lot of sites in South-Eastern Serbia dating from the Paleolithic to the Middle Ages, but not much from the Early Iron Age, which is a consequence of insufficient research. Among the very few Iron Age sites there are three partially excavated necropolises, whose research results indicate regularities in burial practice. Skeletal remains, grave inventory, and especially the orientation of the deceased, provide enough data to draw conclusions in order to get a clearer picture. Those necropolises that will be discussed are Vajuga-Pesak on the right bank of the Danube, Palilula-Signal near Svrlijig and Moštanica-Slanište near Vranje. According to the researchers, these necropolises are dated to the period Ha B3–Ha C according to Central European chronology. The method of burial in all three necropolises involves skeletal burial with the deceased lying on their backs. The burial inventory in these necropolises is typical for the Early Iron Age in this territory and is represented by ceramic vessels in the form of bowls, cups and pots. Metal objects are represented by jewellery in the form of bracelets, anklets, fibulae, spirally coiled double pins with head in the shape of eight and saltaleoni, also spears and knives. In Vajuga necropolis, two ceramic bowls can be seen with ornithomorphic representations, most likely of waterbirds.

One of the regularities in funerary practices which has been recently observed concerns the orientation of the graves. It was noticed that they are oriented differently. 82.60% of them are oriented in the east-west direction with minor deviations, 13.05% are oriented in the SW-NE direction, while 4.35% are oriented in the south-north direction. Another characteristic of these necropolises is that the orientation of the deceased follows the course of the rivers on whose banks they are located. This practice can also be observed in some necropolises in the immediate vicinity. Some of the graves indicate the maximum use of the available surface, and for some, the orientation could directly depend on the configuration of the terrain. The present study, with emphasis on the grave orientation, is aimed for a better comprehension of spatial organisation of the necropolises.

Key words: South-Eastern Serbia; Early Iron Age; Necropolises; Inhumation; Orientation; Spatial organisation.

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Some paleopathological aspects of the Romanian Prehistory

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It is a well-known fact that the environment had always exerted an influence upon the human being, in various ways: by food, by providing some specific living conditions, by regulating the functioning and dimensions of the communities. The nutrients and their proportions existing within the food regime, had determined the condition of the teeth, as well as the presence of some ailments, more or less severe. We are all familiar with the anthropological cases of hyperostosis parotica, or cribra orbitalia, which are symptoms of anaemia, determined by the lack of some minerals, or vitamins from the body, which may be determined by a variety of illnesses. The living conditions, in interrelation both with the host organism and the pathogenic agent, were in a dynamic balance and, when this system became disbalanced, an illness had appeared, because, either the host had a less developed immune system, the pathogenic agent became more active, from various reasons, or the environment was more favourable to it. Moreover, some pathological conditions could have been determined by some stressors, which affected the joints, or other parts of the body, during the activities performed by the respective individuals. These could be related to many other things, including the sex, age and occupation of the individual. We will explore some pathological conditions which are present in the Romanian prehistory and their possible causes. The image about the health condition of a society from remote times provides us information about the development level of its hygiene, its medical knowledge, the cultural and nutritional habits of its members and even about some of their economical activities. In the case of fractures, they could provide important data, concerning the intra- or intercommunity conflicts, but they could be in relation with accidents, as well. Therefore, paleopathology, provide us glimpses into a vivid world, even if it refers to societies of the past.

Key words: prehistory; Romania; disease.

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A rough and ready low-cost procedure for recording the basic features of burial mounds

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Mapping burial mounds (tumuli) become in Romania in the past decades a pressing necessity. Sprawling across the landscape, only a handful have been fully excavated. For most of them the information is scarcely, in the best case the coordinates taking by a handheld GPS and almost nothing about their preservation, annual affected by agriculture. Furthermore, the recent development of infrastructure works become a new threat for tumuli. In this situation, doing things well means doing them quickly. Our procedure (using light equipment like handheld GPS, compass, clinometer and EDM device) allows the measurements of the basic geometric features of ten or even more tumuli in a single day. The presentation of the procedure will contains case studies.

Key words: archaeological mapping; compass & clinometer surveys; basic features of a tumulus.

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Different Times, Different Behaviors: Iron Age Mortuary Practices in the Middle Dniester Basin

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The second half of the 12th century BC sees the beginning of Iron Age habitation in the Middle Dniester Basin, a phenomenon that, with some exceptions, continues unabated up until the end of the 3rd century BC. Set apart in the Eastern Carpathian context by the presence of an important fluvial artery, as well as by the specifics of its evolution and connections with other cultural environments, the area under consideration reveals unique regional manifestations of the Iron Age, represented by the Holercani-Hansca, Saharna, Basarabi-Şoldăneşti and Thraco-Getic cultures. Although we still lack reliable information about burials in the Early Iron Age, past archaeological research has yielded several relevant discoveries regarding the following centuries. Based on them, one can trace the changes in the funerary behavior of the region's communities.

During the Saharna culture period, the burial mound stands out as a defining element of the funerary standard. Another basic feature is the use of stone in the arrangement of graves. Inhumation is the main burial rite, although three cases of cremation are also attested. One or two, rarely three, individuals were laid in inhumation graves. Pottery is the most frequent category used in funerary customs, being present, except for two cases, in all burials with grave goods. At the same time, we also note the lack of weapons among the grave goods of these communities. A specific element of burial behavior is the displacement of certain skeleton parts belonging to the previously buried dead and the subsequent burial of a new corpse. As data from the Saharna "Ţiglău" show, there was a close connection between the burial space and the living space. It is possible that the custom of shifting human remains expresses family relationships in the nearby community.

According to the data available for the Basarabi-Şoldăneşti period, it has been established that cremation is the prevailing funerary rite of these communities, while inhumation was recorded in only one case. All the graves are flat, in pits dug from the ancient ground level. The cremated remains were placed in an urn covered with a bowl or limestone slabs. In a single case, the cremated bones were laid at the bottom of a pit. A characteristic of the rite is that the objects placed in the graves had traces of secondary burning, which is explained by their being in the funeral pyre. The presence of spearheads in the Mateuţi "Curtaia" necropolis could indicate the existence of a warrior group.

In contrast to the abundance of data from the Early Iron Age, the burial finds relating to the Late Iron Age are much more modest: only two urn burials have been documented. The only information come from the area of the Raşcov and Poiana I settlements, where one cremation burial each was attested. Despite lacking the certainty of larger funerary spaces surrounding these finds, both cases show features in common with burial standards established in the necropolises of the Getic communities of the Eastern Carpathian area.

Key words: Iron Age; mortuary practices; Middle Dniester Basin.

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Funerary Practices in the final phase of the First Iron Age in Dobruja

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Archaeological evidence suggests that at the end of the First Iron Age the northern part of Dobruja was a cultural patchwork. Aside from the indigenous, the region has special characteristics mainly due to the Greek influences coming from the West-Pontic colonies and southern influences coming from the Thracian world. Against this background, from the 6th c. BC., Scythian influences appear. Beginning with the second half of the last century, a series of discoveries brought valuable information concerning the funerary practices in this region. They highlighted multiple practices, such as the use of tumular and flat graves, as well as inhumation and cremation. This situation gives us the opportunity to look closer at how the regional poles of power influenced the indigenous population of Dobruja. One of the better examples would be the Scythian presence at the Lower Danube. The most representative site is the Telița-Celic-Dere necropolis where funerary influences from the north-pontic area are present. This, and the presence of objects like akinakai and arrowheads, sparked a debate about the presence of scythian population in the region. Another important discovery is the grave from Sabangia, considered to be an Early Scythian grave due to the wooden structure and inhumation ritual. On the coast of the Black Sea, however, the Greek colonies exert their strong influence. In addition to the necropolises of the colonies, other two rural necropolises could be added: at Istria-Bent and Corbu de Jos. Interestingly, in the aforementioned burial from Sabangia a fragment of Greek pottery was found, suggesting contact with the colonies. In the southern part of the region, the necropolis from Ciucurova, with its megalithic burials – well known in the mountainous area of Thrace, highlights these influences. Another important element is the population mobility. At Isaccea, the presence of vessels with Illyrian origin, but strong analogies in Podolia, might indicate a migration from the upper Dniepr area. The purpose of this presentation is to show the role of the funerary practices in the dynamic of the region.

Key words: Thracians; Dobruja; funerary practices; First Iron Age; Scythians; Greek colonies.

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Unusual Burial of a Thracian Ruler in Yakimova Mogila Tumulus from the 5th century BC in Thrace (Today's Eastern Bulgaria)

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Yakimova Mogila tumulus is located at the foot of Stara Planina in Eastern Bulgaria.

In its center, a large stone cluster covering a pit was discovered. A Thracian ruler (king?) is laid on its bottom. Parts of the skull, bones of the right arm and vertebrae of the buried individual were found in the grave. This leads me to assume that the body was previously ritually dismembered and only parts of it were laid in Yakimova Mogila tumulus.

Among the rich grave goods placed to serve their owner beyond, two items stand out - a golden signet ring and a golden breastplate. They identified the buried individual, although anonymous, as a Thracian ruler of the Odrysian dynasty of the mid-5th century BC.

Key words: South Thracians; Yakimova Mogila; unusual rituals; 5th century.

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Amulets in the mortuary practices of the late Scythian necropolis Chervony Mayak

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In the funeral rite of the Late Scythians, various amulets occupy a separate place.

Mostly amulets accompany the burials of children and women, less often men. Beads amulets were also found on horse harness.

Amulets of the following categories were found in the Late Scythian burial ground Chervony Mayak: Egyptian faience, bucket-shaped pendants, bells, openwork pendants, knobby rings, eye beads, and holey stones – "Chicken Gods".

They were found on the neck and chest of the buried as parts of necklaces or separate pendants, and were also found on the belt and as part of leather purses.

Amelets in the Late Scythian culture were associated with ideas and beliefs about the evil eye, jinx etc. Late Scythians used these items as apotropaic amulets for protection oneself from evil forces.

Key words: Scythians; mortuary practices; amulets; Late Scythians culture.

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Tradition established. Kantharoi in funerary rituals at La Tène necropolis Belgrade-Karaburma

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During the 4th century BC contacts between the Mediterranean world and communities in the Carpathian basin and Central Balkan region intensified, which resulted in the appearance of larger numbers of Greek imports in these areas. Their presence inspired the production of imitations of Hellenistic vessels, such as kantharoi which became recognizable feature of the Late Iron Age material culture.

The earliest imitations of kantharoi were characterized by two strap handles raised above the rim and high or low foot or base. The shape of kantharoi was adapted according to the knowledge of the local potters and technology and ornamental techniques that were influenced by both older autochthonous and Celtic ceramic traditions. Majority of them were manufactured on the potter's wheel, decorated with various motifs executed by stamping, incising or polishing, or sometimes with anthropomorphic or zoomorphic figures or masks on the handles or shoulders. In the Carpathian basin they were in use only for a short period of time, during the phases LT B2 – LT C1. However, this was not the case on the territory settled by the Scordisci during the Late Iron Age, where kantharoi were continuously used for over three centuries. The number of kantharoi increased during the period when such vessels were no longer in use among other La Tène communities living throughout the Carpathian basin. They are found in both cemeteries and settlements, majority of which dated to the Late La Tène period.

The present paper is aimed to analyze the tradition of using kantharoi in funerary rituals at Scordiscan cemetery Karaburma in Belgrade, along with the neighboring site of Rospi Čuprija. The two sites represent the same necropolis, where more than 100 graves were excavated, both cremation and inhumation burials. The earliest graves with kantharoi are dated to the LT C. Tradition of placing kantharoi in graves continued through LT D, as well as during the first decades of the new era. The finds from Karaburma and Rospi Čuprija allow us to observe the changes of the form of kantharoi through various phases of the La Tène period. The practice of placing kantharoi in burials at the necropolis persisted for a long period of time, which indicates the significance of these vessels among the La Tène populations that lived at the confluence of the Danube and Sava rivers, considering that kantharoi could be found in graves even after the material of Roman provenance began to appear in larger numbers.

Key words: Kantharoi; La Tène period; Scordisci; Karaburma necropolis; funerary rituals.

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Elites and warriors in the Lower Danube region (2nd-1st century BC)

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The area between the Balkan Mountains and the Carpathians, particularly near the Lower Danube, has yielded a plethora of vestiges from the 2nd to the 1st century BC, classified as part of the Padea-Panaghiurski Kolonii horizon. Their characteristics, particularly their ethnic attribution, have been the subject of much debate and contradictory opinions for almost a century. However, with the advent of more detailed analysis and better documentation, we can now glean a deeper understanding of these intriguing artifacts.

The unearthed vestiges include primarily tombs, with the occasional deposit lacking human bones. South of the Danube, in the north-western Balkans, the tombs are typically flat and infrequently tumular, with the majority containing cremation remains and only rarely inhumation burials. North of the Danube, only flat tombs of the cremation type are found, with incinerated bones directly deposited in pits, seldom in urns.

The funerary objects discovered consist of various armaments, including spearheads, javelins, swords, daggers, shields, and spears, as well as an assortment of ornaments, clothing accessories, and, on occasion, ceramic vessels. Some items of weaponry, harnesses, and ornaments are characteristic of both the north-Danubian Thracians (Geto-Dacians) and the Scordisci Celts; the ceramic vessels, for the most part, are Dacian. Based on the inventory, most of the tombs are attributed to warriors, the majority of whom were cavalry. Rarely can they be ascribed to women and children. North of the Danube, including Transylvania or the Upper Tisza Basin, such discoveries are isolated, sometimes in the vicinity of Dacian forts or settlements. They date from 180/160-30/20 BC. Also from the same area, a series of discoveries are known with similar inventories (weapons, ornaments, and clothing accessories), but in which no human bones were found; are these cenotaphs or votive deposits?

North of the Danube, from the same period and area, there are also groups of tumular tombs, all of them with cremation remains, discovered near Dacian residential centers; the predominant inventory consists of defense and attack equipment and weaponry, harness pieces, and also Dacian ceramic vessels or Hellenistic imports. Based on the characteristics of the arrangements and inventory, it can be estimated that these are tombs of Dacian aristocrats, predominantly cavalry.

While it may be challenging to determine the precise ethnic origin of certain archaeological finds, a careful analysis of the artifacts and relevant historical documents suggests that these tumuli, flat tombs, and votive offerings were most likely associated with the Dacian aristocracy and warrior classes.

Key words: Neolithic; Southern Scandinavia; fire-damaged objects; axe heads.

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General Session 1
Lower and Middle Paleolithic

General Session 2
Upper Paleolithic

From ill-defined to well-defined: Analysing weathered lithic artefacts from a Palaeolithic site of the Indian Desert

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Recent research on Acheulean-Middle Palaeolithic cultural transitions and the Thar Desert has made the region much more significant from a perspective of prehistoric human dispersals. Palaeolithic sites in this region are a matter of debate over the first Homo sapience migration to South Asia. Most commonly, they are found on dune deposits, hill slopes, and lake shores. Although scattered findings can be found across the desert, important sites are only limited to a few locations. Hominins from the Late Acheulean and Middle Palaeolithic periods, most likely lived in open-air settings of grasslands type micro-ecosystems near lakes and dunes.

Here I present analysis results of assemblage from the site of Kuldhara, located in the Jaisalmer district. This was the first site identified in the extremely arid part of the Indian Desert. It was difficult to explain the existence of the Palaeolithic there since it was entirely isolated from the other sites of the region when it was initially identified. Surface scatters of the artefacts are exposed to severe weathering through the aeolian process, making them difficult to identify. Further analysis results enable us to discover more extensive Palaeolithic sites in the nearby area of the same district. A major part of the assemblage consists of silicious sandstone, a locally accessible raw material. Despite its place in the coarser grain category, this rock type is similar to quartzite and suitable for producing sharp edges. On the other hand, the edges are less durable and vulnerable to damage and weathering. Typological analysis and photographic effects supported the identification of the morphology of the hominin-manufactured lithic tool. The cultural material exhibits the presence of Acheulean bifaces in a semi-primary context and Middle Palaeolithic artefacts, including tanged points and Levallois core. Ultimately the results were confirmed by the comparison with other regional assemblages and the finding of more sites in the vicinity. Overall results put forward the idea of arid zone adaptation and demonstrate the possibilities of the hominin occupation of the core arid part of the Thar during the Palaeolithic. A detailed field survey was conducted to understand the nature of the site distribution pattern. As a result of exploration in associated areas, we found about a dozen new sites. Archaeological evidence has been an important source of information for the reconstruction of the palaeodrainage network. This research confirms the presence of Palaeolithic sites from previously unknown regions and their firm associations with the paleo landscape and hominin dispersal routes.

Key words: Arid zone; Palaeolithic; human migration; lithic analysis.

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Site functionality and mobility pattern during the East African Middle Stone Age new data from the GOT10 site, southern Ethiopia

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The preservation of in situ open-air archaeological contexts is rare, especially for Pleistocene arid landscapes due to the erosion caused by environmental phenomena, one of the principal events that make difficult the preservation of organic and, sometimes, inorganic remains. These phenomena make extremely hard the analysis of human occupations; for this reason, when found, organic remains represent an extremely important proxy for the reconstruction of past human behaviour and site occupation dynamics. However, it is still difficult to combine data with the lack of a secure stratigraphic archive to compare with.

The site named GOT10, in the Gotera area, southern Ethiopia, shows an archaeological sequence in a stratigraphic context located in a depression of modern savannah environment rich in artefact and faunal remains in a primary deposition in association with fireplaces, dated to MIS 3. Due to the scarcity of well-dated sites in this region, this new evidence is fundamental for the reconstruction of the dynamics of adaptation and occupation by the *Homo sapiens* groups in southern Ethiopia.

The analysis of the GOT10 archaeozoological record may give a strong contribution in order to include Ethiopia in the broader debate about site functionality and seasonality, mobility, and environmental exploitation during the late Pleistocene. In fact, despite the weathering and the tectonic processes that may affect surface exposed materials, the state of preservation of this faunal assemblage is extremely good and can be used to investigate in detail the occupation dynamics at a high-resolution level. Through the analysis of faunal remains, in combination with other proxies, it will then be possible to clarify past human activities and to identify gaps in the research that need to be filled through additional experimental analysis or ethnographic study.

Particularly interesting are the ways in which sites differ from one another and how this differentiation is related to seasonality dynamics, short-term cycles, and movements of hunter-gatherer groups. The faunal remains from the GOT10 site come both from the stratigraphic layers (2018 and 2022 fieldworks) and from a surface collection (2017, 2018, and 2022 fieldworks) within the Gotera area. Thus, we propose the case study of GOT10 faunal assemblage for the reconstruction of past human occupation dynamics in a poorly known context characterized by both stratigraphic deposits in situ and surface eroded materials. The aim of this research is to combine the results from faunal analysis with detailed spatial and isotopic data to understand the organization of past cultural systems. This may allow us to clarify the relationship between site functionality and seasonal movements cycles among human groups that inhabited the region during the final Pleistocene.

Key words: Pleistocene; Faunal remains; Environmental dynamics; Functionality.

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Central African ethnographic tool-use and its contribution to understanding of the earliest archaeological traces in the Congo Basin

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The earliest archaeological signature of human presence across much of the Congo basin consists of distinctive stone tools attributed to the Middle Stone Age (MSA) Lupemban industry. Dated to ~260 thousand years old (kya) on the southern plateau margin of the basin, in recent years this stone tool industry has been considered potentially significant for understanding the evolutionary origins of our species, *Homo sapiens* ~300 kya (Barham 2001). Its modern geographical correlation with the tropical forest belt led, in the 1960s, to enduring speculation this technology developed as a prehistoric adaptation to rainforest foraging (e.g. Cornelissen 2002), but this association remains unconfirmed due to a lack of well-preserved sites and sequences (Taylor 2016).

Important hypotheses about the possible prehistoric functions of the stone lanceolate points, core-axes, and small blade tools found in the Lupemban have been drawn from ethnographic accounts of iron tool use by Congo basin hunter-gatherers (e.g Miller 1988). This comparative work has, however, never been undertaken systematically, at least by archaeologists. In this paper I attempt to address this by revisiting available accounts (e.g. Turnbull 1965; Tanno 1981) of how modern iron tools are successfully deployed to exploit closed-canopy environments in equatorial Africa. While recognising there are critical differences in the qualities of metal and stone tools, and that there is no direct or continuous cultural ancestry between Lupemban and modern central African foragers, it is hoped a cautious reconsideration of anthropological and archaeological data might help develop further clues about the potential subsistence strategies of the Congo's first inhabitants.

Key words: Stone tool function; Congo Basin; Middle Pleistocene; Middle Stone Age.

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$\delta^{13}\text{C}$ and $\delta^{18}\text{O}$ enamel isotope insights into the paleoenvironmental and paleoclimatic context of MSA humans from Gotera, southern Ethiopia

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Ecological and climatic changes thought to have driven cultural and cognitive developments including dispersal and vicariance, adaptation and resilience, symbolism and ornamentation, and technological complexity of modern humans within and beyond Africa during the late Pleistocene. Over the past few decades, global cooling and humid climatic episodes associated with behavioral and biological changes between 70-30ka have sought scholarly attention in Africa. However, despite the recent advances, more refined studies on the regional and local paleoenvironmental and paleoclimatic context of late Pleistocene MSA foragers associated with behavioral modernity and the transition from Middle Stone Age (MSA) to Later Stone Age (LSA) technologies hampered by site-based research lacunas. Carbon ($\delta^{13}\text{C}$) and oxygen ($\delta^{18}\text{O}$) stable isotope analysis of mammalian tooth enamel has become a well-established proxy for the understanding of the paleoecology and environmental contexts of hominins in eastern and southern Africa. In order to address this critical issue, here, we report our carbon ($\delta^{13}\text{C}$) and oxygen ($\delta^{18}\text{O}$) stable isotope analysis of mammalian tooth enamels from the Gotera MSA site dating to the MIS3.

Key words: Late Pleistocene; paleoecology; stable isotopes; Gotera; southern Ethiopia.

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Any colour you like : “Second choice” raw material exploitation by the Mutzig-Rain Neanderthal.

The Phtanite chaîne opératoire example

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Ardu à la lecture et souvent en faibles proportions au sein des assemblages archéologiques, ces facteurs caractérisant les matières lithiques autres ou de « second choix ». Ces critères ont préférentiellement mené, et ce depuis le début de la discipline préhistorique, à l'étude typologique, technologique et fonctionnelle des chaînes opératoires sur le silex et ses dérivés. Au sein des séquences archéologiques, cela a conduit à un manque de reconnaissance des industries en roche « autres » ainsi qu'à une sous-estimation dans la part réelle tenue par ces industries dans les systèmes technologiques des sociétés néandertaliennes. Menant, de fait, à une lacune de compréhension des sociétés moustériennes que la recherche tend aujourd'hui à combler.

Les Néandertaliens ayant peuplé le site Paléolithique moyen de Mutzig (environ 90 ka BP), ont exprimé leurs savoir-faire techniques en grande majorité sur une large diversité de roches sédimentaires, métamorphiques et volcaniques qui ici tiennent le rang de matière première de « premier choix » tel que la rhyolite ou la phtanite, toutes disponibles dans leur espace géologique et territorial parcouru, adaptant leurs gestes de taille aux contraintes présentées par ces matériaux. Après avoir présenté les différents systèmes techniques relatifs à l'exploitation des diverses roches, nous détaillerons l'exemple de la phtanite, roche sédimentaire siliceuse dont les produits sont techniquement très investis et parfois majoritaires dans certains niveaux de la séquence archéologique. L'analyse fonctionnelle de cette matière n'étant pas aisée, il nous fut nécessaire de créer un nouveau référentiel expérimental afin de bien appréhender les diverses traces d'usures. Nous aborderons les différentes cinématiques de mise en fonction des produits de taille obtenus par les Néandertaliens et les particularités fonctionnelles inhérentes à cette roche.

Cette communication vise donc à mieux appréhender la gestion des matières premières lithiques ainsi que leurs utilisations dans le Paléolithique moyen du nord-est de la France. Elle permet également de comprendre et questionner les différents schèmes d'approvisionnement des différents groupes néandertaliens ayant occupé l'abri de Mutzig. Ceci vers des gîtes de matières premières offrant des spécificités et contraintes techniques, mécaniques et fonctionnelles dont l'exploitation et l'utilisation relève non pas d'une sélection par défaut, mais de choix de la part de ces populations. In fine, ceci nous mène à questionner aujourd'hui la pertinence de certaines terminologies orientées, employées dans la discipline pour qualifier les matières premières autres que le silex, souvent à tort qualifiées de « second choix ».

Arduous to read and often in small quantities within archaeological assemblages, these factors characterize other or 'second choice' lithic materials. This criteria has, since the beginning of the prehistoric discipline, preferentially led to the typological, technological and functional analysis of the chaîne opératoire on flint and its derivatives. Within the archaeological sequences, this has led to a lack

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of recognition of such industries as well as an underestimation of the real part played by these other materials in the technological systems of Neanderthal societies. This has led to a gap in our understanding of Mousterian societies that research is now trying to fill.

The Neandertals who inhabited the Middle Paleolithic site of Mutzig (around 90 ka BP), expressed their technical know-how on a wide variety of rock types, such as rhyolite or phtanite, which, at this site, hold the title of "first choice" raw material. All of these rocks are available in the Neandertal's geological and territorial space. They were able to adapt their knapping methods to the constraints presented these materials. After presenting the different technical systems relating to the exploitation of the various rocks, we will detail the example of phtanite, a siliceous sedimentary rock whose products are technically very invested. As the functional analysis of this material is not easy, it was necessary to create a new experimental reference corpus in order to understand the various use-wear traces. We will discuss the different kinematics of the cutting products obtained by the Neandertals and the functional particularities inherent to this rock.

This paper therefore aims to better understand the management of lithic raw materials and their uses in the Middle Paleolithic of northeastern France. Also, this allows us to understand and question the various procurement patterns of the different Neandertal groups that occupied the Mutzig-Rain rock shelter. This refers to raw material sources offering specific technical, mechanical and functional constraints, the exploitation and use of which is not a matter of selection by default but of precise choice by these populations. In fine, this leads us to question the relevance of certain oriented terminologies used in the discipline to qualify raw materials other than flint, often wrongly qualified as 'second choice'.

Key words: Chaînes opératoires; Middle Paleolithic; Phtanite; Raw materials; Use-wear analysis.

Quartz management during the late Middle Palaeolithic of Corrèze (France)

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Lithic industries utilising quartz are commonly found during the Lower and Middle Palaeolithic periods in Southern France. These raw materials, characterised by diverse mineral compositions and qualities, can be preferentially used for various types of production (shaping or flaking) or coexist in smaller proportions within flint industries, such as for the production of Large Cutting Tools or percussive implements.

In this study, we compare the quartz chaînes opératoires of three lithic assemblages from the Brive Basin (Corrèze, France), located on the western margins of the Massif central. These assemblages, attributed to the late Middle Palaeolithic (between MIS 5 and 3), were excavated between 2019 and 2021 as part of preventive archaeological excavations: Brive-Laroche-Aérodome North and South, and Les Hauts-de-Lestrade (Brive-la-Gaillarde, Saint-Pantaléon-de-Larche). They correspond to open-air sites situated near the Corrèze and Vézère rivers, in the alluvial plain.

Quartz pebbles and cobbles constitute the majority of the knapped material found at these sites. Despite certain taphonomic biases (the absence of smaller pieces), all elements of the chaînes opératoires are present, including opening and initialisation, flaking, shaping, and occasionally flakes retouching (notches, denticulates, side-scrapers). Percussion tools such as anvils and percussors were also discovered, often associated with recycling phenomena (cores recycled as percussors and vice versa).

While there are similarities among the three lithic assemblages (utilisation of low-productivity S.S.D.A. methods, Discoid *lato sensu*), they do not share the same composition and characteristics. The methods employed for quartz are more elaborate, featuring a form of core hierarchy present in both assemblages of Brive-Laroche (North and South). At the site of Les Hauts-de-Lestrade, where cores are over-represented, the proportion of bipolar-on-anvil debitage is significant. However, the production of splits, used as blanks for shaping or flaking, has been identified across all sites. This represents a technical response to the constraints imposed by quartz modules, resulting in a plano-convex matrix. Another distinction lies in the production of tools on flakes, specific to quartz, and the production of Large Cutting Tools.

The production methods applied to quartz serve as less of a chrono-cultural marker, particularly when compared to reduction processes on silicites, which are more characteristic of the Middle Palaeolithic in all sites (Levallois, Discoid with pseudo-Levallois points, and typical flake tools such as side-scrapers and points). However, it should be noted that only a few silicites are present in the assemblages originating from the outcrops on the periphery of the Brive Basin (jasperoids from the Hettangian). The knappers, therefore, chose local or semi-local materials that could fulfil their immediate needs and worked them accordingly, each lithic industry presenting its specificities related to site function, activities or cultural traits.

Key words: Southwestern France; Techno-economy; Quartz; Bipolar-on-Anvil; Discoid.

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A paleoenvironment study of the Aterian (upper Pleistocene) Oued Djebbana site (Southeast Constantine province, Algeria)

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Our research is based on a sedimentological study of the Aterian site of Oued Djebbana, which is located more specifically to the southwest of Bir el Ater province (Algeria).

This work consists in the study of the soils of occupations in which human prehistory practised their lifestyles during the Middle Stone Age, in order to reconstitute the paleoclimate of these populations, we adopted a methodology based on granulometry, morphometry and mineralogy analyses, carried out on sedimentary fillings of the Upper Pleistocene, which had been collected at the level of the stratigraphic sequence of the site of Oued Djebbana and its surroundings.

Key words: Chronostratigraphy; Oued Djebbana; occupation soils.

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Human occupation during MIS 5 in the Besor basin, southern Negev, Israel an integrative approach combining characterisation and dating

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The Levant is a key area to study past human dynamics, due to its strategic position connecting Africa to Europe and Asia. It has been the main route of the most ancient dispersals of modern humans out of Africa and a privileged environment for Neanderthal occupation. Several human species occupied this area between around 200,000 and 40,000 years ago, which makes it a hotspot for studying human dynamics during the Middle and Late Pleistocene.

We present here the chronological results obtained at Besor 27 (B27), a Middle Palaeolithic open-air site located in the Besor basin, southern Israel. Radiocarbon dating was applied on charcoals, optically stimulated luminescence (OSL) on quartz from sediment and combined electron spin resonance and uranium-series (ESR/U-series) on teeth samples.

Regarding ESR/U-series, only poorly preserved herbivore teeth were available for dating. Here we investigated the degree of preservation of the dated samples using a set of characterisation tools including scanning electron microscopy (SEM), cathodoluminescence (CL), Fourier transform infrared (FTIR) and Raman spectroscopy. Alterations in the fossil samples were visible both to the naked eye and at the microscopic level. In particular, U-series analyses showed that U was heterogeneously distributed in the enamel, confirming that diagenesis may occur at different levels within a sample, which has to be taken into account for the age calculation. The modelled ESR ages allow framing the human occupation at the site to ca. 90,000-70,000 years, in agreement with the OSL ages obtained on the sediment.

Our results show that humans occupied this semi-arid environment during an interglacial phase, earlier than previously thought. Human presence at B27 occurred during the second half of marine isotopic stage (MIS) 5, giving new insights into the occupation of the lower Besor Basin, which was occupied also at later stages and during cooler phases (e.g., ca. 49,000 years at the nearby site Far'ah II). Moreover, our results support the necessity of combining characterisation studies to dating, in order to better understand the complex diagenetic processes that may affect the age calculation, and to provide a high-resolution chronological framework for Palaeolithic occupation in the Levant.

Key words: Chronology; Middle Palaeolithic; Levant; ESR/U-series dating; Characterisation.

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Spatial geomorphology as a tool for deciphering open-air archaeological and paleoanthropological site formation-preservation processes in the East African Rift System lacustrine basins

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In Africa, high climatic variability between humid and arid periods is one of the main factors in earth surface dynamics affecting the archaeological record of the Quaternary period. Archaeological contexts are often disrupted by sedimentary hiatuses, and in addition erosional processes lead to archaeological palimpsests, making it difficult to establish the reliable chrono-stratigraphic and chrono-cultural sequences. In the case of the hyper-arid lacustrine basins of the East African Rift System (EARS), the interaction between lake level fluctuations, dune system migration, delta progradation, littoral soil development and fluvial incision features, provides a high-dynamic palaeo-landscape framework ideal to track the spatial diachronic evolution of human inhabited environments through time.

In order to interpret the archaeological and palaeoanthropological record, we need studies of local and regional scale landscape surface processes and their link to hydro-climatic variation. Here we explore a number of such processes in two EARS lake basins. First, palaeo-shoreline sequence reconstruction is used to draw the extension of ancient lake surfaces at a high temporal resolution, providing the tools to build the archaeological predictive maps at a basin scale. Second, we compare lake level fluctuation models with the littoral archaeological sequences, their sedimentary formation processes. This is used to strengthen the chronological and taphonomic framework of the archaeological deposits, and to constrain the age reservoir effects resulting from the dating of biogenic carbonate materials. The documentation of erosional processes from the local to regional scale allows the identification of periods characterized by the loss of sediment and likely to lead to palimpsest formation. Finally, a multi-site and off-site geomorphological approach leads to the inference of some spatial-temporal interactions between human mobility and palaeolandscape evolution.

In this paper, we will present some results from this approach applied to the Lake Abhe (Central Afar Region, Ethiopia) and Lake Turkana (Kenya) basins, for a time span ranged from the Middle Pleistocene to the Holocene. The comparison highlights similarities and differences between the two basins in terms of chronological hiatus, palimpsest formation and the connection between archaeological site formation and palaeoshorelines. Finally, we will describe some basic guidelines for future studies of open-air sites and their context in the EARS lacustrine basins systems and arid lands more generally.

Key words: East African Rift System; Turkana basin; Palaeoshorelines; Open air; Archaeological sites.

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Coastal mobility and maritime interaction during the Late Pleistocene and Early Holocene in the Philippines

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The Philippines straddles two distinct biogeographic zones, Sunda and Wallacea, and has likely acted as a conduit for the movements of people, material culture and ideas between the islands of Southeast Asia throughout prehistory. A key location for our understanding of human interaction with maritime environments is Mindoro, which is among the Wallacean islands of the Philippines that were never connected to the Asian mainland, even during glacial maxima and extremely low sea levels. On the southwestern end of Occidental Mindoro, several prehistoric sites have provided valuable information on how the first humans reached the Philippines and how they responded to climate changes and adapted to a new ecosystem.

This paper presents an overview of our excavations in several caves and rock shelters which have yielded a radiocarbon chronology from c. 35,000 cal. BP until the Late Holocene and a wide range of information helpful for understanding early human migration into the Philippines. Cultural material and biological remains found in the Mindoro sites as well as in similarly old sites across the region, suggest that the Late Pleistocene and Early Holocene were periods of increasing mobility, significant social change, and technological innovation. The successful adaptation to coastal and marine environments and the efficient use of its diverse resources probably ensured a quite successful subsistence strategy for these early islanders, perhaps even in the sense of Sahlins' concept of the original affluent society.

Key words: Maritime Ecology; Human-Environment Interaction; Island Adaptation; Wallacea; Philippines.

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The early coastal environment and lifeways in Bilat Cave, southwestern Mindoro, Philippines

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The Mindoro Archaeology Project investigated several important cave sites from the late Pleistocene and early Holocene, located in Sta. Teresa and Ilin Island in Occidental Mindoro. Like most Philippine islands, Mindoro is part of the region of Wallacea, between Pleistocene Sunda and Sahul, and was never connected to the Southeast Asia mainland. However, the southwestern end of Mindoro, where the sites are located, is in close proximity to Huxley's Line, which divides the paleobiogeographic regions of Mainland Southeast Asia and Wallacea, and is therefore considered a potential stepping stone for early human migration.

The sites and retrieved cultural and biological remains demonstrate adaptation, occupation, and long-distance interaction in changing coastal environments, particularly landscape formation, sea levels, and landmass, resulting in massive archaeological deposits. Bilat Cave is one of the coastal sites on Mindoro Island, situated just above the present sea level. The cave has three chambers with a large shell midden near its entrance. Archaeological fieldwork began in 2014 and revealed important information on the Pleistocene and Early Holocene human occupation of Mindoro, the Philippine archipelago and Island Southeast Asia. This was evidenced by a complex sequence of site use based on molluscan assemblages with remains of marine and terrestrial vertebrate faunas and lithic artefacts. Our results indicate the diverse subsistence patterns and behaviour of the cave's inhabitants. In addition, they possessed advanced maritime technology, extensively used local marine resources, and engaged in coastal networking and trading.

Key words: Coastal archaeology; marine environment; coastal societies; subsistence patterns; human maritime cultures.

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The mechanics of raw material quality

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In archaeology, the study of raw materials used for making stone tools provides important insights into the organisation and behaviours of ancient peoples. Unfortunately, it is still poorly understood how knapping quality can be objectively measured. Standard mechanical properties are difficult to interpret, as they often seem to result in interpretations of what knapping quality is that contradict empirical observations made by experimental stone knappers. Here, we propose a quantitative framework for understanding the knapping force requirements imposed by different raw materials. For this, we combine some of the mechanical properties most commonly used in engineering sciences. We found that flake detachment depends on three factors: 1) the force applied to the material, 2) the material's characteristic strength and 3) its resistance to fracture. These three mechanical properties combined, allow to make predictions that are apparently in accordance with observations made by knappers. Our findings also have important implications for understanding the differences between raw materials.

Key words: Stone tool knapping; Knapping quality; Archaeometry; Raw material quality; Mechanical analysis of stone tools.

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Reconnaître la taille bifaciale au percuteur tendre végétal: expérimentations sur les grès de Tshitandalukua, Province de Benguela, Angola

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En Afrique Centrale, malgré de nombreux travaux attestant de la présence d'industries bifaciales en roches grenues, il n'existe pas à ce jour d'étude discutant des techniques de production et de leur identification. Il existe donc, pour les préhistoriens, un véritable besoin méthodologique pour l'identification des techniques de type percussion dure / tendre / par pression ou encore, percussion indirecte sur les roches grenues africaines. La région de Tshitandalukua, Province de Benguela, Angola, est un large gisement de grès et de quartzite en position primaire qui semble avoir été exploité de l'Early au Later Stone Age par les populations préhistoriques.. La production d'industrie bifaciale dans la région met d'ailleurs en relation l'utilisation de percuteurs durs et de percuteurs tendres pour le façonnage, parfois en grande quantité, d'outils bifaciaux sur ce type de roche (e.g. l'Acheuléen, le Lupembien, le Still Bay). En Afrique, l'acquisition de percuteurs tendres en bois animal n'est pas possible mais le bois végétal dur pourrait avoir été utilisé pour pallier ce manque. A travers la production expérimentale d'outils bifaciaux sur les roches de Tshitandaluka, et l'étude détaillée technologique et morphométrique du matériel, nous cherchons ici à déterminer et quantifier les différents stigmates de façonnage bifacial à la percussion dure et tendre, liés à l'utilisation d'un percuteur en bois de mopane (*Colophospermum mopane*) un bois végétal dur particulièrement présent dans le nord de l'Afrique australe. Grâce à cette expérimentation nous avons pu mettre en évidence des stigmates de taille spécifiques à la percussion tendre en Mopane similaires aux stigmates de tailles de percussion tendre mais aussi un stigmatisme spécifique à ce type de percuteurs.

Key words: Soft hammer; percuteur tendre; Knapping marks; Stigmates de taille; Igneous rocks; Roches grenues; Africa; Afrique.

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Session 12-2

Dynamics of Neolithisation in the Banat and Neighboring Areas

SESSION ABSTRACT

The central geographical position of the Banat region between Central and South-Eastern Europe, about halfway between the Black Sea and the Adriatic, makes it an important area across European cultural history. The very flat landscape framed by mountains is characterised by meandering river courses and very fertile soils, which were an important resource for the oldest farmers in Europe. The Banat is of great importance for the spread of the Neolithic from Anatolia and the Aegean to Central Europe. The Balkan type Old Neolithic was already able to spread into this area by the end of the 7th millennium BC. After that, the process of further expansion into Northern Europe stagnated for half a millennium. The reasons for this were certainly manifold and are to be understood as a creative process. At the end of this development stands the genesis of the Linearbandkeramik (LBK), which enabled the Neolithic to spread as far as the Paris Basin and the Ukrainian steppes, and in the north almost to the southern edge of the Baltic Sea. Parallel to this expansion to the north, we record social differentiations in Southeast Europe that culminate in the formation of the Vinča cultural phenomenon. In recent years, interdisciplinary archaeological research has added various facets to the picture of the spread of the Neolithic in the Banat. Genetic studies on human and animal remains of the period shed new light on the actors in this process. New sets of radiocarbon dates obtained in recent years and advances in statistical modelling of data including information from archaeological contexts, offer for the first time precise information of the temporal dynamics of Neolithisation. This session provides a forum for current research on the Neolithic in the Banat and neighbouring regions.

Main Organizer:

Raiko Krauß

Co-Organisers:

Nenad Tasić

Dan Ciobotaru

Paint it white: New approaches to regional variations and interregional similarities in the Early Neolithic Balkans

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Over the past decades, interaction between Southeastern Europe and neighboring areas have been discussed intensively. Among other features, these early farming communities were strongly connected with the first appearance of pottery. Within these emerging networks, painted pottery plays a significant role in explaining early farming communities. The remarkable styles of white-on-red painted pottery (WRPP) can be considered one of the most well-known characteristics in the Early Neolithic (EN) Balkans. The phenomenon covers only a small part of the total amount of the pottery assemblage. It is a highly controversial debated characteristic of pottery-producing communities in the Balkans, as well as Anatolia and the Aegean, reaching its peak at the beginning of the 6th millennium calBC. This study attempts to bring clearer understanding of the appearance and distribution of WRPP. The main focus is to detect networks of decoration styles and interpretations of their chronological and geographical distribution with a particular focus on interregional interactions. The presented analyses offer a new insight in regional peculiarities and interactive relations of EN pottery in the influential regions of Anatolia, the Balkans and the Aegean.

The first part of the paper will focus on WRPP in the Aegean. Vessel forms and decoration styles of WRPP from sites like Nea Nikomedeia and Mavropigi-Filotsairi in Western Macedonia, as well as Argissa and Achilleion in Thessaly will be classified. Using a wide range of bi- and multivariate statistics, the results will be compared to sites like Ulucak and Uğurlu in Eastern/Northeastern Aegean.

The second part will concentrate on the area of modern day Bulgaria and Southern Romania. Pottery from EN sites like Kovachevo in the Struma River Valley, Karanovo in the Thracian Plain, as well as Dzhulyunitsa and Măgura Buduiasca in the Danube River Basin will be reassessed in order to detect stylistic networks and asses the level of regional and interregional contacts. Network and correspondence analysis are used to support the visualization of patterns of similarities through time.

Key words: white-on-red painted pottery (WRPP); Early Neolithic Balkans; correspondence analysis; network analysis.

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14C-Chronology of (multi-layered) Early Neolithic sites in the Lower Danube Valley and the Thracian Plain

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The research on absolute-chronological questions in regions along the Danube River Basin has made significant progress in recent years. Important studies have been published that highlighted the beginning of LBK longhouses, the absolute chronology of Vinča – Belo Brdo and associated pottery assemblages, as well as the transition to the Neolithic in the Danube Gorges. While projects like TOTL, BIRTH or Lepenski Vir have greatly enlarged the radiocarbon dataset and opened new perspectives (not only in the context of the spread of Neolithisation), databases like CalPal, RADON or 14SEA greatly improved the accessibility of dates.

Surprisingly some regions seem to stay unaffected by this trend. In the area of research, there are less than 500 radiocarbon dates from less than 50 sites, measured to a big extent before 2000 CE. Most of these dates were published in a comprehensive article by Görsdorf and Boyadzhiev 1996 or in small series in site specific publications (Măgura Buduiasca, Dzhulyunitsa, Slatina, Aşağı Pınar).

This presentation will focus on Early Neolithic (multi-layered) sites in the Lower Danube Basin, east of the Danube Gorges and the Thracian Plain. The available data will be summed up, reevaluated and analysed specifically on the level of a single site. If possible, dates will be modelled according to their stratigraphic position to increase dating accuracy. The models will be interpreted in comparison with existing chronologies established by above mentioned research projects, as well as commonly used regional typologies. Summed Probability Distributions (SPDs) will be calculated to trace specific bias of the samples and to enable comparisons with neighbouring regions on a bigger scale. Methods of modelling include Gaussian Monte Carlo Wiggle Matching (CalPal), Sequence and Outlier analysis, as well as Sum and KDE functions integrated in OxCal and free R packages.

Key words: Bayesian statistics; Gaussian Monte Carlo Wiggle Matching; KDE; SPD.

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Mechanisms of Neolithisation: The social, cultural and economic dimensions of stone objects at Svinjarička Čuka (south Serbia)

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In this contribution, we present new data from the multi-layered Neolithic site of Svinjarička Čuka in south Serbia and its key position for reconstructing the commencing dispersal of the Neolithic way of life from Anatolia into Central Europe. The process of Neolithisation started around 6200–6000 BC in the Balkan region, displaying regionally varying patterns associated with eponymous sites such as Starčevo, Karanovo and Amzabegovo. Ancient DNA and archaeological research have revealed the general trajectories of Neolithisation, however, we just begin to understand the complex social, cultural and economic processes underpinning and governing these developments. In this regard, the case of Svinjarička Čuka located on one of the main communication routes following the Axios-Vardar-Morava Rivers connecting the Aegean and Central Europe is of particular significance given the rich archaeological dataset available by now.

Using the lithic assemblage from this site, we will address the relationship between particular socio-economic and cultural developments and Neolithisation. Due to their longevity, abundance and the availability of innovative techniques to conduct raw material and provenance analyses, lithic objects are ideally suited for this endeavour. For this case study we examine factors such as deliberate choices of raw materials and the occasional resilience to innovations based on various aspects, e.g. strong local traditions, and the varying degree of interconnectivity on a local, regional and supra-regional scale. The chipped stone assemblage in combination with other selected stone objects from Svinjarička Čuka, investigated from a diachronic perspective, offer the unprecedented opportunity to reconstruct the development of early Neolithic resource management and socio-cultural and economic behaviour reflecting key mechanisms involved on the Neolithisation of the central Balkans.

Key words: Neolithisation; Balkans; Svinjarička Čuka; lithic objects; resource management.

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The Sava-Drava-Danube interfluvium in the 6th millennium cal BC: the regional radiocarbon evidence

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The first human groups with a subsistence strategy based primarily on agriculture and animal husbandry appeared in the area between the Drava, Sava and Danube rivers, i.e. in the eastern part of modern Continental Croatia around 6000 cal BC or shortly after the turn of the millennium. Their emergence is in line with the supra-regional dynamics of the neolithisation process in Europe. The accompanying material culture can be classified as south-east European type early Neolithic, called Starčevo in the cultural concept. There is little doubt that the major regional rivers played a prominent role in the northward and westward spread of food production. So far, archaeological evidence on the earliest phase is limited and concentrated in the eastern part of the interfluvium. The situation is similar along the left bank of the Danube, in the Bačka region and along the Tisa/Tisza river in the Banat. Further spread of inventions and people within the investigated area is closely linked to the Drava and Sava rivers.

The spectacular emergence of new pottery styles in the ceramic assemblages marks the profound transformation of the mid-6th millennium cal BC period. The formation of settlements with early Vinča- and Ražište-style pottery and the obvious elements of the central European Linearbandkeramik culture (LBK) in the Drava river basin provide plenty of information on an altering settlement system and society. The outstanding visibility yielded by settlements, architecture and the abundance of contemporaneous pottery styles enables exceptionally detailed analyses. By the late 6th millennium cal BC, in the eastern part of the interfluvium, flat settlements with similar architecture but with a slightly different mixed pottery tradition, incorporating stronger south-eastern Vinča B style traits, were established in the period preceding the formation of tell settlements. This pattern has been recently recognized and remains less discussed in publications to date.

Absolute chronological evidence became inevitable during the past decade as formally modelled series of AMS radiocarbon dates challenged earlier beliefs summarized in carefully elaborated typological systems. The paper presents the evaluation of already existing 6th millennium cal BC radiocarbon dates from the region and their integration into formally modelled series. Another level of the assessment incorporates radiocarbon results from adjacent regions, such as from southern Transdanubia and northern Serbia. Timing and dynamics of the neolithization process as well as the abandonment of south-east European (Starčevo) pattern early Neolithic settlements of the area are discussed and re-evaluated. In case of later 6th millennium cal BC sites, our aim is to gain more insight into the complex system of mutual effects, contemporaneities and diachronic patterns. The ultimate purpose of the presented investigations is the regional scale re-consideration of the 6th millennium cal BC development by accurately integrating all available absolute chronological evidence.

Key words: Sava-Drava-Danube interfluvium; 6th millennium cal BC; neolithisation; absolute chronology; formal radiocarbon modelling.

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Ethno-cultural links between Gura Baci-Donja Branjevina and some new discoveries

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This article synthesizes one of the older studies originating from the neolithization process in S-E Europe that happened after 6200 cal. BC, with several stages of southern migrations, reaching the northern center of Transylvania and Bačka, at Donja Branjevina, the most important ones based on the ceramic categories painted, but also on the analysis of the most important features in the two resorts. The research is based on the study of Sergei Karmanski's original documentation (at his residence), with images from photographs and drawings on features. Over time I have published numerous references based on chronological and cultural series.

Based on the new research with material publications, with C14 data from: Dzhulyunitsa, Bulgaria (Raiko Krauss *et alii*), but also from the Romana Plain from Măgura Buduiasa, Teleorman county and Serbia (N. Tasic), I resumed through in a more recent synthetic study, presented at Piatra Neamț 2022, the problem of neolithization, for the first three/four migrations and diffusions defined as Starcevo-Cris 1A, 1B, 1C, 2A. The links with the Bulgarian area show a second way of neolithization, coming from the area from the east of the Balkans towards Campia Română (mentioned above) and Oltenia with the discoveries from Carcea and Gradinile towards the south of Transylvania at Ocna Sibiului, Cristian, Miercurea Sibiului.

Transylvania played an important role through the sources of salt inside the Carpathian arc.

Key words: ways of neolithization; Transylvania; cultural links; Starčevo-Criș.

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New data about the Early Neolithic in Transylvania. The results of recent research from the archaeological site of Limba-Oarda de Jos (Alba)

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The preventive research occasioned by the construction of the A10 highway (Sebeş-Turda) carried out from 2016 to 2018 led to the documentation of an important area of the archaeological site from Limba-Oarda de Jos. The complex stratigraphy of the Neolithic settlements placed on the high terrace of Mureş, located between the confluence of the Ampoi and Sebeş rivers, was confirmed by the opening of a considerable surface (50 Ha).

The early Neolithic was revealed by two distinct levels of habitation: a first horizon belonging to the first phases of the neolithization process of the Transylvanian area (WRPP) Precris, Starcevo Cris I, as well as another level belonging to the late phase of the early Neolithic (Starcevo Cris III B, polychromy).

Key words: early Neolithic; Transylvania; Mureş Valley; White on Red Painted Pottery.

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Unusual Eating Habits – The Use of Aquatic Resources by Early Neolithic Settlers in Banat

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The evaluation of settlement remains from the sites Bucova Pusta IV and Movila lui Deciov in the Romanian Banat provides a comprehensive insight into the resource use and nutrition of the Early Neolithic settlers in the centre of the Carpathian Basin. The settlements show typical elements of the Early Neolithic in the Balkan region, such as solid dwellings, pottery production - the use of domestic animals and cultivated plants is also well documented.

Remarkable, however, is also the use of numerous aquatic resources by the inhabitants, which at first seems unusual for a Neolithic population. Various species of mussels and water snails as well as frogs, turtles and water birds were on the menu of the Neolithic settlers. Among the animal bones evaluated so far, about 1000 skeletal elements could be assigned to different fish species, including carp (*Cyprinus carpio*), pike (*Esox lucius*), perch (*Perca fluviatilis*), roach (*Rutilus rutilus*), catfish (*Silurus glanis*), chub (*Squalius cephalus*) and sturgeon (*Acipenser* sp.). The association of relatively small (*P. fluviatilis*, *S. cephalus*, and *R. rutilus*) and large fish (*C. carpio*, *E. lucius*, *Acipenser* sp., and *S. glanis*) can be explained by different fishing methods used at Movila lui Deciov. In general, fishermen captured big fish using hooks. The use of fixed fishing gear, such as fish traps or nets close to the margins of the water, would be typical for fishing small fish. Based on their ecological requirements, the fish taxa at Movila lui Deciov describe the presence of a significant mature river system with some vegetation. Most of the species are common in deep and slow-flowing waters. It indicates that this site was probably located close to the downstream showing a maximum water temperature between 20-25°C, which corresponds to the geographical location of the site in the estuary of the Mureş and Aranka rivers into the Tisza.

The evaluation of the plant food remains shows a dominance of cultivated cereals and the typical Neolithic legumes. In addition, however, there are numerous wild gathering plants, some of which also originate from the water or the immediate riparian area of the rivers. Is this merely an adaptation to the local environmental conditions?

Landscape reconstruction is also important for understanding these settlement sites. Nowadays, this natural area presents itself as an open steppe landscape. However, initial interpretations of the excavation results allow us to reconstruct a pronounced micro relief and the landscape was apparently more forested. A special feature of the region is also the absence of stones in the subsoil. This circumstance is remarkable, as stone artefacts are essential for any Neolithic society. Different strategies for dealing with this lack can be pointed out and discussed.

Recent genetic studies on human remains highlighted the predominance of migration processes in the spread of Early Neolithic communities over the discussed area. And although the neolithisation phenomenon was swift and seemingly successful reaching the Tisza area, it took five centuries until the Linear Pottery cultural package to develop a similar process of spreading westwards over the central and western Europe and northwards towards the Baltic Sea.

Key words: Settlements; Fishing; Subsistence Strategies; Genetics; Landscape Reconstruction.

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Cattle, Connections and Coincidences: A Case Study from Entringen, Southwest Germany

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Discussions of possible connections between the Linearbandkeramik (LBK) and Vinča worlds have been intensively researched within the past years. This has been supported by a range of radiocarbon dates which indicate a chronological overlap between the early phases of both cultures, as well as the presence of sites with mixed culture markers like Szederkény in the Hungarian Danube basin. Recent research indicates that these contacts might even reach over the area of Transdanubia, as finds with morphological and stylistic similarities could be uncovered in the western part of the LBK as well. This paper aims to present finds from one of these sites in the south westernmost distribution area of the earliest LBK.

Excavations in Ammerbuch-Entringen, “Lower Field”, located in the middle Neckar river catchment, in the past years provide new insights about the habitation of this LBK site. Geophysical prospections as well as pottery assemblages and radiocarbon dates suggest that the settlement was in use throughout the earliest to the younger phases of the LBK. Among the ceramics from the earliest stage, there were seven handles in shape of stylized cattle heads, a form which can be associated with figurines in southeast Europe. The cattle plays an important role in terms of Neolithic subsistence and also symbolism, as many finds of plastic figurines and specifically shaped ceramic vessels indicate. While this phenomenon is well documented in Transdanubia, the number of associated finds from the LBK is also steadily increasing. The comparison between both regions in the light of zoomorphic clay finds aims to discuss the question whether the finds from Entringen are part of a supra-regional symbolism in the European Neolithic.

Key words: Linearbandkeramik; ceramics; symbolism; connections.

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Session 8-7

Characterizing changing technology, subsistence and settlement dynamics of the Middle Stone Age and Middle Paleolithic

SESSION ABSTRACT

The Middle Stone Age (MSA) and Middle Paleolithic correspond to the time in which modern humans evolved in Africa and began to disperse across Eurasia. While some researchers highlight the differences between late archaic and early modern hominins, other emphasize the broad similarities in their technological adaptations, subsistence strategies and settlement dynamics. This session addresses regional and site-specific case studies to examine and contextualize cultural change and variability during the late Middle and Late Pleistocene, when modern and archaic humans coexisted, at times interbred and likely exchanged knowledge and ideas along the changing interfaces of their territories. The session asks what, if any meaningful differences in technology, subsistence and settlement dynamics distinguished the diverse populations that inhabited the regions of Africa and Eurasia by inviting research to present informative regional and site-based case studies that highlight cultural stasis, continuity as well as subtle and more radical change on different temporal and spatial scale. Papers highlighting new approaches for examining the causes and consequences of social-economic change during the MSA and Middle Paleolithic are particularly welcome.

Main Organizer

Nicholas J. Conard

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An Investigation of Discoid technology in South Bihar, India

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Of late, South Asia has produced a few well dated Middle Palaeolithic sites having rich prepared core technologies. Recent studies from Attirampakkam (Tamil Nadu) and Hanumanthunipadu (Andhra Pradesh) point to the possibility that the Middle Palaeolithic assemblages, mostly featuring prepared core-based technologies, may have emerged from the preceding Late Acheulian technologies and probably evolved locally. Levallois, Discoid and other prepared core technologies are present in the Middle Palaeolithic assemblages of South Asia. Sometimes identification and distinction of different flaking methods involved in prepared core technologies are challenging. For example, the Discoid method shares several characteristics with the centripetal recurrent Levallois method, which can lead to confusion in reading the flaking patterns and products. Refitting, as an investigative approach, can be exceptionally useful in these circumstances. It offers valuable inputs to understand the precise chaîne opératoire of each individual core and can be helpful to understand knappers mindset to utilize blank (blocks or cobbles) morphology to attain different modes such as unifacial, bifacial or multi-facial discoid exploitation. Additionally, it can provide more input to understand hominin behavioural pattern, cognitive ability and site formation processes.

Examples of refitting are rare in South Asian open-air site contexts, and the present work will be the first of this kind in the Indian subcontinent where a large number of refitting pieces along with cores are analysed. This paper presents detailed analysis of discoid cores and products recovered from South Bihar, India. Lithic pieces are found scattered in clusters on the surface as a result of recent erosion of top layers and exhibit in situ knapping activity by hominins. Lithic pieces from the cluster refits into the discoid cores, partially and sometimes completely. Assemblage shows various modes such as unifacial and bifacial exploitation incorporated in the Discoid technology. In some cases, complete exploitation of discoid cores is evident. A portion of lithic assemblage shows sirt fractures that can be resulted either because of knapping error or post-depositional effects.

Key words: Discoid; Refitting; Middle Palaeolithic; South Bihar; Levallois; Prepared core technology.

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Understanding Quartz and Quartzite procurement strategies by Neanderthals at Abri du Maras: preliminary results

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The Rhône River valley and its tributaries, particularly in the middle valley region, are known for the abundance in Palaeolithic occupation vestiges counting some very well know sites namely in caves and rock shelters. The Rhône River acts as a natural corridor with a north-south direction, linking the interior of France with the Mediterranean coast while separating the Central Massif to the west from the Alpine Massif to the east. Its geomorphologic characteristics allow the study of models of human and fauna mobility, and the study of their contact with different biomes and resources.

Abri du Maras is a Middle Palaeolithic site located close to the margins of the Ardèche River, a tributary of the Rhône River. It has an occupation spanning MIS5 and MIS3 that yielded faunal remains and lithic industry as well as some other very interesting findings such as traces of cordage found in lithic tools. Levels 4 and 5 have a predominance of flint collected mainly on a perimeter of 30 km, with the secondary presence of quartz and quartzite collected possibly in the surrounding areas of the site. Though flint outcrops are numerous in the region, a detailed analysis of quartz and quartzite explored by Neanderthals has never been done to understand the different strategies and economy of procurement of the diverse materials used throughout the Middle Palaeolithic. Quartz and quartzite were transported to the site in more diverse shapes, e.g. as flakes, but also cores or pebbles. This shows not only diversity in strategies of selection and transport of these raw materials but also demonstrates the potential of its study to understand Neanderthal behaviour and its relationship with local resources.

The project 'Quartz and Quartzite Neanderthal Assemblages of Payre and Abri du Maras' is being developed in an MSCA CoFund fellowship framework at IPHES (Spain) and MNHN (France) and aims to better understand the technology, economic strategies and the ability of Neanderthal to select specific resources and the use of quartz and quartzite in areas abundant in flint sources.

We present the preliminary results of surveys dedicated to mapping local raw materials in the vicinity of Abri du Maras. The preliminary results indicate the possibility of the existence of a strategy for the acquisition of raw materials in different locations. Although close to the site, they indicate the presence of distinct zones of displacement and transport of material at a local level, contributing to a better understanding of the dynamics of daily mobility patterns near a settlement area such as the Abri du Maras. We look to discuss the importance of understanding local resources as an indicator to interpret settlement choices and mobility patterns through lithic procurement strategies.

Key words: Abri du Maras; lithic raw materials; Neanderthals; quartz and quartzite.

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High-Altitude Adaptation in the Middle Palaeolithic of the Zagros Mountains, Iran

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The Middle Palaeolithic of the Zagros Mountains of Iran and Iraq languished for most of the 20th Century as a sort of intellectual backwaters of knowledge production on human origins research due to fragile political climates. Models of Middle Palaeolithic hominin behavioural evolution and environmental adaptations in southwest Asia, therefore, historically have been grounded in research based on fieldwork in the Levant. Consequently, lithic technological adaptation within the Middle Palaeolithic of the Zagros, gauged through production variability, raw material preferences, and functional decision-making through use, have been lacking behind the better-known industries of the Levantine Mousterian (e.g., Shea 2013; Nymark 2021). Intensification of fieldwork in the Zagros Mountains over the past two decades have provided crucial new insights into the region, and revealed a much more complex patchwork of Middle Palaeolithic lithic industrial variability than hitherto appreciated (e.g., Biglari 2014; Beshkani 2018). The Zagros Middle Palaeolithic historically has been associated – or even equated – with the so-called ‘Zagros Mousterian’ (Skinner 1965; Dibble 1984; Lindly 2005), an industry featuring pointed and heavily-retouched tools, in particular Mousterian points (Solecki and Solecki 1993) and scrapers (Dibble & Holdaway 1993). The Zagros Mousterian has been explained as a techno-behavioural expression of hominin summer-seasonal adaptation, specifically designed to manage lithic raw material scarcity within lowland to highland mobility strategies of high-altitude land-use (Lindly 2005). This paper will present a series of new case studies on the high-altitude Middle Palaeolithic rockshelter of Houmian (Bewley 1984) in the Iranian Zagros. Posited to be one of the oldest, as well as highest-lying, Middle Palaeolithic sites in southwest Asia, contextualising a series of new findings offers both site-specific as well as regional implications for cultural change and variability. The paper will focus on a re-analysis of the stone tool and pollen records (Nymark 2021), making the claim for multi-seasonal occupation at ca. 2000 m.a.sl. A lithic techno-functional study (Nymark and Beshkani, in prep) identifying separate – and non-Mousterian Middle Palaeolithic – technological strategies of production within different layers of the stratigraphy. A use-wear study (Nymark and Bye-Jensen, in prep) revealing evidence of specific materials and resources targeted by Middle Palaeolithic hominins in the surrounding landscape. Examining the causes and consequences of social-economic change the paper will be highlighting a successful approach for extracting high-quality lithic use-wear data from museum collections using state-of-the-art portable equipment. These findings all serve to confirm and refuse previous behavioural and environmental interpretations surrounding Middle Palaeolithic land-use in the Zagros. The resulting implications contribute to a re-appreciation of the Middle Palaeolithic of the Zagros as a dynamic region of hominin complexity.

Key words: Lithic technology; Use-wear analysis; Zagros Mousterian; Iran.

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Who ate the fish? The role of fish during the Middle Paleolithic in Western-Central Europe

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Archaeologists have traditionally assumed that freshwater fish remains were not part of the diet of Neanderthals and early modern humans. Researchers often rejected inland fishing as part of the subsistence activities prior to the Upper Paleolithic.

Addressing this question is made more difficult by a lack of systematic recovery and study of fish remains at Paleolithic sites. To determine the potential predator of fish and to reconstruct past ecosystems, we must consider complete faunal assemblages, especially the combination of fish remains and other small vertebrates. Comparative analyses of fish remains are needed to clarify the origin of the accumulations in the context of European Paleolithic caves and rock shelters. Such studies will also increase our knowledge of past aquatic ecosystems. Interpreting the role of aquatic resources and fishing in hominin subsistence strategies represents a crucial goal for future faunal research.

This paper explores the role of fish in two Middle Paleolithic sites, Gran Dolina (Atapuerca Iberian Peninsula) and Hohlenstein-Stadel (Swabian Jura, Germany). In this comparison, we study the fish assemblages' most probable agents of accumulation to understand the dichotomy between non-anthropogenic and anthropogenic assemblages in archaeological contexts. We also use fish remains to reconstruct the landscape and the freshwater ecosystem around the sites. In both cases, taxonomic studies, demonstrate that cold-water salmonids are the best represented species in the assemblages, indicating similar freshwater environments.

In addition, several other Middle Paleolithic fish assemblages are also presented to demonstrate the great potential of multi-method studies based on fish remains.

Key words: Fish exploitation; Middle Paleolithic; Taphonomy; Freshwater ecosystems; subsistence; Neandertals.

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Middle Palaeolithic Stone Toolmaking Skill: The 3D Geometry of Experimental and Archaeological Levallois Flakes

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This contribution examines the Levallois flakes made by three species of Levantine Middle Palaeolithic knappers from the sites of Neshar Ramla, Qafzeh Cave, and Kebara. We ask if the skill involved in Levallois blank production differs among these three groups. Individual knappers leave behind traces of their technological choices, style, and proficiency on the artefacts they produce. By observing the lithic technologies made by past hominins, we can thus reach an appreciation of the technological skills possessed by these knappers. The demands of Levallois knapping on cognition and dexterity make Levallois technology a useful medium to explore phenomena like skill. We introduce a new 3D toolkit for assessing the amount of knapping skill involved in Levallois blank manufacture in search of technological differences among the different Homo species of the period.

First, we use recurrent Levallois flakes produced by intermediate and expert experimental knappers to find 3D attributes that distinguish lower- and higher-skilled Levallois knapping. Using an automatic, objective, and precise 3D geometric analysis, we find that metrics relating to the control of Levallois flake volume, shape, edges, and symmetry reliably distinguish expert knapping from less skilled knapping. We then apply these attributes to three MP Levallois assemblages of the southern Levant to explore how skilfully different species of Homo produced Levallois flakes. In particular, we explore whether the knapping skill and technological variability of Homo sapiens and Neanderthals can be distinguished.

Key words: Levallois; Technological Variability; Skill; Lithic Experiment; 3D Lithic Analysis; Middle Palaeolithic.

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Discoid Technology during the late Acheulean in the Levant: a brief technical story?

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Discoid technology has been identified as one of the distinctive technologies employed during the Lower and Middle Paleolithic periods. Since its original definition by Boëda (1995, 1993), the diversity of productions related to Discoid technology has been highlighted (Peresani, 2003), leading to the recognition of both *lato sensu* and *stricto sensu* Discoid methods (Mourre, 2003).

In this paper, we present the identified Discoid reduction processes at area D in Jaljulia (Israel) following a detailed technological analysis. Located in the coastal plain north of Tel Aviv, the site has yielded several prehistoric occupations attributed to the late Acheulean (Shemer et al., 2022).

The abundant lithic collection from area D (approximately 500,000 years old - 12,000 pieces) mainly consists of debitage chaînes opératoires. Among them, the Discoid concept is well represented, accounting for one-third of the production. *Stricto sensu* Discoid methods were employed on selected globular pebbles and cobbles made of Mishash flint, which varies in quality. The debitage is characterized by alternating bifacial flaking, often with significant recurrence (maintaining of the core convexities through predetermined/predetermining removals). The production aimed to create pseudo-Levallois points and other backed flakes, achieved through cordal flaking. Additionally, longitudinal crested flakes and "éclats centrés" were also identified. Various sizes of pseudo-Levallois points were produced, including the smallest ones (less than 1.5 cm), as supported by the presence of cores under 2 cm. Thus, Discoid debitage proved to be a preferred method for fulfilling diverse functional objectives that required significant dimensional differences.

Discoid technology follows a unique trajectory in the Levant, being used during the Lower Paleolithic while absent during the Early and Late Middle Paleolithic periods. At Jaljulia, the primary objectives (pseudo-Levallois points or backed flakes) surprisingly exhibit similarities to those found in the Middle Paleolithic Discoid technology in Europe, where it is part of the definition of a Lithic Techno-Complex. We will explore in the discussion the different technologies identified in the archaeological record of the Near-East and their connections to neighboring geographical areas.

Key words: Late Acheulean; Levant; Discoid; Lithic Techno-Complexes.

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Discoidal and centripetal methods used in the Mousterian from the Carpathian caves (Romania)

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Most of the Mousterian settlements in Romania are mainly located in the Southern Carpathians region. These are represented by cave dwellings and have benefited from several stages of research, started in the late nineteenth or early twentieth centuries. Several sites are better known and have benefited from recent observations on lithic material collections: Bordul Mare Cave from Ohaba Ponor, Curata Cave from Nandru, Gura Cheii-Râșnov, Cioarei-Boroșteni Cave etc. Even though the findings come mostly from old excavations, they are the only ones that can provide information about technical behavior in the Middle Paleolithic of this area. Fortunately, at least in the case of Bordul Mare cave, recent studies have revealed the existence of coherent lithic assemblages, proving a good recovery of materials regardless of the stage at which the research was carried out. Also, despite the low number of artifacts, the assemblages from Cioarei-Boroșteni cave have benefited from more recent research, carried out with modern methods compared to the excavations performed in other caves, as well as from a consistent number of interdisciplinary studies. The use of a large diversity of rocks (flint, chert, jasper, quartz, quartzite, andesite, basalt, diorite etc.) provides particular technological and typological features to the material culture from the Carpathian caves and could offer significant information on the economy of the Mousterian communities concerning the use of raw material sources and the technical options for tools production. Among the identified methods, the discoidal technique is present in each settlement, regardless of the raw material used. Therefore, our presentation will focus on identifying and characterizing these methods from several Mousterian occupations discovered in the Carpathian caves.

Key words: Middle Paleolithic; discoid; raw materials; lithic technology; Carpathian caves; Romania.

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Margit Kohl-Larsen's excavation at Njarasa Cave and its importance for the Middle Stone Age in East Africa

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Between October 1935 and January 1936 Margit Kohl-Larsen and a team of local residents excavated Njarasa Cave near lake Eyasi in present day Tanzania. Little attention was ever paid to the site, most likely due to the greater interest in the neighboring and much bigger Mumba Cave. Njarasa Cave is located only 40 m northeast of Mumba and holds unique potential to contribute to our understanding human lifeways and subsistence at the local and regional scale. Underneath the three uppermost stratigraphic units (layers I – III) containing late Holocene assemblages, Margit Kohl-Larsen identified a sterile layer (IV) and five still deeper strata (V1, V2, V3, VI1, VI2) providing large numbers of Middle Stone Age (MSA) artifacts. After the end of the Kohl-Larsen expeditions in 1939, the archaeological artifacts recovered from Njarasa and other sites were transported to the University of Tübingen, where Ludwig Kohl-Larsen earned a professorship. Under the lead of Hansjürgen Müller-Beck, researchers studied and published several assemblages from these sites, but not from Njarasa. Since 2018 new research in collaboration between the Universities of Dar es Salaam and Tübingen has begun to contextualize the Kohl Larsen assemblages with new data gained through state-of-the-art re-excavation techniques and analytical methods at Mumba and Njarasa. We conducted a test excavation at Njarasa in 2022 revealing intact deposits at the bottom of the sequence suited for OSL dating. Here we present the first results of our research on the lithic and faunal material from the Njarasa assemblages recovered from layers V1, V2 and V3. In addition, we provide the first age estimates for the site, placing the entire MSA sequence within the middle of the Late Pleistocene. These dates include ESR ages using teeth from the 1930s, as well as new TT-OSL and IRSL measurements on the freshly uncovered profile at the bottom of the Njarasa sequence. Stratigraphic unit V at Njarasa is broadly contemporary to Bed V at Mumba. A lithic technological analysis reveals similarities with Mumba Bed V, such as low proportions of bipolar cores, but also interesting differences, including high numbers of platform cores and comparatively little evidence for Levallois technology relative to published results from Mumba Bed V. The faunal assemblages from layers V1, V2 and V3 contain large browsers and grazers consistent with savannah habitats. Our results document the high quality of Margit Kohl-Larsen's excavations and underline their important scientific value for further study of human behavioral evolution during the MSA in East Africa.

Key words: Middle Stone Age; East Africa; ESR Dating; Lithic technology; faunal remains.

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New Perspectives on the Still Bay lithic assemblages from Sibhudu Cave, KZN, South Africa

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In recent decades the Still Bay (SB) techno-complex of the Middle Stone Age (MSA) has often been regarded as an exceptionally innovative period. Along with the presence of bone tools, personal ornaments and the use of ochre; possible hafting of bifacial points - the type fossil of the Still Bay - represents a cultural element supporting this view. The tireless focus on SB points has overemphasized the commonality and homogeneity among the SB assemblages, which are geographically widespread in southern Africa. This approach has masked the complexity and diversity within the SB techno-complex. This biased focus on one kind of artifact has also led to the neglect of lithic artifacts other than SB points, thereby misrepresenting the complete reduction sequence and technological diversity within these assemblages as a whole.

Sibhudu Cave in KwaZulu-Natal contains one of the longest MSA sequences in southern Africa. After numerous, highly successful seasons of excavation by Lyn Wadley of the University of the Witwatersrand, the Department of Early Prehistory and Quaternary Ecology of the University of Tübingen under Conard's direction, has conducted yearly field seasons at the site since 2011. Sibhudu preserves rich SB assemblages with high, spatial-temporal resolution within a well-established cultural sequence. The site thus provides a unique opportunity to investigate the diversity and regional variation of the SB. This paper reports some first results from lithic techno-economic and techno-functional analyses of the SB assemblages from layers Winnie, Walter, Viola and Victor. Here we analyze lithic artifacts from each of these cultural horizons aiming to assess diachronic change in technology and site-use, as well as to reconstruct the overall characteristics of the SB at Sibhudu. We discuss the properties of SB assemblages to help establish the degree of variability within this cultural taxonomic. Our research provides new perspectives on the behavioral complexity and cultural evolution during the MSA of southern Africa.

Key words: MSA; Sibhudu; Still Bay; lithic technology; behavioral variability.

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Analyzing the settlements patterns dynamics of Homo sapiens in Eastern Morocco through stratified open-air sites from the MSA and LSA periods

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The archaeological records of *Homo sapiens*' MSA-LSA occupations in eastern Morocco primarily come from cave and rockshelter sequences, such as Ifri n'Ammar, Rhafas, and Taforalt. However, there has been limited research on the settlement's dynamics of open-air sites in this region, with the only available data consisting of dispersed and unstratified lithic scatters.

Over the past sixteen years, systematics surveys and archaeological excavations have been conducted in the Aïn Beni Mathar - Guéfaït basin, located in the Jerada province. Through our collaborative research project between Spain and Morocco, we have discovered several stratified open-air sites in this area, showcasing different archaeological horizons that include lithics and faunal remains associated with the Middle Stone Age (MSA) and Late Stone Age (LSA).

They are predominantly located on slopes, exposed surfaces of riverbanks, and in close proximity to springs, always linked to areas abundant in biotic and abiotic resources. Paleoenvironmental reconstructions reveal an open semi-desert landscape with vegetation concentrations surrounding water sources and lakes, closely resembling the present-day scenery.

Technologically, the MSA sites exhibit consistent flake assemblages resulting from Levallois and discoidal knapping strategies, as well as opportunistic ones. Retouched tools, primarily denticulates and scrapers, are abundant, and we have also documented "Aterian" assemblages with tanged pieces and bifacial foliates. The LSA sites display a higher density of lithic remains, characterized by standardized laminar and flake assemblages with typical technological attributes associated with the Iberomaurusian culture.

This paper presents new findings derived from systematic excavations conducted at Sahb el Gahr 1 and 2, Oued Charef, and Tahya 3 MSA sites, as well as preliminary test pits at Tahya 4 and Ain Tifirassine LSA sites. Through an interdisciplinary approach, our results offer a new overview on MSA-LSA dynamics within open-air contexts. We focus on subsistence strategies, territorial mobility, and the types of occupations that were dependent on the available resources in the area.

Key words: MSA; LSA; Eastern Morocco; *Homo sapiens*; settlements dynamics.

Everyday life in a late Mousterian cave-site with Discoid technology: the case of Fumane, A9 layer

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The multidisciplinary update of discoid Mousterian and discoidal lithic technology, main objective pursued by the session S8-8, starts from case studies which could help to disentangle the various aspects featuring this facet of past human behaviour at a local or regional scale. The A9 layer of Fumane cave, located in the Venetian Prealps (Northern Italy), represents the chance to test this integrative approach. The layer, dated to 47.6 ky BP, has been subjected to extensive investigations in the last years which led to technological, techno-economical, functional, zooarchaeological, paleoenvironmental, geoarchaeological and spatial analyses, besides some evidence of complex and symbolic behaviour.

In particular, A9 lithic assemblage displays one of the most paradigmatic cases of discoid technology within late Mousterian. Here, two main reduction sequences have been recognized: the first one, aimed at the discoidal reduction of nodules and cobbles for the obtaining of short and thick flakes, often equipped with a natural or knapped back, is perfectly reassumed by a nearly-complete refitting found in a waste concentration, as well as the majority of the lithic finds; the second one involves the reduction of flakes mainly obtained from the first stages of core shaping or directly from the lithic outcrops, especially if we consider raw materials collected more than 5-10 km from the site. The strategies of raw material exploitation and circulation seem to be well embedded within the hunting activities, mainly directed to the available ungulates with well-established, cost-effective patterns in carcass selection and processing. The analysis of anthropogenic features and the spatial distribution of finds reveal portions of hearths and occupation horizons, in addition to concentrations of different classes of materials, which strongly suggest the existence of distinct areas for production activities, prey exploitation, combustion and waste. The partial superimposition of lenses and features, however, indicates the existence of a palimpsest particularly evident in the cave entrance. Evidence of innovative behaviour is represented by the unusual production of lithic tools with a retouched back, which served to improve the effectiveness of the manual grip for precision activities or adapt the artefact to different types of handles. Finally, the extraction of raptors' long feathers and wings is documented, as well as the use of an ochred fossil shell.

The layer, embedded within two human occupations marked by the adoption of Levallois lithic technology, could therefore provide some important data regarding the social and technical organization

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of Late Neanderthals in Prealpine setting, especially if we cross-check paleoenvironmental and ecological information of the whole sequence highlighting the features of discoid reduction strategy in respect to the other systems characterizing the cultural variability in the final part of the Middle Palaeolithic.

Key words: Middle Palaeolithic; MIS 3; lithic technology; spatial analysis; Micromorphology.

Short-term Middle Paleolithic occupations at Ghar-e Boof, southern Zagros Mountains

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Located not far away from the junction of the Mesopotamian Plain and the Persian Gulf, the southern Zagros Mountains are characterized by a heterogeneous topography and high environmental diversity. Thus archaeological research in this region is critical to improve our understanding of human settlement dynamics and techno-cultural adaptations during the Middle Paleolithic (MP) in southwestern Asia. However, due to the small number of well-dated MP sites in the southern Zagros, little is known about how MP foragers used and interacted with their surrounding landscape and whether or not their subsistence strategies varied through time. Between 2006–2017, the Tübingen-Iranian Stone Age Research Project (TISARP) team excavated Ghar-e Boof (N 30.2839°, E 51.4352°, Dasht-e Rostam region, Fars Province, Iran), a Late Pleistocene cave site, and documented well-stratified MP and early Upper Paleolithic (UP) deposits. The site has yielded eight MP archaeological horizons (AH VI – IVc), each containing lithic and faunal assemblages. OSL analyses produced ages of ~81–45 Kya for the MP layers, while the early UP sequence ranges between ~42–35 cal BP based on radiocarbon and OSL dates.

In order to examine the characteristics of MP occupations at Ghar-e Boof, and by extension, in the southern Zagros region, we present the results of the ongoing analyses of MP lithic and zooarchaeological assemblages from this site. From a techno-typological perspective, the lithic assemblages are primarily centered on the production of flakes and scrapers. Throughout the entire MP sequence, we have recorded a low density of lithic artefacts, which constitute incomplete reduction sequences and suggest transient occupation episodes at the site. The ephemeral use of Ghar-e Boof during the MP, coupled with the paucity of other MP sites in the surrounding regions, likely signifies either low human population densities or the presence of small groups inhabiting the southern Zagros. Our zooarchaeological and taphonomic study indicates that MP foragers mainly targeted and exploited caprines for meat and marrow, while gazelles and tortoises might have represented important supplementary food resources. Other ungulate taxa, such as wild pig, red deer, equid, and wild cattle are rare in our assemblage. In addition, MP foragers occasionally hunted carnivores and birds. When we assess the entire Late Pleistocene deposits recovered at Ghar-e Boof from a diachronic perspective, we document not only differences in the techno-cultural industries, but also significant changes in find densities, prey choice (small, slow-moving game relative to quick animals), and sedimentation rates. Up to now, MP hominin fossils have not been recovered in the southern Zagros, and we do not have conclusive evidence to link the MP and the early UP assemblages with different human groups. Nevertheless, independent of the taxonomic status of the MP occupants of Ghar-e Boof, our results demonstrate important patterns in technological behavior, site occupation intensity, mobility and hunting pressures throughout the Late Pleistocene in the southern Zagros Mountains.

Key words: Middle Paleolithic; Zagros Mountains; Subsistence Strategies; Site Use; Paleodemography.

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Re-examining the Mumba Industry at the type locality on the shore of Lake Eyasi, Tanzania

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Margit Kohl-Larsen's excavations between 1934 and 1938 at Mumba Cave near the shore of Lake Eyasi, Tanzania represent a landmark in the history of Middle Stone Age research in East Africa. This large scale excavation with a volume of roughly 1,000 m³ yielded a long stratigraphic sequence spanning the Late Pleistocene. During the middle of the last century, researchers used these rich collections to define the Mumba Industry. Segments and other backed lithic artifacts from Bed V at Mumba have long been viewed as the main indicator of the Mumba Industry, but from the start the nature and importance of this industry has been debated. At times the Mumba Industry has been viewed as being linked to the Howiesons Poort of southern Africa. This paper will critically examine the concept of the Mumba Industry based on a new data base of the lithic artifacts from the Kohl-Larsen's excavations. Among other topics, the paper will address whether or not backed artifacts are restricted to a narrow chronostratigraphic window and can serve as a reliable cultural-stratigraphic marker. The paper will also review the chronology of the site with regard to new ESR/U-series dates. Finally, we will also touch upon unifying and contrasting aspects of the Late Pleistocene cultural sequence in eastern and southern Africa to help to contextualize the importance of the Mumba Industry today.

Key words: Middle Stone Age; Technology; Mumba Industry; East Africa.

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The case study of Piedmont (north-western Italy) and the contribution of surface collections to research on the Middle Palaeolithic in the region

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Current knowledge about the Middle Palaeolithic of the regions on the south-western edge of the Alpine arc is very scarce and based on sporadic evidence. In Piedmont in particular, the only Middle Palaeolithic site known and investigated in recent years with a multidisciplinary approach is the Ciota Ciara cave. However, data from a single site cannot be considered exhaustive to define the population characteristics of an entire region. In this work we want to show how, in a regional context generally poor in archaeological evidence relating to the Middle Palaeolithic, a substantial aid to understanding regional dynamics can also come from the study of materials from surface collections.

Due to purely geological constraints, Piedmont is a region that lends itself poorly to the conservation of such ancient archaeological contexts, but the strong anthropisation of some areas for agricultural and industrial purposes has brought to light interesting evidence for research on the Middle Palaeolithic in the region. They come from different localities in the northern part of the region, from Vaude Canavesane, Trino, Baragge biellesi and Colline Novaresi.

The technological study of these assemblages led to the identification of strong similarities in the technological behaviour of the Middle Palaeolithic human groups of Piedmont: they based their technology on the exploitation of vein quartz, a rock diffused all over the regional territory, from time to time accompanied by other local (spongolite, rhyolite, metamorphic rocks, jasper) and allochthonous (radiolarite) lithic resources, with technological adaptation to their quality and mechanical properties both when it comes to predetermined methods (Levallois and discoid) and when expedient reduction sequences are used. The ongoing study on the provenance of the lithic raw materials attested in Trino, together with the data known for the Ciota Ciara cave, also makes it possible to formulate the first hypotheses on mobility during the Middle Palaeolithic along routes linking Piedmont with the Lombardy and Emilian areas.

In this work we present the data obtained after about ten years of research in Piedmont: they outline a scenario where, even in the limits of analysis mostly based on materials issued from surface collections, we can hypothesise for the first time the land mobility and the technological behaviour of the hunter-gatherers' groups that inhabited the region during Middle Palaeolithic.

Key words: Middle Palaeolithic; Piedmont; land mobility; lithic technology.

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General Session 5

Metal Ages

SESSION ABSTRACT

The invention of metalworking was a turning point in human prehistory that changed the course of societies forever. The harnessing of fire to work metals by means of human ingenuity, or as some would say, by feats of heroes and gods, set in motion a chain of events that altered the trajectory of human progress. The pace of transformation in human societies has accelerated ever since, and despite the many advancements and innovations of the modern world, the impact of the Metal Ages remains undeniable. To this day, their legacy continues to shape the way we live and the world we inhabit.

This general session is run jointly by the organizers of the UISPP World Congress in Timisoara and the UISPP's 'Metal Ages in Europe and the Mediterranean' Commission. It provides a platform for meaningful discussion and the exchange of new ideas regarding the transformative journey of humanity, dating back to the time when fire and metal were first combined to create a new world, one of tools and weapons, but also of ornaments and symbols. Join us as we delve into the rich history of the Metal Ages and its impact on societies, from the first sparks of innovation to the eve of history.

This session, welcoming experts working on any aspect of the archaeology of the Metal Ages from around the globe, will explore a diverse range of topics spanning from technology to theory. Whether you are presenting cutting-edge research or building upon existing knowledge, it provides a valuable opportunity to exchange ideas and advance the field.

Any paper or poster relating to the Metal Ages (Chalcolithic/Aeneolithic, Bronze and Iron Ages), that does not fit into any of the thematic sessions, can still be accommodated in this general session.

Main Organiser

Dan Ştefan

Co-Organisers

Dirk Brandherm

Luis Berrocal Rangel

La fin du néolithique et l'âge du bronze en Algérie

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L'âge du bronze est considéré comme l'une des étapes les plus difficiles, notamment sur le plan chronologique, car elle diffère d'une région à l'autre, l'homme entre dans une nouvelle étape de développement en utilisant des matières premières telles que le bronze.

Cette période a été conçue comme une séquence, englobée par la fin de l'âge de pierre jusqu'à l'âge du fer.

On retrouve cette étape décisive en Algérie, qui semble s'être développée à la fin de la période néolithique, et cela se manifeste à travers les peintures et gravures rupestres du Sahara central, qui remontent à la période caballine, et des vestiges archéologiques des différentes régions du Nord, la question la plus débattue a été celle de l'origine : la connaissance de la métallurgie est-elle venue en Algérie du monde extérieur introduite par les peuples et par des échanges ?

Si oui, quand et d'où? Les archéologues se penchent également sur la technologie elle-même et les restes pour voir dans quelle mesure il a évolué? Ainsi de nombreuses questions subsistent sur les débuts, le développement et la propagation. L'âge du bronze marqué en Algérie par la présence d'un foyer métallurgique près de Bejaia au Pic des Singes, on retrouve peu d'objets métalliques, soit qu'il n'y en avait presque pas, soit qu'ils aient été refondus successivement pour d'autres utilisations, il se manifeste aussi par les tombes mégalithiques qui se concentre surtout dans le nord-est de l'Algérie et l'ouest de la Tunisie, c'est dans les tombes qu'il y en a le plus (bracelets et bagues en bronze) alors que les armes sont exceptionnelles (Hache de Karouba près de Mostaganem et poignard de Chénoua près de Tipaza), en l'absence de documents écrits et peu de recherches effectuées pour cette période la recherche archéologique offriraient le seul espoir de trancher les débats sur les origines et la chronologie.

Key words: Age du bronze; Algérie ; restes archéologiques ; échanges.

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Lithics in the Metal Ages the role of lithic industries as chrono-cultural marker in Bell Beaker productions in Eastern Languedoc (South-Eastern France) and in Lombardy (Northern Italy)

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Even though lithic productions, especially from domestic contexts, played for a long time a marginal role in the studies on the Metal Ages societies, they may constitute useful sources for reconstructing the socio-economic and cultural contexts and their study offers new perspectives on the comprehension of ancient societies. In the middle of the 3rd millennium BCE, the Bell Beaker phenomenon entails important innovations to many European regions, including the development of long-distance networks of contacts and circulation across Europe. Bell Beaker groups settled in regions occupied by local groups, with which they establish relationships and reciprocal influences. Lithics, which are less sensitive to changes and to external influences than other materials such as ceramics, highlighting the weight of local Pre-Bell Beaker technical traditions in Bell Beaker lithic production, can provide useful information for understanding the real extent of these relationships, thus representing an important chrono-cultural marker.

In this communication, data from the study of lithic industries from some Pre-Bell Beaker and Bell Beaker domestic contexts in Eastern Languedoc (South-Eastern France) and Lombardy (Northern Italy) are presented; these are the Pre-Bell Beaker industry of grotte de Thérès (Fontbousse group) and the Bell Beakers industries of the sites of Beaussement and Maupas for Eastern Languedoc, and the lithic assemblages from Pre-Bell Beaker (Civate-White Ware facies) and Bell Beaker layers of the site of Monte Covolo and the industries of Bell Beaker sites of Brescia-San Polo and Calcinato-Campo Musna for Lombardy. Although lithic productions of the 3rd millennium BCE show a common tendency towards simplification (e.g. exploitation of local raw materials, simplification of the chaînes opératoires), the detailed techno-economic and typological analysis of the industries of Eastern Languedoc and Lombardy made it possible to observe not only similarities and differences between the Pre-Bell Beaker and Bell Beaker productions of each region, highlighting the presence of elements of continuity linked to local technical traditions and elements that can be interpreted as Bell Beaker innovations, but it also showed that the weight of local Pre-Bell Beaker traditions, although always very strong, can affect Bell Beaker lithic production in different ways.

Key words: Lithic industries, Lithic technology, Bell Beaker phenomenon, Local Cultures.

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The dynamics of Bronze Age upland settlements in Ireland and Northern Britain. A comparative perspective

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The Bronze Age in Ireland dates from approximately 2500 BC to 500 BC; in Scotland it ranges from 2500 BC to 800 BC, with a slightly different ending date if applied to Britain in a wider geographic context. The earliest periods originally proposed by Montelius as the copper transitional period is now widely accepted to end and the Early Bronze Age to begin c. 2000 BC-1800 BC. While the Irish and Northern Britain Bronze Age artifact record was, and remains, undeniably rich in finds of extraordinary beauty and artisanal skill, it has not been mirrored by settlement finds. Particularly in Ireland, the flowering of archaeological finds associated with developer driven archaeology and continual improvements in scientific techniques enabling dating from smaller and more complex samples has helped to expand our knowledge, but most studies have focused on lowland sites or the more high-profile hillfort sites. The data sources from upland areas in both Ireland and Northern Britain remains fraught with chronological inconsistencies, broad occupational date ranges and in places is scant.

By synthesizing existing radiocarbon dates from select sites located exclusively in upland areas of Ireland and Northern Britain and confirming those dates through multivariate secondary sampling the project aims to refine known settlement chronologies in these areas against correlations to climatology data being produced from upland area pollen analyses' where initial data seems to indicate simultaneous settlement expansion and contraction during periods of climate change. This data will be proofed against sites newly identified or not yet subject to testing in both regions that can be Radiocarbon dated to expand the dataset. A region-to-region comparative analysis will determine if settlement data has significant identifiable regional nuances or evidence of concurrent expansion and contraction. If evidence of simultaneous contraction and expansion exists, comparisons against site data in Continental Europe will be made to ascertain if N. Britain and Ireland may fit in a larger pattern of Bronze Age settlement shifts during periods where the record supports evidence of climate change impact.

Keywords: Bronze Age, Ireland, Northern Britain, uplands, climate change.

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Swords by Numbers: numerical patterning in Bronze Age weapon depositions

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At a European scale, the numerical composition of some categories of structured metalwork deposition shows clear evidence of patterning, with distinct numerical patterns changing over time and between regions. The relevant trends are particularly striking in the numerical patterns found in depositions of bladed weapons, which in this contribution are examined through a Europe-wide dataset, revealing a clear tendency towards normalization over the course of the Bronze Age and into the Early Iron Age, as well as repeated attempts at reconciling competing dualistic and trinitarian principles in the structuring of the relevant assemblages.

In addition to numerical patterning, from the Late Bronze Age onward and across Europe, an increasing number of paired weapon depositions also show clear evidence of differential treatment of the deposited objects, with some regional exceptions, such as the Carpathian Basin. This differential treatment of individual objects in the relevant assemblages may offer hints at a potential cosmological backdrop to this practice.

Key words: Europe, Bronze Age, sword, weaponry, metalwork deposition

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Getting of age in the Late Bronze Age

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Studies that use material culture are uniquely valuable components to the study of prehistory that considers individuals, their intentions, habits and their socially contextualized identities. Focusing on graves and hoards, material remains of “ritual” actions, considered being the opposite to everyday practices, we claim, that the construction of such assemblages involves both performance and participation through which the principles of social and symbolic world of Bronze Age societies are deliberately highlighted and reinforced.

In our presentation we will discuss two finds that changed profoundly our understanding of what growing up in the Late Bronze Age was about. We will discuss the grave number 16 from Zavrč in Slovenia where accompanied by extremely rich attire a young girl was buried and the hoard from Moravička sela in Croatia from which several items were interpreted as ritual used in the process of learning social (male?) roles in the society.

Based on our observations of quantity and quality of selected items in hoards as well as their biographies, we will demonstrate that parts of middle sized and smaller sized hoards with mixed compositions, could be observed as reflections of activities of individuals. Such activities also include the creation and manipulation with material culture that enabled the adolescents to learn the proper social use of material culture. On the other side graves had socially constructed and codified contents – grave goods were reflections of how the societies of the living perceived the deceased often ignoring their biological age. They represented dialectically created individuals that were considered being members of an imaginary society – the society of the dead. Consequently, hoards are sometimes better material indications of the processes of growing-up in the Late Bronze Age since they can be interpreted as material reflections of what individual people did in the past while the graves were material indications of what people thought the deceased should be doing in their lives, if they would have lived.

Key words: Late Bronze Age, hoards, cremation graves.

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Looking for traces of craft activities and everyday life in a lowland settlement of the Urnfield period

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The close connection between settlements and craft activities has been known for a long time by now and is exemplified by detailed studies of numerous archaeological sites. Which kind of activities took place where can only rarely be shown, and even then mainly through primary deposits, like preserved floors or surface levels.

The problem is, however, that primary deposits in lowland settlements are not often preserved, because of the all too common destruction of these features caused by erosion or agricultural land use.

Through my research on a section of the Urnfield Period lowland settlement of Groß-Enzersdorf, Austria, I show that it is possible to trace craft activities within secondary deposits, or de facto refuse, via a precise analysis of formation processes and mapped distributions of artefacts and features.

In this process, one key point is the question of how much or how little certain finds, especially ceramics, are relocated. The evaluation of distribution patterns of certain artefact categories as, for example, bone tools, deposited raw materials, whetstones and specific vessel types show concentrations and dispersions. Furthermore such show concentrations and dispersions can also be derived from the mapped position of feature categories in relation to each other or, a variety of feature types, like grain storage pits. Here, the interdisciplinary results of archaeobotanical and archaeoichthyological analyses of 4 soil samples as well as a thorough analysis of animal bone contingent of this settlement section are included. The synthesis of all these strands and their interpretation finally results in a model that depicts the processes of everyday life but also the craft activities in this section of the Urnfield settlement of Groß-Enzersdorf.

This case study shows how answers concerning sequencing and formation processes can even be derived from settlement sites in which no primary deposits are present, as long as formation processes are closely observed.

Key words: settlement archaeology; Bronze Age; crafts; formation processes

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I did it my way...Regionalization in the artistic expression of Eastern Celts

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In cultural history, although acknowledged as being one of the major materials that shaped our civilization, iron was always considered as the material used for the productions of tools and weapons. And in the narrative about the cultural evolution (and aesthetic) it was perceived as the original functional material and its use in the production of art was mostly cast aside.

In the Late Iron Age, especially in the framework of La Tène culture, the situation changed dramatically (for a short period of time). Iron sword scabbards became decorated with intricate patterns that, spreading across vast territories of Europe, were interpreted in numerous different narratives focusing on explanations such as demonstrations of Celtic mobilities or indicators of cultural networks connecting regions. Once interpreted as individual decorations connecting on a symbolic level the weapon, its owner and the society, these decorations are now considered being public demonstrations of the carrier's status perceived as symbols and signs explaining the history and the future of the society that relied on the correct recognition and understanding of intertwined triskeles and tendrils.

Consequently, decorated weapons are carriers of cultural, social, regional and transregional aesthetic information. And all this was possible due to the exceptional handiness of individual master blacksmiths that were able to translate the basic cultural principles of Celtic society into iron reliefs covering swords scabbards. Our presentation is dedicated to one of such stories – the decorated sword discovered in Srednica near Ptuj in eastern Slovenia. In its eclectic decoration we recognize the central Pannonian origins of the complex composition consisting of the decorated scabbard and the clamp reinforced with semi-circular decorated buttons. But it is the plastic decoration accentuated with hatching covering the clamp and the complex triskeles with vegetable of-shots produced in deep relief on the iron scabbard that indicate that at the end of Early La Tène there was a workshop in the area between Slovenia, Austria and Hungary that developed a “local” style. For a short period of time it produced a series of decorated weapons, variations on a theme recombining a limited set of decorative elements. A regional specific visual expression was developed within the Early La Tène art of the Eastern Celts.

Key words: Celtic Art, swords, Eastern Celts.

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Indigenous low-density urbanism prior to the Greek colonisation in the southern Ukraine

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The Greek colonisation brought ready-made forms of urban life to the shores of the Black Sea. However the indigenous groups had a long tradition of living in agglomerations which can be characterised as pre-urban or proto-urban. Forms of these agglomerations were very variable and evidently had not formed an evolution line towards fully developed urbanism. Moreover each of them should be understood in its peculiar societal contexts and not as a step in the imaginary stairs to the real city. This overview intends to present the basic spatial parameters of the indigenous pre-Greek agglomerations, carry out a comparative analysis of the settlement patterns and search for a continuity of a pre-Greek and Greek settlement in the region of the study.

Key words: Urbanism; Bronze Age; spatial pattern

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Processus d'origine des sociétés guerrières en Sicile

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1. Museo Civico Comprensoriale – Corleone, Italy

L'arrivée de l'artisanat en Sicile vient de la mer Égée, à travers ces échanges maritimes qui voyaient la Sicile comme le point d'atterrissage central vers la Méditerranée occidentale. Au début, les premières connaissances étaient partagées par les marins, mais ensuite il y a eu une véritable invasion par les artisans grecs et anatoliens, qui ont commencé à fréquenter les grands villages du sud-est de la Sicile pour se déplacer au rythme de 15-20 km par an dans direction ouest. Ils commencèrent par copier les figures peintes ou gravées dans la poterie provenant des métiers maritimes, mais l'arrivée des ouvriers, qui ouvrirent leurs ateliers sur l'île, constitua la plus importante école d'art sicilien préhistorique et protohistorique. Les idoles du faciès Thapsos/Milazzese témoignent de l'influence mycénienne dans la région. La péninsule de Thapsos avec la culture homonyme a agi comme un pont vers l'influence de la Méditerranée orientale sur l'île sicilienne. Avec les artefacts et les matériaux, les divinités, les coutumes et les langues ont voyagé, ce qui, comme le montre l'écriture linéaire B qui indiquait l'arrivée de marchandises de loin. Les gisements de cuivre et d'étain étaient situés dans la région de l'Espagne et dont le trafic, à travers la Sicile, a généré les premières sociétés guerrières, qui se sont fortifiées à travers ces macro-zones qui cherchaient à étendre leur territoire d'influence. Même le pouvoir d'utiliser les meilleurs travailleurs représentait l'acte de violence le plus féroce entre les prétendants. Tout cela s'éternise jusqu'à la colonisation hellénique au VIIIe siècle B.C.

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La Sicile, centre de la Méditerranée dans la préhistoire et la protohistoire : un carrefour de peuples et de biens basé sur les acquisitions les plus récentes

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La Sicile est située au centre de la Mer Méditerranée, et précisément à cause de cette position privilégiée, elle a joué un rôle fondamental dans la dynamique historique à partir du Néolithique. La plupart des flux provenaient de la mer Égée et de l'Anatolie, et donc la première partie intéressée était la partie sud-est, la zone actuelle de Syracuse et Raguse. La partie occidentale de l'île était plus intéressée par le commerce et les mouvements depuis l'Afrique du Nord. Les dernières acquisitions nous livrent un chemin parfois tortueux, qui a conduit de nombreuses régions à être touchées par des cultures venues de l'est de l'île, mais cela uniquement dans des zones macro, notamment à l'intérieur de l'île. En particulier, la zone du Corleonese et du Belice supérieur, moyen et inférieur a été investie par la culture Castellucciana et par celle de Rodi-Tindari-Valllunga, toutes deux de l'âge du bronze, mais cette dernière semble être la plus récente. Les héritages de cette culture se trouvent principalement dans la culture de Naro-Partanna, très présente dans la région corléonaise avec la décoration typique linéaire brune et en treillis. La culture de Rodi-Tindari-Valllunga a les bols typiques avec poignée surélevée et noir brillant. Montagna Vecchia, qui devint plus tard une véritable métropole de la Sicile antique, Contrada Caputo et Costa S. Giovanni, toutes deux situées dans le périmètre de Corleone, dans le centre-ouest de la Sicile, représentent les deux points les plus importants pour la présence de ce type de découvertes. La méthode mise en œuvre à l'époque, selon les chefferies, faisait de ces macro-espaces particuliers un territoire indépendant du reste de l'île, même s'ils étaient parfois vaincus par des ennemis, comme en témoigne la couche de cendres retrouvée dans les stratigraphies des huttes.

Key words: Corleone, montagna, micenei, egei.

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L'arrivée de l'artisanat en Sicile depuis la mer Égée génère des sociétés guerrières

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1. Museo Civico Comprensoriale "Pippo Rizzo", Corleone

L'arrivée de l'artisanat en Sicile vient de la mer Égée, à travers ces échanges maritimes qui voyaient la Sicile comme le point d'atterrissage central vers la Méditerranée occidentale. Au début, les premières connaissances étaient partagées par les marins, mais ensuite il y a eu une véritable invasion par les artisans grecs et anatoliens, qui ont commencé à fréquenter les grands villages du sud-est de la Sicile pour se déplacer au rythme de 15-20 km par an dans direction ouest. Ils commencèrent par copier les figures peintes ou gravées dans la poterie provenant des métiers maritimes, mais l'arrivée des ouvriers, qui ouvrirent leurs ateliers sur l'île, constitua la plus importante école d'art sicilien préhistorique et protohistorique. Les idoles du faciès Thapsos/Milazzese témoignent de l'influence mycénienne dans la région. La péninsule de Thapsos avec la culture homonyme a agi comme un pont vers l'influence de la Méditerranée orientale sur l'île sicilienne. Avec les artefacts et les matériaux, les divinités, les coutumes et les langues ont voyagé, ce qui, comme le montre l'écriture linéaire B qui indiquait l'arrivée de marchandises de loin. Les gisements de cuivre et d'étain étaient situés dans la région de l'Espagne et dont le trafic, à travers la Sicile, a généré les premières sociétés guerrières, qui se sont fortifiées à travers ces macro-zones qui cherchaient à étendre leur territoire d'influence. Même le pouvoir d'utiliser les meilleurs travailleurs représentait l'acte de violence le plus féroce entre les prétendants. Tout cela s'éternise jusqu'à la colonisation hellénique au VIIIe siècle avant JC.

Key words: angelo, corleone, montagna, castelluccio.

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Elément de chronologie de la protohistoire en Algérie

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Les travaux menés anciennement sur la protohistoire en Algérie ont presque exclusivement porté sur le domaine du funéraire, par conséquent elle demeure la période la moins documentée de l'histoire de l'Algérie.

Cette période qui coïncide avec l'âge des métaux est connue par ses nombreuses nécropoles et monuments funéraires qui se caractérisent par leur grande variété sur le plan architectural. Si quelques essais ont abouti à l'établissement d'une typologie de ces monuments, en revanche on a accordé très peu d'intérêt aux objets et bijoux métalliques que ces tombes pouvaient contenir mais qu'on a souvent qualifié de rare. C'est pourquoi, en l'état actuel des connaissances, cette période est définie à tort tantôt par la période préislamique, tantôt par la période protoberbère, allant jusqu'à la faire remonter aux premiers siècles historiques pour certains auteurs, reniant ainsi l'existence d'un âge de cuivre et d'un âge du bronze en Algérie.

Pour examiner la question de la protohistoire en Algérie, cette étude s'appuiera sur une analyse critique des travaux anciens, qui seront confrontés aux investigations ayant porté sur un essai de révision et d'actualisation des données en relation avec les objets métalliques issus des tombes. La détermination de la composition chimique de certains objets métalliques conservés dans les musées d'Algérie sera mise à profit pour évoquer la question de l'âge des métaux en Algérie.

Mots clés: protohistoire; âge des métaux; monuments funéraires; chronologie; mobilier métallique

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Bronze Age aquatic foods in the Eastern Mediterranean – an underestimated resource

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In the context of Philipp W. Stockhammer's ERC Starting Grant "FoodTransforms" (2016-2021) at Ludwig-Maximilians-Universität (LMU) Munich, Germany, we investigated Bronze Age Eastern Mediterranean food by conventional and cutting-edge methods. An aspect notoriously under-researched and rather difficult to grasp due to preservation issues, is foodstuffs derived from aquatic habitats, both freshwater and marine. While archaeological remains of fishbones and mollusc shells have been successfully studied for decades, the actual consumption of filter feeders and crustaceans by humans is a very new line of research. It is based on the application of a triple analysis of human dental calculus including 1) Organic Residue Analysis (ORA) with a focus on lipids, 2) proteomics, and 3) diatom biomarkers. By means of dental calculus samples taken at the sites of Tiryns, Chania (GR), Alalakh (TR), Kamid-el-Loz (RL), Megiddo, Ashkelon, Tel Erani (IL), Abusir el-Meleq, and Thebes (ET), we were able to produce evidence for the Bronze Age consumption of marine crustaceans in the Aegean, freshwater crustaceans in the Levant and Egypt, and freshwater molluscs at Alalakh (River Orontes) and Thebes (River Nile). This is supported by diatom and protein evidence, as well as archaeological sources, such as shell middens, ancient texts, and contemporaneous images. Moreover, we analysed available and newly generated isotopic data with the help of Bayesian mixing models in order to trace the importance of marine consumption in the Bronze Age Aegean over time and with regard to the changing social conditions behind them. A third line of thought tried to trace archaeological evidence for human awareness and use of aquatic creatures as reflected by existing evidence for large-scale fish trade, by the exploitation of different aquatic plants, and by the multi-purpose use of certain bivalves such as *Pinna sp.*

Key words: seafood; aquatic food; Bronze Age; Eastern Mediterranean; diet.

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Exploiting the salt in south-eastern Oltenia (Romania). A history of more than 6000 years

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The mountainous and premountainous range of the north-eastern side of Oltenia it was known as the richest in salt region of Romania. This fact is documented by the outcrops, some of them situated very close to the surface of the ground, but also by salted springs. Their modern and contemporary exploitation was done and still is, by galleries and surface excavations, the salt being used especially in the chemical industry. During the Middle Ages, this was also extracted from galleries. The instruments used for cutting and extracting the salt block was handled by specialized personnel mostly composed of slaves (gipsies) of some monasteries (Cozia) or of the Wallachia ruler (Ocnele Mari). In fact, this mentioned authority had the exclusive right of opening a saline. Subsequently, this could have been "granted" to a private person, or to a monastery. Salt was also exploited during the Roman time (Ocnele Mari-Aval Baraj), as in this region of Vâlcea existed the military and economical centre from Stolniceni-Buridava Romană). Dacians were also interested in the salt exploitations, fact which is documented by the fortifications (dava) from Buridava, which exerted an economically and military control over the terrestrial roads and waterways (Olt River) towards Transilvania and the Danube. The prehistoric communities had also exploited the salt, both the surface one, an aspect which is documented by some tools made of stone (mining hammer), as well as the salted springs. In the proximity of the latter ones, there were a large number of seasonal settlements of the Early Iron Age (Copăcelu) and of the Bronze Ages (Coțofeni, Glina and Verbicioara cultures: Ocnele Mari-Aval Baraj, Cosota, Coasta Ungurească and Zdup, Ocnița, Govora, Căzănești). To the Coțofeni milieu had belonged the briquette vessels, which resembled those used also by the Neolithic communities of the Criș culture from Copăcelu. Salt was not only exploited, but also carried on some terrestrial roads in the hilly zone, which started from the region rich in salt and reached up to the Danube, at Drobeta-Turnu Severin and Corabia, but also on the Sărata, Olteț and especially Olt River. This fact is confirmed by the finds for the Dacian, Roman and Medieval times.

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Chronology of the Bronze Age in southeast Transylvania: A Radiocarbon Perspective

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Southeast Transylvania, located on the western fringe of the Eastern Carpathians, serves as a unique region influenced by both the west (inner Transylvania and the Great Hungarian Plain) and the east (Moldavia and the North-Pontic area). This contact zone between East and West has witnessed continuous cultural interactions throughout history, evident in numerous archaeological discoveries.

The study area encompasses the Ciuc Depression, the eastern components of the Braşov Depression (Sfântu Gheorghe and Târgu Secuiesc Depressions), and parts of the Transylvanian Plateau. Research on the Bronze Age chronology in southeast Transylvania is closely connected to the rest of the province and neighboring regions.

Radiocarbon dating has played a crucial role in understanding the Bronze Age chronology. While central and western Transylvania have seen an increase in ¹⁴C data, the study area's contribution remains limited. In recent years, 33 samples from 23 key sites, spanning the entire Bronze Age, have been radiocarbon dated. These samples include animal and human bones, as well as some charcoal and charred seeds, obtained from earlier excavations and recent discoveries during field surveys and excavations.

The research reported here aimed to achieve comprehensive coverage of the Bronze Age period and study area through radiocarbon dating. Although there is a partial gap in Early Bronze Age (EBA) material from certain basins, Middle Bronze Age (MBA) and Late Bronze Age (LBA) sites yielded significant data. Among the LBA findings, the emergence of Gáva-type pottery in the study area likely occurred around the first half of the 12th century cal BC.

The new results both confirmed previous assumptions and presented unresolved issues. The EBA chronology remains challenging due to the plateau on the calibration curve, which makes it difficult to narrow down the timespan of cultural manifestations. The MBA results align with those from other parts of Transylvania. However, the LBA data suggest an earlier beginning, around the middle of the 16th century cal BC.

This research provides valuable insights into the Bronze Age chronology of southeast Transylvania, highlighting its historical development and cultural exchanges within the Carpathian Basin. Ongoing investigations will further clarify the outstanding issues and enhance our understanding of the complex dynamics that shaped this contact zone between East and West.

Keywords: radiocarbon dating, Bronze Age, southeast Transylvania, cultural transformations.

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„Seeing” before digging: archaeo-geophysics and development-led archaeology in Romania. About the study case of Tărtăria – Podu Tărtăriei Vest site

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This prehistoric site situated on Mureș river valley (Alba County, Central Transylvania, Romania) was discovered in 2012 by large-scale archaeological field researches occasioned by the construction of the A1 motorway. At that time non-invasive field investigations were still a pioneering matter for Romanian archaeology, even for the development-led one. Despite this, throughout an open area archaeological excavation was completely investigated an area of about 2 hectares (on the southern and eastern limits of the site), significant archaeological features and vestiges being discovered, providing major new data and finds for Middle Hallstatt period (9th -8th c. BC). The most important ones are two ditches (on the southern and eastern site's), two bronze hoards and a collective grave. Given the particular nature of the site, since 2016 was initiated a multi-annual archaeological research program, aiming both field excavations and geophysics surveys (a large-scale magnetic survey and aerial photography) for documenting the setting of the prehistoric site characterized by particular features. Moreover, in 2021, a new complex range of non-intrusive investigations were undertaken: aerial photogrammetry scanning, Graphic Target Imaging – detection, LiDAR scanning – Light Detecting and Ranging, as well as a new geophysics survey. Thus, were obtained highly accurate and complex sets of data, indicating new archaeological features on the northern part of the site (a ditch), but also outside the currently outlined Hallstatt period habitation. Rather unusual as phasing these research stages, yet with significant sets of survey data, by analyzing the results of the 2012 campaign in relation with the ones from 2016 – 2022 ones, by a comparative multidisciplinary approach is possible to have a better understanding of the features of this archaeological site and the surrounding landscape, a very representative one, providing also a very interesting case study on the benefits of archaeological prospection in undertaking development-led archaeological projects.

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Have they always been there? Exploring Archaeological Visibility of Past Societies in the Lower Danube during the Early Iron Age

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4. Muzeul Național al Carpaților Răsăriteni, Sfântu Gheorghe, Romania

The beginning of the first Iron Age witnesses a complex interplay of cultures in the region between the Carpathian Mountains and the Danube River. A mosaic of populations emerges, exhibiting recognizable local characteristics from previous periods, including the Middle and Late Bronze Ages, while also absorbing influences from the west, east, and southern Aegean regions. This dynamic environment sets the stage for the widespread adoption of a uniform decorative style for pottery, characterized by the intricate use of white paste inlays, combined with imprints, incisions, excisions, and grooves, commonly referred to as the "Basarabi" cultural complex. However, an intriguing disruption of continuity unfolds in a distinct zone located in the southern foothills of the Carpathians.

Further perplexing researchers in this field is the manner in which this interrupted zone is subsequently occupied during the immediate post-Basarabi period (7th-5th centuries BC, a phase named Ferigile Group). As the Basarabi cultural complex disintegrates, a new horizon emerges, consisting notably of clusters of small tumuli, many exceeding 100 mounds, distributed along river valleys. The complementary nature of this shift lends credence to the hypothesis that external factors might have triggered the disintegration of the Basarabi cultural block, prompting human communities to seek refuge in the hilly and sub-mountainous terrain that seemingly lay uninhabited until then.

This presentation explores an alternative perspective, suggesting that the sub-alpine region might not have been uninhabited at all. Instead, its archaeological visibility might have been hindered by limitations of traditional archaeological methods. If so, the sudden appearance of sites in the Ferigile phase could be attributed not necessarily to the migration of besieged populations from the Basarabi environment but to changes in burial practices. These changes, initially leaving no archaeological traces, might have led to the formation of a new horizon of cluster of small mounds during the Iron Age.

Through a comprehensive analysis of archaeological evidence, burial practices, and settlement patterns, this study delves into the enigmatic transition from the Basarabi cultural complex to the Ferigile Group in a small sub-alpine area, shedding light on the intricate dynamics that shaped the Carpathian-Danube region during the crucial transition from its prehistory to the protohistory.

Keywords: Early Iron Age, archaeological visibility, cultural transition, Lower Danube region, Basarabi cultural complex, Ferigile group, burial practices.

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The exploitation and processing of ores in pre-Roman Dacia

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We aim to analyze the archaeological evidence regarding the soil and subsoil resources in the southeastern Carpathian region, with a focus on the significant presence of ferrous and non-ferrous ores, particularly limonite, siderite, magnetite, hematite, chalcopryrite, and copper. Research has highlighted the advanced level of iron metallurgy within the Geto-Dacian communities, starting from the 2nd century BC.

We will also address how contact and commercial exchanges with the Mediterranean world influenced the technological progress of the indigenous communities in the area. Archaeological discoveries indicate the existence of mining activities in the region as early as earlier periods, especially regarding copper deposits.

The significant quantities of slag resulting from the iron ore reduction process, the identification of craft workshops, and the number and variety of iron objects discovered in settlements undoubtedly attest to the exploitation and processing of ores in pre-Roman Dacia.

Key words: metalworking and craft workshops, tools, techniques, ferrous and non-ferrous ores, trade routes.

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Dacian settlements on the territory of modern Bulgaria 2nd - 4th CE

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This paper presents the author's recent research on pottery evidence in the territory of modern Northwestern Bulgaria concerning the Roman and the beginning of the Late Roman period published in a volume study in 2022 "Roman ceramics from stratified sites in Northwestern Bulgaria". The main point of the research is to give the appropriate date supported by sufficient evidence to two sites in the region (Yakimovo Gradisteto and Yakimov Nad urvata), excavated by the Bulgarian archaeologist Aleksander Milchev in the 1950s. The stratigraphic documentation and other data from these excavations are not preserved. The only evidence left is the pottery shards kept in the depot of the Department of Archeology at the Sofia University St. Kliment Ohridski.

In 2002 L. Vagalinski published several fragments from these sites in his book devoted to the burnished pottery in Bulgaria (Burnished pottery from the first century to the beginning of the seventh century AD from the region South of the Lower Danube (Bulgaria). He stated that some of the forms belong to a Celtic tradition dating back to the 1st c. BC. However, our work on this material shows that the burnished forms in question are discovered among typical Roman pottery from the 2nd to the 4th CE in the same stratigraphic position. To give an exact dating of this material we used a comparison with stratified sites in the same region as well as the results from the Locusteni sites in Romania. The analysis confirms that the question is about Dacian settlements settled down on the territory of the Roman province Moesia after Trajan's Dacian Wars. These settlements grow after the withdrawal of the Dacia by the Romans and the foundation of the Late Antique province Dacia Ripensis due to the migration of Dacian tribes from the North. Settlements with such character could be found not only in Yakomovo, but also in Kula (Castra Martis) and the course of the Scut River. They kept very old Dacian traditions coming from the end of the 1st Millenium BC. Based on a very careful analysis of the artifacts we're able to prove that the pottery in question is not connected with Celtic influence but with the movement of the Dacian tribes on the territory of the Roman Empire in the period 2nd - 4th century.

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Far from home Dacii ad Margum during Roman reign

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Question about obvious presence of the Dacian material culture in the upper stream of the Great Morava river, together with the Late La Tène and Early Roman material is fact noted half century ago on the basis of the scarce material finds. Since then, no new or extensive research addressed that particular problem. Some of the excavations in the last 10 years, with archaeological material in enclosed context, suggests a strong presence of Dacians in this area, which lived together with the autochthonous population of Scordiscian origin, while the Roman material culture is recorded to a lesser extent. Most of the Dacian archaeological material corresponds to the territory of present-day Romania, and some of the elements which are registered on hand-thrown pottery (double modeled pinched bands, bands with sharp incisions, suspended modeled pinched bands, branch motif, triangularly modeled prong-shaped application) originate exclusively from the Late Dacian culture in original territories. These forms of vessels and decoration motifs are characteristic for the original Dacian regions and occur from the 2nd century BC to the 2nd century AD when we find them mixed with Roman material. Based on the latest excavations at the site of Gloždak-Lidl and DIS in Paraćin, on which a thick layer of Dacian La Tène period was recorded, together with numismatic finds from the 1st century AD, as well as AMS absolute dates, it can be assumed that the deportation in question is connected with the displacement of 100.000 "Tansdanubians" by the Silvanus Aelianus, the legate with pro-praetorian authority in Moesia (legatus propraetore Moesiae), between the 61 AD and 64 AD, while the material evidence indicates the Dacian presence in the Central Morava Region during the second half of the 1st century and the 2nd century AD. The exact reason for the settling of a large number of Dacian in this area, in particular, remains unclear, although the fact that this area is considerably distanced from their original territories. Another interesting fact can be noted in relation to the Late La Tène pottery which we find mixed with the Dacian and Early Roman pottery. The heterogeneous archeological material indicates either a peaceful cohabitation of different communities which inhabited this area or the acceptance of certain forms by other communities. In both cases, the need for taking only certain ceramic forms could be caused by the greater utilization value or qualities of such forms, compared to the analogous ceramic forms of the societies which accept them. This resulted in the fact that the hand-thrown pottery of Dacian provenance was favored, compared to the wheel-made pottery, where Late La Tène and Early Roman forms are dominant.

Key words: prehistory, protohistory, Central Morava Region, Dacians, Late La Tène, Early Principate

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Exploration of Megalithic Burial Monuments in Kasaragod District, Kerala

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Megaliths are one of the most significant prehistoric structures in India. The megalithic or Iron Ages sites outweigh all other prehistoric remains on the Indian subcontinent. From the Kashmir valley to the tip of the Indian Peninsula, they extend from the northwestern border regions to the hill tracts of Assam in the East. The frequency and spread of these remains, however, expand as we leave Maharashtra's northern borders, and the occurrence of one or the other type becomes rather frequent. The majority of the historians have discussed the size of the Iron Age throughout South India.

In India's Kerala State, Kasaragod District, which stretches 85 km along the coast, makes up the state's northernmost region. The region, which is primarily made up of hard crystalline rocks, slopes gradually down from the lower flanks of the Western Ghats. In low lying places, laterites cap them and West flowing rivers cut them into pieces. The district's physiographic features demand special attention since they directly affect where people live, worship, and other activities. These three unique geographical areas - the Kasaragod coast, Kasaragod plateau and Hosdurg undulating uplands are where all of the settlements are located.

The Megaliths in the Kasaragod district are extensively documented as part of the current research work. A total of eight new sites have been discovered by the Researcher in the course of the Field Exploration. A Select few of the sites have been undertaken as part of the research project due to limitation of time and financial constraints.

The discovered sites contain Umbrella stone, rock cut caves and Cairn Circles which are the major types found in the Northern part of Kerala.

Key words: Megaliths; Kasaragod; Umbrella stone; Rock Cut Caves; Cairn Circle; Field Exploration

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Session 1-1

Untold stories. "Marginal" scholars and/or intellectual movements in the history of archaeology

SESSION ABSTRACT

Boucher de Perthes, Pigorini, Montelius, Childe....our histories of archaeology are dominated by this giants of the discipline and from their main intellectual affiliations (evolutionism, cultural-historical approach, New Archaeology and so on). Ezra Zubrow in a paper on the international trends of theoretical archaeology (Norwegian Archaeological Review 1980) wrote that the ship of archaeology doesn't need only helmsmen but also good sailors. The session is devoted to the life and works of these "minor" scholars or to the less debated theoretical movements in our discipline.

Main Organiser
Alessandro Guidi

When marginality is the norm fighting for prehistorical studies in the geological survey of Indochina (1900-1932)

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In the early decades of the 20th century, after the first and random discoveries of prehistorical material in the territories of French Indochina, the practice of prehistory is starting to faintly appear in the administrative structure of the colony. It takes place in the Geological survey thanks to very few actors, never prehistorians themselves. The sites they discover and study depend on the geological aims of their fieldwork and their practices on the geological ways of collecting and classifying. The excavation and the studies of the ancient populations of the colony take some times to be affirmed as one of the goals of the Survey and, except for a short amount of time during the 1920', they are always at the margins of the Survey's activities.

Paradoxically, in the very beginning of the 1930', when Indochinese studies and discoveries are well known to prehistorians of Southeast Asia, and when the prehistory itself start to be institutionalized at an interregional scale, the new frame that is being built in the region is rejected by the First Congress of Pre- and Protohistorical Sciences that take place in London in 1932, pushing the emergence of Southeast Asia Prehistory at the margins of the discipline.

Key words: history of prehistory; collecting practices; collecting sciences

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Erazm Majewski and his contribution to archaeology in 20th-century Warsaw

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The term "great fathers of archaeology" is usually attributed to internationally recognized figures such as Oscar Montelius and Vere Gordon Childe. However, these names have no meaning for the everyday bread eater, especially in a period lacking access to information, when science is reserved only for the wealthiest social classes. Locally oriented grassroots work is therefore of no small importance in this regard, as evidenced by Erazm Majewski (1858-1922), a Polish entrepreneur, chemist, sociologist, ethnographer, archaeologist and novelist active in 20th-century Warsaw. His interest in the past began with accidental finds, quickly developed into a collecting passion, and by the end of his life he was recognised with the title of professor despite his lack of formal academic qualifications. His activities were related not only to conducting scientific research, but also to creating spaces for meeting, studying, learning archaeology and discussing the past. The poster shows how one man's actions can influence the development of a discipline and its perception in society.

Key words: history of archaeology; local archaeologists; Erazm Majewski; 20th-century; Warsaw

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Marginal excavators? The innovative role played by the crew of the excavation field-school of Pincevent, France

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Historical narratives focusing on “great scientific figures” tend to underestimate the importance of their social milieu. However, the practice of science, especially in such empirical field as archaeology, is a collective endeavor. So, what part did the excavation crew members play in the production of scientific innovations? Are the directors and their senior colleagues analogous to chief conductors and main performers of an orchestra? Or can the entire social structure of the team be considered as a collective author? To address the problem of the social vs the individual determination of scientific innovation, I conducted a case study in archaeology concerning the excavation “field-school” of Pincevent (1964 to the present). This case is relevant because: 1) in the mainstream disciplinary history, this “school” is considered to be the place of origin of some of the technical and methodological innovations that characterize the modern study of Paleolithic occupation floors and structures in France, such as planimetric excavation, spatial refitting studies, and analysis of *chaîne opératoire*; 2) the school was created by André Leroi-Gourhan (1911-1986), one of the most renowned figures of French prehistoric archaeology of the second half of the 20th Century, and there is historiographical debate on how important was his role on the innovations.

Pincevent is located on the banks of the river Seine near the community of La Grande-Paroisse a hundred kilometers southeast of Paris. It consists of several Magdalenian campsites – up to 4500m² – preserved in the laminated silts created by seasonal floodings. In order to exploit the unique richness of the site, A. Leroi-Gourhan created a highly specialized and hierarchical structure to control all the steps of the chain of scientific production. I argue that, in spite of this structure, the empirical challenges posed by the terrain granted to his field collaborators the prerogative of innovation. My analysis of the excavation archives shows that: 1) between 1964 and 1972, several of the main tools and practices of the planimetric excavation (3D latex casting, horizontal *décapage*, azimuthal photography, recording sheets) were inspired by the excavators and the students, not by A. Leroi-Gourhan; 2) during the 1970- 1980’s, the permanent crew members and the students developed new microstratigraphic analysis techniques, spatial analysis of refittings and established new collaboration networks with rival schools; 3) after the death of A. Leroi-Gourhan, in 1986, at a time when his school was entering a dead-end, his crew created a new structure of collective direction, based on the principle of taking turns in responsibilities. This new structure allowed to reinvigorate and to diversify the school of Pincevent, but it also created new conflicts that posed a threat to its continuity. Finally, the contradiction between this opposed tendencies characterizes the outgoing history of this school, from the beginning of the 21st Century until today.

Key words: History of scientific techniques, André Leroi-Gourhan, Chaîne opératoire, Practices of archaeological excavation, scientific communities.

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The role of “doctors house” in Italian prehistoric archaeology of XIX century

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Luigi Pigorini between 1874 and 1877 became the leading figure of the newborn prehistoric archaeology founding the first periodical (the “*Bullettino di Paleontologia Italiana*”), creating a National Prehistoric and Ethnographic Museum in Rome, becoming the first Professor of Prehistory in Rome University.

One of the secrets of this hegemony that lasted until his death, in 1925, was his capacity to establish an highly branched network with many amateur archaeologist who collected with surveys and excavations data and objects that he voraciously tried to obtain.

Many of these scholars were local doctor in their counties, a role socially very important in their communities and that allowed them also to collect information from peasants working in the countryside.

We'll concentrate our attention on four scholars:

1. Concezio Rosa (1824-1876), belonging to the older generation, made many important discoveries in the Vibrata valley, in Abruzzi. He had many contrasts with Pigorini, trying uselessly to create a local museum in Corropoli with materials that after his death were given to the Rome museum.
2. Ignazio Cerio (1840-1921), living in Capri where he conducted very important excavations creating also a local collection.
3. Domenico Ridola (1841-1932), a very esteemed physician from Matera that in 1913 became also senator of Italy, who made very important discoveries, core of the Museum he created in his city.
4. Paolo Carucci (1842-1925) from Teggiano, in the province of Salerno, obtained his degree in medicine but never practiced the profession. He made important discoveries specially excavating in the Pertosa cave (where he had a strong contrast with Giovanni Patroni, author of other excavations in the same site) and had difficult relationships with Pigorini.

By reconstructing the activities of these figures and their interactions with the academic and institutional scene of the period, it is possible to gain an insight into aspects that have been little considered, but which are crucial for the definition of prehistoric archaeology in Italy.

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Count Albin Belina Węsierski and discovering of forgotten cradle of Polish state on Ostrów Lednicki island

Jakub Linetty*¹

1. Museum of the First Piasts at Lednica, Poland

Ostrów Lednicki is a large island on Lednica Lake, between the cities of Poznań and Gniezno in the Polish region of Wielkopolska (Greater Poland). In the light of contemporary knowledge, resulting from decades of historical, archaeological, anthropological and paleobotanical research, we know that it was one of the most important centers of the first Polish state, i.e. the early Piast monarchy of Prince Mieszko I and his son Bolesław Chrobry. This place is also often associated with the beginnings of Christianity in Poland and the baptism of the first historical ruler – Mieszko I.

To this day remained large ruins of the early Piast residence – the Palatium, and the ramparts of the hillfort. However, the function and significance of this place have been shrouded in a fog of oblivion for centuries. In the Middle Ages Polish chronicler Jan Długosz mentioned this place, having in mind ruins. But later, till the 19th century, historical sources had been silent on this place.

The discovering of this place began in the 19th century on the wave of popularity of Polish native history and the growing interest in archaeology. This was due to the mention made by Count Edward Raczyński in the second volume of his work „Remembrance of Wielkopolska” published in 1843. The mention identified the Island of Ostrów Lednicki with the „castrum Ostrów”, noted in the late medieval Polish-Silesian chronicle. Prince Chrobry was supposed to receive the emperor Otton III at this place. Under the influence of Raczyński’s finding, the local Prussian authorities became interested in the local ruins. They conducted excavation there, in the years 1845-1847, causing significant and irreversible damage and ending with the conclusion that the object has no historical value. As a result, the Prussian government lost interest in the subject and put the whole island up for sale.

It was purchased in 1856 at an auction by local Polish aristocrat, Count Albin Belina Węsierski, who had been interested in archaeology and was trying to preserve the Polish cultural heritage. The heritage of the nation deprived of the state and any rights at that time.

After purchasing the island Albin Węsierski started cleaning it up and began research. He did not feel competent in archaeology matters, which is why he started to correspond with the most eminent Polish historians and beginners in archaeology and amateurs, such as Joachim Lelewel, Aleksander Przezdziecki and Antoni Białecki. Under their influence he ordered to make a plan of the basement of the ruins on which he marked the places of discoveries. At that times, when for numerous amateur archaeologists the remains of pottery vessels were of no value, Węsierski collected even animal bones and cereal grains. He also established cooperation with specialists, ordered analyzes of the chemical composition of mortars from the ruins of Ostrów Lednicki. He sent human bones for analysis to Rudolf Virchow – the famous Berlin anthropologist.

Thanks to encouragement of count Aleksander Przezdziecki he participated in three international congresses on anthropology and prehistoric archaeology – in Bologne in 1871, in Brussels in 1872 and in Stockholm in 1874. He wrote reports from them in letters to friends. He also did his best to make sure that monuments of Polish history find place in the most prominent museums in Europe and that Polish culture and history are not erased. He donated artifacts from his collections to museums, including the British Museum in London. Due to his cooperation with numerous researchers were born first scientific works on the ruins of Ostrów Lednicki, on their function and significance. He also popularized this monument in belles-lettres and painting. He planned to create a museum and a cultural park in this place. Unfortunately his death in 1874 thwarted the plans.

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Albin Węsierski is one of the little known archaeological researchers and for years he was underestimated even in Poland, although his achievements were known among a small group of archaeology historians. However his role in shaping the archaeology as a scientific discipline in Poland was significant, also due to his discoveries, which in the 19th centuries were called Polish Pompeii. Thank to his efforts the greatest early medieval archaeological site in Poland was saved. The place that played fundamental role in the beginnings of the country.

Key words: history of archeology; Firsts Piasts; 19th century; monumental architecture

Federico Strobino and Monte Fenera (Piedmont, north-western Italy), a 300,000-year history

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Federico Strobino is a figure who deserves to be remembered in the panorama of Italian archaeology; a multifaceted character, he lived many lives, one of which is immortalised in Audrey Gordon's documentary "Une Histoire d'Amour sous l'occupation Italienne". For the purpose of this presentation, we will focus on Federico Strobino as a great enthusiast and scholar of prehistory.

Teacher and accountant, after the Second World War he moved to Borgosesia (north-western Italy) where he began to take an interest in the Monte Fenera area. His perseverance in promoting research and his interest in the discipline make him today a fundamental figure in the research on the Palaeolithic of north-western Italy. During the speleological exploration of the Monte Fenera caves, he realizes that some of the caves preserve Palaeolithic contexts that only multidisciplinary studies conducted by teams of specialists can fully understand. Thus began the long collaboration with the University of Turin, thanks to which, between the 60s and 70s of the last century, the first systematic research was carried out in the caves of Monte Fenera, still today the only area in the region where a Middle Paleolithic site is being excavated (Ciota Ciara cave).

Federico Strobino dedicated himself over the years to the speleological and archaeological exploration of many caves on Monte Fenera, making a substantial contribution to the knowledge of the pre-protolithic frequentation of that area; he initiates collaborations with Italian and European research institutes and scholars for the study of archaeological and paleontological materials and he participates in Italian and international congresses, including the UISPP congress in Nice in 1976.

In order to preserve the archaeological contexts of Monte Fenera, Federico Strobino was the main promoter of the establishment of the Monte Fenera Natural Park. We owe him again, after years of postponements, the creation of the "C. Conti" Museum of Archaeology and Paleontology in Borgosesia, as well as the construction of the refuge on Monte Fenera still destined today to give hospitality to researchers conducting studies in the area.

Died in 2000, Federico Strobino deserves to be remembered as the founder of prehistoric archaeology in Piedmont.

Key words: Piedmont; Palaeolithic; Federico Strobino; Monte Fenera.

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Federico Halbherr, a pioneer of Mediterranean Archaeology

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The paper aims to tell “untold stories” about a figure who, despite his centrality in the birth and early development of the field of archaeology now generally known as Mediterranean Archaeology, has received little attention in the international literature.

Federico Halbherr ((1857-1930) was an Italian archaeologist who came to Crete in 1884, following the advice of his professor, the philologist Domenico Comparetti, interested in researching the oldest records of laws in ancient Greece. In the same year, the Italian expedition became famous for the discovery of the Great Inscription of Gortyna. In 1899, after a few years of exploration in Crete, Halbherr was appointed head of the first Italian archaeological mission in the Mediterranean, in Crete. As is well known, the mission achieved important scientific results in the field of Cretan prehistory, including the excavation of two sites of fundamental importance, Festòs and Haghia Triada. In his capacity of head of the Mission, Halbherr intensified his relations with Luigi Pigorini, the most powerful Italian prehistorian that was also the director of the School of Archaeology in Rome, on whom the mission depended for administrative and funding management. As is well known, the mission achieved important scientific results in the field of Cretan prehistory, including the excavation of two sites of fundamental importance, Festòs and Haghia Triada.

The paper shows, through an extensive exchange of correspondence, how the relationship between the two archaeologists influenced the first steps of Italian archaeology abroad in the first 15 years of the 20th century.

In particular, the research brings new data:

- on the contrasts that preceded the establishment of the Italian Archaeological School in Athens in 1909;
- the distance, more evident in Italy than in the European context, between prehistoric archaeology and Aegean archaeology.

In conclusion, the paper tries to contextualize the figure of this scholar and to explain why he received less attention in the context of the history of early Aegean studies.

Zelia Nuttall: The Complicated Legacy of a fin de siècle Indigenous Artifacts Collector

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Recently, international museums and libraries have been grappling with responsible stewardship for patrimonial archeological artifacts and manuscripts gathered by 18th and 19th century antiquarians. New agreements are being designed that allow for the countries of origin to provide loans of artifacts, receive acknowledgments, and ask for the repatriation of materials.

Who did these collectors represent, and how did they get involved with extracting materials? What relationships did they have with the actors in the countries in which they worked? This talk will examine the role of the Mexican-American anthropologist Zelia Nuttall (1857-1933) as she worked to establish archaeological standards in Mexico at the same time that she sent manuscripts and artifacts to the United States.

Zelia Nuttall began collecting indigenous artifacts and manuscripts on her honeymoon, which she spent in Mexico in 1880. Wedded to Alphonse Pinart, the French ethnographer who gathered materials for the Trocadero in France, she learned the art of cultivating relationships with excavators, archivists, and looters. After divorcing Pinart in 1886, Nuttall continued collecting and selling pre-Columbian and colonial manuscripts to museums in the United States, a project she justified as being in the interest of science. Removing archaeological objects from Mexico to the Peabody Museum or the University of California, she maintained, enabled their preservation and made them more broadly available for scientific study. This was part of her larger project to build institutions of higher learning.

At the same time, she made her home in Mexico City and attempted to establish scientific methodologies for archaeology there. This brought her into conflict with the National Archeologist of Mexico, Leopoldo Batres, who was struggling to exert national control over Mexican archaeology and exploit the nation's rich archeological legacy for political and ideological ends. A bureaucrat and government official as well as an archaeologist, Batres was committed to the position that authority over indigenous materials and their interpretation belonged, not to an international scientific community, but to the Mexican nation, for whom it could play a crucial role in defining indigenous and Mexican identity.

The conflict between Nuttall and Batres intensified in 1910, when Batres confiscated an archaeological site that Nuttall had begun excavating at the Isla de Sacrificios. Nuttall publicly accused Batres of using nonscientific methods at the site, and Batres retorted that she had no scientific credentials that would entitle her to criticize him. In the years that followed, Nuttall would orchestrate a scholarship for Manuel Gamio, a Mexican archaeology student that enabled him to acquire his scientific training in the United States. She did so in the explicit hope that Gamio, who eventually received a PhD in archaeology from Columbia University, would supplant Batres—which, following the collapse of the Porfirian government, he did. The ongoing rivalry between Nuttall and Batres serves as a case study of the ways in which foreign anthropologists and Mexican nationalists struggled over the archaeological artifacts that would define Mexico's history and identity.

Nuttall was involved in a cosmopolitan trend to establish archaeological standards at the same time that she sought to build institutions of higher education. However, her actions would leave behind a complicated legacy related to issues of national patrimony.

Key words: Zelia Nuttall, archeology, Peabody Museum, collecting.

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Session 1-2

History of the History of Archaeology: between Archaeologists' and Historians' Concerns. Figures, Trends, and Perspectives

SESSION ABSTRACT

Since several decades, historians and sociologists of science scrutinize the history of science as a practice. Loren R. Graham et al., for example, investigated the “Functions and Uses of Disciplinary Histories” in their eponymous edited book (1983). Writing the history of archaeological research, and prehistoric archaeology in particular, has a long history too. It raised the interest of several archaeologists in the early 20th century, such as James Reid Moir, in his paper about the “Position of Prehistoric Research in England” (1917), and Léon Aufrère, with his “Essay on the first discoveries by Boucher de Perthes and the origins of primitive archaeology” (1936, in French). This long-term concern of archaeologists for the writing of the history of their field has continuous occurrences until today, as illustrated by Glyn Daniels' introduction on the “Necessity for an Historical Approach to Archaeology” (1981), Douglas R. Givens' “Short History of the Bulletin of the History of Archaeology” (2002), and Tim Murray's paper addressing “Why the History of Archaeology is Essential to Theoretical Archaeology” (2013). These few references demonstrate, first, the relevance of investigating who are the writers of disciplinary histories and what are the uses of these histories and, second, archaeologists' concern to this regard. This session is intended to strengthen these studies from the case of archaeology. Proposals may relate to, but are not limited to, these topics: a. the status of the history of archaeology as a discipline, sub-discipline, informal network, etc.; b. publishing aspects of in the history of archaeology: bibliometrical studies, history of related publishing houses or journals, etc.; c. biographical case-studies about prominent or poorly-known historians of archaeology; d. tension between the global and national dimensions in the practice of history of archaeology; * styles and theoretical trends in the history of archaeology; e. past and current places of the history of archaeology in university trainings in archaeology; etc.

Main Organiser

Sébastien Plutniak

Unearthing Identities and Challenging Hierarchies Queering the History of Archaeology

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Archaeology is collaborative. Despite popular depictions of lone discoverers and histories of the discipline highlighting individuals and 'their' discoveries, archaeological or antiquarian exploration, fieldwork as well as work conducted in museum or legacy collections is never undertaken in solitude and without assistance. However, both popular accounts as well as disciplinary histories obscure the social environment archaeology creates in the field. This is particularly prevalent in histories of archaeology in the Middle East, where the attention is on the gendered image of Western archaeologists as 'objective' scientists and lone 'masculine'

Adventurers or female 'intrepid' travelers. My approach disrupts this linear narrative to explore the international 'support networks' of local collaborators, spouses, and philanthropists that have sustained these individuals but have been written out of a history of scientific' progresses. My presentation will introduce queer studies and the concept of gender performativity as useful methodological and theoretical approaches for the history of archaeology.

While acknowledging the efforts of previous historians in uncovering the role archaeologists played in maintaining empire through class-based, gendered, and racial inequalities, my aim is to challenge the prevailing narrative of linear development in archaeology. Instead, I will focus on two key themes: international collaborations, friendships, and competitions within archaeological communities, and the gendered performance inherent in scientific activity and communication.

Taking archaeology in the Middle East as its broad geopolitical context, my research highlights the importance of social connections between archaeologists, local and international trade networks and collaborators, and the informal support provided by family, friends, and private funders. Moreover, it explores how gender, race, and class influenced access to education and career opportunities in archaeology and shaped interpretations of the past. In using queer studies, my aim is not to question or reascribe past gender identities or sexualities, but to use the radical potential of this approach to challenge entrenched ideas of hierarchy and scholarly belonging both in the past and the present.

To illustrate this, I will present two case studies: The excavation at Wadi el-Mughara/Mount Carmel in Palestine, led by Dorothy Garrod in 1929; and the projects of the Iraq Expedition, under the directorship of Henri Frankfort, funded by the Oriental Institute of the University of Chicago (now the Institute for the Study of Ancient Cultures) from 1929-1937.

Key words: history of archaeology, Middle East, queer studies, collaboration.

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The History of Archaeology Research Tradition in the Łódź Archaeology Community

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Over the past several decades, Polish research on the history of archaeology has produced remarkable results, with significant contributions being made by researchers associated with the Łódź archaeology community, which emerged after 1945. Pre-eminent among these was Andrzej Abramowicz (1926–2011), whose achievements in the field set the course for subsequent generations. Abramowicz's series of studies on the history of Polish antiquity research and archaeology begins with the book *Wiek archeologii. Problemy polskiej archeologii dziewiętnastowiecznej* (A Century of Archaeology. Topics in Polish Nineteenth-Century Archaeology), which was published in 1967 and earned him his habilitacja postdoctoral degree. Abramowicz's capstone achievement was his novel overview of the history of archaeology in Poland, published between 1991 and 1992 and consisting of two volumes: *Historia archeologii polskiej. Początki* (The History of Polish Archaeology. Origins) and *Historia archeologii polskiej. XIX i XX wiek* (The History of Polish Archaeology. The 19th and 20th Centuries). In addition, Abramowicz also authored a memoir titled *Koral Pamięci* (Bead of Memory, vols. I–III, 2010–2011), which is based on his meticulous notes, collected letters and the documents and diaries of his wife, Maria Abramowicz, née Łączyńska (1926–2015), an English philologist and translator of archaeological treatises.

Andrzej Abramowicz graduated with a degree in archaeology from the University of Łódź, and worked at the Institute of the History of Material Culture of the Polish Academy of Sciences, Łódź Branch (modern-day Institute of Archaeology and Ethnology), which between 1973 and 1992 also employed Maria Magdalena Blomberg (b. 1936), another brilliant historian of archaeology, who is currently in retirement. At the outset of her career, she worked at the Department of Archaeology of the University of Łódź, where she focused on the Roman influence period (as was the dominant trend in the department at the time). After joining the Institute of the History of Material Culture, she was inspired by Abramowicz to focus on the history of Polish archaeology, eventually expanding her research to include the history of archaeology in Russia, Belarus and Ukraine, which was a natural step considering the political history of Poland and the biographies of Polish researchers of antiquity and archaeologists. In 1987, she earned her PhD in the humanities for her dissertation *Polscy członkowie rosyjskich towarzystw archeologicznych* (Polish Members of Russian Archaeological Societies). Although M. Blomberg retired in late 1992, she continued her research, which three years later earned her the habilitacja postdoctoral degree for her dissertation *Badania archeologiczne Polaków na terytorium Imperium Rosyjskiego w XIX i początku XX wieku* (Polish Archaeological Research on the Territory of the Russian Empire in the 19th and Early 20th Centuries). She returned to her alma mater – this time as a lecturer – in 1995, continuing her research on Polish archaeology, particularly on research conducted by political exiles in the central and eastern border regions of the Russian Empire. It is important to mention that Blomberg's employment led to a significant increase in the number of archaeology courses offered by the University of Łódź, which makes the university stand out from other archaeology centres in Poland.

Another faculty member who conducted research and taught courses on the history of archaeology at the University of Łódź was Tadeusz Grabarczyk (b. 1946) – since 2016 professor emeritus – a specialist in the history of German archaeological research in East Pomerania (the north of Poland). Since 2009, the research on the history of archaeology at the Institute of Archaeology of the University of Łódź has been continued by the author of this paper.

Key words: history of archaeology, Łódź archaeological center, Łódź historians of archaeology, Andrzej Abramowicz, Maria Magdalena Blomberg, history of archeology at the University of Łódź.

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The beginnings of Polish university archaeology in the description of historians of archaeology

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In the second half of the 19th century, archaeology, initially supported both in Europe and abroad by scientific societies, began to gain the status of a university discipline. At that time, in Central Europe, its departments began to be established at the universities. In the Habsburg Monarchy, its first chairs were established at the University of Vienna (in 1849 for Ján Kollár [1793–1852], associate professor of Slavic archaeology) and at the Charles University in Prague (in 1850 for Jan Erazim Vocel [1802/3–1871], professor of archaeology and history of art). Both Kollár and Vocel dealt with archaeology understood in a broad, romantic way. On the other hand, issues related to prehistoric archaeology, referring to the achievements of natural sciences, were introduced to their lectures in the 1860s and 1870s by anthropologists. This happened during the breakthrough discussions on the theory of evolution and the new chronology of history, which contested the biblical vision of human history. In Central Europe, in Munich, in the Kingdom of Bavaria (soon to be part of the German Empire), Johannes Ranke (1836–1916), a physician and anthropologist, became a professor of both anthropology and prehistory in the late 1860s. Also in the German Empire, in Berlin, Rudolf Virchow (1821–1902), a professor of anatomy, incorporated prehistory into his university classes during this period.

At that time, Poland was not on the map of Europe - was divided between three countries: Russia, Austria (later Austria-Hungary) and Prussia (later Germany). Nevertheless, in 1866, thanks to the favour of the Austrian authorities, the first Polish chair of archaeology was established at the Jagiellonian University in Kraków. The creation of this chair required a lot of formal and informal efforts, as well as a favourable political climate, as archaeology was then associated with national issues.

The presentation aims to show how historians of archaeology described the beginnings of Polish university archaeology. When and what was written about, what was paid attention to (professors' careers, students), what was omitted (behind the scenes of creating chairs, methods of operation, controversies, international context). What did it come from?

Key words: History of Archaeology, chair of archaeology, Jagiellonian University, Cracow, 19th century.

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Decolonising India's Prehistory: Materials, Periodisation and Nomenclatures

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The beginning of Indian prehistory started in the 1800s when Robert Bruce Foote discovered the first stone tool, a handaxe, in the southernmost part of India, Pallavaram, Tamil Nadu. A.C. L Carllyle made discoveries of microliths in central India in the mid-1800s. An expedition led by De Terra and Paterson to study the Soan Valley stratigraphy was made pre-Independence. The above stated sentences are an example of the “history” of archaeology in India which is basically written by the British colonisers. The material culture, i.e., the stone tools, was constantly compared with the European evidence and the periods were defined on the same basis. Attempts were made to revise the nomenclature and periodisation within prehistory at least three times. The first time in 1916, Foote did the first periodisation according to the classifications of tools in his own collection. The second time Burkitt and Camidae revised it in 1930 used series-based division- for Palaeolithic- series I, II, III and IV- European counterpart of Lower, Middle, Upper and Mesolithic cultures. Furthermore, the third and the last time was during the International Congress of Asian Archaeology, New Delhi, 1961- where the organisation decided upon the use of the Early Stone Age, Middle Stone Age and the Late Stone Age and again shifted to Lower Palaeolithic, Middle Palaeolithic, Upper Palaeolithic and Mesolithic. These terms have been used interchangeably in historical literature and even scholarly work that is not even a decade old. In light of new research, a need to remove the European influence on Indian prehistory is required. This paper will make an effort towards untangling the Indian prehistory in the light of new evidence and start a dialogue on decolonisation with the help of material culture.

Key words: Decolonisation; Indian prehistory; Nomenclatures.

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An Approach to Japanese Archaeological Historiography –Authors, Trends, and Epistemological Issues–

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In recent decades, the history of Japanese archaeology has been the subject of study by various Western authors. However, to date, there is still no essay that has analyzed the historiographical perspective of Japanese scholars regarding the origins and development of their own discipline. This presentation will present the preliminary findings of an analysis of the principal Japanese authors who have discussed this matter, as well as the different issues associated with their approaches.

Chronologically speaking, this analysis will establish four significant stages. The initial historiographical essays on the history of Japanese archaeology were published between 1900 and 1930. These were brief texts written by members of the first generation of modern archaeologists in Japan, such as Yagi Shozaburo and Torii Ryuzo. This stage gave way, in the 1930s, to individual studies conducted by the generation born between the late 19th and early 20th centuries; these attempts did not coalesce into a systematic approach to the history of archaeology. Finally, following the defeat in World War II, two main currents emerged. Broadly speaking, these currents mirrored the two dominant trends in the study of archaeological history in the West: internalism and externalism. Consequently, comprehensive works on the history of archaeology in Japan were produced. The first of these currents viewed the evolution of archaeology primarily as a methodological history, aiming to order the significant events that shaped the development of the discipline. Conversely, the externalist current sought to explain the evolution of archaeology by contextualizing it within the political, social, and economic circumstances of modern Japan. These two currents have exerted a significant influence on historiographical studies since 2000.

Furthermore, it is crucial to acknowledge the existence of several phenomena specific to Japanese archaeological historiography. Firstly, the history of this discipline is intertwined with the history of Japanese anthropology from its origins until the 1940s. Therefore, an approach to the history of this discipline in Japan must also encompass historiographical works on anthropology. Secondly, both currents rest upon a shared interpretative framework that has reduced "Japanese archaeology" to the "archaeology of the Japanese archipelago." Consequently, neither current has provided a critical reflection on the role played by Japanese archaeologists in the colonial context of the Greater Empire of Japan between 1895 and 1945. This epistemic perspective has subsequently been inherited by scholars born after 1945, who unconsciously assume that the history of Japanese archaeology equates to the history of archaeological studies within the present-day boundaries of Japan.

Key words: Japanese archaeology, archaeological historiography, archaeological epistemology, internalism, externalism.

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Writers of Disciplinary Histories: the PhD Dissertations regarding the History of Prehistoric Archaeology (1948-2021) and their Authors

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It is commonplace to state the importance of “meta” approaches in archaeology, namely “theoretical”, “philosophical”, and “historical” investigation about archaeology. The definition and scope of archaeological “theory” and “philosophy” were —and still are— debated; conversely, what the “history of” archaeology is, seems much less controversial. Its importance, for the production of archaeological knowledge in particular, was proclaimed by many scholars (Daniel 1981, Murray 2013). However, historical and social studies of science has long shown the multiple uses of disciplinary history (Graham et al. 1983). There is no reason to think that archaeology is any different from other fields. Writing its history can serve multiple purposes, pursued by actors holding various positions. Consequently, empirical investigation about who writes its history is required. For three reasons make PhD dissertations regarding the history of archaeology reveal the socio-epistemic relationships between discipline construction and the writing of disciplinary history:

1. In the 20th century, the doctorate title internationally became a requirement to enter a scientific field, get recognition, and access places in academic institutions (Hulin 1990, Ehrenberg et al. 2010). Is a “historical” topic acceptable to become a doctor in archaeology?
2. The writing of disciplinary histories is a practice that is always, in varying degrees, both a contribution to the history of science (as a discipline) and an (un)intentional commitment to the construction of the discipline under study. To which extent writing the history of archaeology is a research effort expected of archaeologists? Or should it be carried out outside the archaeological field?
3. Social and historical researches on the growth of disciplines usually focus on the formation of disciplinary socio-epistemic “cores” (Mullins 1972). Interestingly, studying the authors of “historical” PhD dissertations gives a view from the margin, from those newcomers trying a tangent way to enter the field. What are their academics and professional trajectories?

All this makes the authors of “historical” PhD dissertations on archaeology of particular interest. Due to its administrative nature, the process of earning a doctorate creates a paper trail that turns PhD dissertations into relevant historical sources, to trace social relationships, in particular, as demonstrated in previous studies (Bès et al. 2021).

Based on a dataset of 126 PhD dissertations, regarding the history of prehistoric archaeology and defended between 1948 and 2021, this ongoing research offers a prosopographical analysis of their authors. Addressing aspects of their academic careers and networks sheds light on what is, in practice, the social and intellectual status of historical investigations in the evolution of a scientific discipline.

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Key words: History of Science, History of Archaeology, Prosopography, PhD Dissertations, Discipline Construction.

Session 18

Prehistoric art studies in North Africa and Sahara at the beginning of the 21st Century. Contributions from Interdisciplinary Research Approaches

SESSION ABSTRACT

Prehistoric art (mobiliary, parietal, personal adornments) in North Africa and the Sahara, from the Atlantic to the Red Sea, is a fundamental field of research as it has the potential to reveal the symbolic and intellectual component of prehistoric groups, which are indispensable to a comprehensive reconstruction of the lifestyle of ancient societies. The developments in field research that have facilitated major advancements in the study of economics, environmental and chronological reconstructions have also proven to be of great value to investigations involving prehistoric art. Indeed, the study and analysis of this class of archaeological evidence can also benefit greatly from the application of innovative interdisciplinary approaches. In this sense, scholars are proceeding on a dual path. On the one hand, we can assist with an increasingly careful analysis of the artistic production, which allows identification of representations of elements connected with the real world (tools, dwellings, landscape elements), socio-economic activities (hunting, fishing, gathering, herding, feasting, conflicts), and elements related to the symbolic activities, as known from the excavations. On the other hand, technological approaches aimed at better analysing manufacturing techniques and pigment components, together with more advanced dating techniques, new tracing and documenting methods (e.g., photogrammetry and laser scanning), and development of tools for image enhancement, enrich the available documentation, and open new perspectives for prehistoric art interpretation.

The main goal of this session is to encourage dialogue and exchange among scholars involved in prehistoric art research in the regions from Mediterranean and Atlantic Africa, the Sahara, the Nile Valley, and the Red Sea coast, from the Final Pleistocene to Holocene. We particularly welcome the participation of colleagues working on technology, landscape-rock art sites nexus (i.e., the relationship human groups-landscape-artistic production), systematic reviews or newly discovered sites characterised by the presence of art productions.

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Rock Art and Archaeological Context - A reappraisal

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Saharan rock art, with its hundreds of images painted or engraved on rock walls, is an unrivalled testimony to the symbolic universe of the inhabitants of the Holocene Sahara. Faced with these images, the recording of technical characteristics alone (manufacturing technique, outline, colour, etc.), as well as stylistic and thematic comparisons, cannot be the sole objectives of a scholar. Anthropomorphic representations are of particular importance, as they enable us to observe the idea that members of a social group had of themselves and the way in which they wanted to communicate it. While it is true that anthropomorphic images cannot be interpreted as a simple reflection of Neolithic society and gender dynamics, they do reflect how the artist saw himself and his contemporaries within the cultural context in which he lived. This is why the development of techniques that can convincingly link works of art to the archaeological context in which they were produced seems to be one of the most useful tools for elucidating the meaning of the messages that have come down to us.

Key words: Saharan Rock Art; Holocene; human settlement; social representations.

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Des représentations géométriques et zoomorphes dans l'art préhistorique à Bir Oum Ali et dans la Chaîne de Chereb

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Le site de Bir Oum Ali fait partie de la chaîne de Chereb au Sud de la Tunisie, au Nord de chott El Fjej. Ce site renferme plusieurs zones d'occupations préhistoriques. Des points d'eau stables à l'intérieur des terres favorisaient l'installation de la civilisation Ibéromaurusiennes et celle du Capsien qui ont dominé cette région. Pendant ces deux périodes, l'Homme développait de comportements symboliques et identitaires à travers les incisions et les gravures trouvées sur des fragments d'œuf d'autruche.

L'équipe de la Carte Nationale des Sites Archéologiques et des Monuments Historiques a effectué en 2008 une prospection le long de chaîne de Chereb entre Chott El Fjej et Chott El Gharssa, qui a mis au jour la présence d'une gravure représentant un registre animal entouré par des tumuli. Lors de la prospection que nous avons fait en 2019 dans la même région, nous avons mentionné l'existence de cet art pariétal gravé sur un bloc de pierre dans un contexte qui peut être probablement Capsien.

Lors de ce travail, nous allons présenter les décors géométriques et figuratifs employés et leur relation avec le registre faunique.

Mots-clés: représentations géométriques; représentations zoomorphes; art préhistorique; Ibéromaurusien; Capsien.

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Caracterisation des silex noirâtres du site Pleistocene de l'Oued El Akarit (Gabès Tunisie)

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Les fouilles et travaux portant sur le gisement moustérien de l'Oued el Akarit, aux environs de Gabès (1991 - 1998), n'ayant pas résolu l'énigme posée par la présence et l'exploitation de silex noirâtres ont conduit à prolonger les recherches, sur le terrain et en laboratoire.

Les résultats minéralogiques et taphonomiques de ces nouvelles enquêtes concluent à une estimation trompeuse de l'apparence de la matrice initiale, acquise secondairement, lors d'imprégnations d'une patine noirâtre répandues en suivant fissures et accidents de la matrice : l'origine de la coloration découle d'une caractéristique structurale, assez commune.

Le réexamen du matériel conduit à préciser la provenance locale des approvisionnements et la répartition des types de silex dans l'industrie.

Key words: Tunisie, Oued el Akarit, Pléistocène, Silex, Patine

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Rock art in the Ahnet sector north-west of Ahaggar, Central Sahara

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Fieldwork carried out in recent years in the Ahnet sector located in the north west of the Ahaggar central Sahara has revealed a rich archaeological and artistic potential characterized by dozens of known or unpublished painted rock shelters presenting stylistic varieties. and themes reflecting different cultural groups. This art presents similarities to the rock art of the central Sahara as well as local particularities.

Through this communication we will present the stylistic and thematic characters of this art, in order to contribute to the knowledge of the prehistoric Saharan cultures propagated during the Holocene.

Key words: Ahaggar ,Ahnet , Central Sahara, rock art, Holocène,

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Paleo-environmental and cultural data in the Tassili-Tan-Ahaggar (Central Sahara, Algeria): first observations in the Telem Fezza cave

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The southern slopes of the Tassili Tan Ahaggar are cut by a dense network of wadis that flow from north to south. The Ti-n-Tarabine wadi is one of the most important arteries that takes its source from the Ahaggar massifs. It would have played an important role in the circulation of populations during the Holocene.

These southern Tassilian slopes have numerous valleys and refuges that people would have occupied. The Telem Fezza site, situated upstream of the Ti-n-Tarabine wadi, was occupied by different human groups evolving on the vast territory of the Tassili Tan Ahaggar. The Telem Fezza cave would probably have played a determining role in the settlement of the men.

Since spring 2022, we have conducted two excavation campaigns in the cave to understand its potential and to confirm its rich archaeological heritage. Our project entitled "Adaptation to Holocene climate change of Neolithic societies in the Tassili-Tan-Ahaggar (Tamanrasset, Algeria)" has been granted an annual excavation permit. This enabled us to organise a first prospecting campaign and issue a prescription order for the cave and its immediate surroundings in order to document the entire site.

We began by recording the hundreds of engraved and ochre figures on the two walls of the cave and indicating the presence of numerous funerary monuments. This initial information indicates the intense cultural and funerary activity in the study area. The first excavated squares yielded numerous archaeological objects and biodocuments of different kinds (human, fauna, microfauna, macrofauna, malacofauna, etc.).

In our presentation, we will show the main discoveries that are currently being studied. We will also ask a number of questions about the role of the cave during the Holocene? Could the cave be an attractive place that allowed Neolithic populations to make this place a rallying point?

Key words: Paleoenvironment; Holocene; Neolithic; Tassili Tan Ahaggar; Telem Fezza; Central Sahara

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Chars sahariens protohistoriques, chars égyptiens du Nouvel Empire: réflexion sur les systèmes de retenue

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Les chars légers équipés d'un unique timon et de roues à rais, destinés à être tirés à vive allure par des chevaux, sont utilisés au Sahara et dans la vallée du Nil à partir du milieu du IIe millénaire av. J.-C. De nombreuses représentations illustrent leurs usages pour les courses, les combats et les chasses au gros gibier. L'iconographie égyptienne détaille les systèmes de retenue mis au point pour éviter les risques d'accident par inertie de roulement des véhicules dans les descentes pentues et lors de brusques ralentissements. La documentation rupestre saharienne suggère l'utilisation d'autres procédés, et par-là des innovations techniques locales.

Key words: Fire, human health, habitability, fuel management, Palaeolithic.

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Rock art and the digital “revolution”: insights into the last researches on North Africa rock art

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The application of digital technologies to document rock art is at present enough widespread. A brief synthesis by Robin G. (2015: fig.1) highlighted the development of the digital techniques in this field. According to Robin the beginning of the XXI century is the crucial date that marked the increase of publications devoted to this topic. This contribution aims to illustrate and discuss some recent studies on rock art of different North Africa countries, focusing on the open questions sometimes signalled by the authors of the studies. The improvement of the sites recording techniques using Photogrammetry and 3D laser scanner and of the analysis of the decorated panels using the DStretch photograph enhancement program has not completely solved a series of problems involved in the research (Le Quellec, Duquesnoy, Defrasne 2015). The amount of data obtained is undoubtedly greater than in the past but the selection of the most important details useful both to reconstruct the archaeological contexts, the decorated landscape and to interpret the rock art panels remains a challenge. A multidisciplinary approach is necessary to build the right perspective because each rock art context is characterized by specific features and the recording methods should be adapted to the local environment. Moreover our knowledge of the environment *lato sensu* and our perception of the figurative repertoire play a role in the deciphering of the decorated walls so that the structuring of the research and of the technical methods is strictly related to a series of individual choices beyond the availability of highly sophisticated programs.

Key words: North Africa; Rock art; Digital techniques

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Occupation and use by the last hunter-gatherers during the Holocene of the Kheneg el-Ghar cave (Monts des Ksour, Atlas Saharien)

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The climate in North Africa during the Holocene is marked by a succession of humid and arid phases that are thought to be the cause of environmental changes. The traces of a dense hydrographic network and paleolakes in the southern foothills of the Atlas are evidence of this.

The ancient ecology of the pre-Saharan zones, visible through the biodocuments discovered during the first excavation campaign of the Kheneg el-Ghar cave on the southern slopes of the Ksour Mountains, announces the nature of the climate and its upheaval during the Holocene. The study of the Neolithic level, which is currently underway, could give us important clues about the behaviour of the site's occupants.

The Kheneg el Ghar cave is located in the southern slopes of the Ksour Mountains, the western part of the Saharan Atlas. It is dug into a calcaire-marne anticline forming the "Atlas wall". This rocky barrier, the southern limit opening onto the western Grand Erg, is fractured by seismic dynamics, giving rise to a series of wadis flowing from the great Atlas massifs in the north towards the great Sahara in the south. Oued el-Gharbi is one of the main fluvial arteries that the cave dominates on its left bank, and it is thought to be one of the traffic routes that prehistoric populations would have used.

In March 2023, we organised our first excavation campaign in this cave, which consists of two large chambers (45 m²). The first strippings revealed numerous artefacts and bio-documents (ceramic shards, lithic and bone industries, armatures, wild and domestic fauna, ostrich egg test discs, fragments of grinding stones and millstones, a polished axe, numerous fragments of charcoal, seeds) which are useful for understanding climatic fluctuations and the adaptation of prehistoric people.

Our study will focus on the human groups that may have occupied this cave. Using an archaeozoological and palaeobotanical approach, we will try to understand the subsistence behaviour of these populations. Could they be the first Neolithic populations to settle in these Atlasian massifs? Would they be connected with the other cultural centres of the Atlas region? Could the Kheneg el-Ghar cave and the Saharan Atlas in general be an interface between the two major cultural regions, the Sahara in the south and the Mediterranean in the north?

We are at the beginning of our study, and we will only give the first results of this project, which would renew our knowledge of the Atlasian Neolithic.

Key words: Saharan Atlas; Interface; Holocene; Kheneg el-Ghar; Ksour Mountains; Neolithic.

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Prehistoric settlement patterns in the high Tafna (extreme north-western Algeria) during the Upper Paleolithic to the Neolithic: preliminary results of a survey mission based on lithic and ceramic artefact finds

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As part of an ongoing project of the CNRPAH* which aims to understand the cultural and economic dynamics of prehistoric groups in the Tafna basin (extreme north-western Algeria), two short survey missions have been conducted in the under-explored southern part of this region which corresponds to the high Tafna (mounts of Tlemcen). In numerous places of the area new sites have been discovered through surface collecting of an abundant artefact material (lithics and ceramics) many of which on the slopes of caves. The preliminary study of the finds produced evidence of prehistoric human occupations ranging overall from the final Paleolithic to the Neolithic. The localization of natural sources of lithic materials (mainly flint and to a lesser degree limestone) far to the south from the habitats, in the high plains close to the margins of the zone study, points to a mobility and adaptive subsistence strategies of prehistoric groups. In addition to water and rock shelters, the presence of raw material (mainly flint) seem to be a powerful element that attracted Paleolithic and Neolithic people to settle in this rugged mountainous region. In this context we present here our very first investigations on raw material exploitation that derive from survey surface collecting and also from test excavations.

Key words: Tafna, Paleolithic, Neolithic, Raw material, Occupation, Subsistence.

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Visual and automatic satellite detection of Early and Mid-Holocene stone structures in the Egyptian Western Desert

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In this study, we present two approaches for visual and automated satellite detection of stone structures related to the Early and Mid-Holocene proto villages of the Egyptian Western Desert (hereafter EWD). This paper investigates the extent of these two approaches and the mobility of the hunter-gatherers early pastoral groups, especially concerning the contacts between the Eastern Sahara and the Nile Valley. In this period, the Sahara witnessed significant climatic, hydrographic, and biosphere changes, which triggered cultural and economic transformations in the local communities. In the EWD, these transformations greatly impacted the life of the hunter-gatherers inhabiting the region of the modern oases (Farafra, Dakhleh, and Kharga), causing the insurgence of more sedentary behavior and the introduction of herding. Between the 7th and 6th millennia cal. BC in the Farafra Oasis (Wadi el Obeiyid), groups characterized by a mixed economy based on hunting activities, wild plant gathering, ostrich exploitation, and caprine herding, built semi-sedentary settlements, characterized by houses, open air fireplaces and workshop areas. Similar kinds of evidence are present in other areas of the EWD, like Great Sand Sea, Gilf Kebir, Karkur Talh, and Jebel Uweinat. The progressive aridification of the Sahara led these groups to slowly shift their occupation patterns and positions towards the Nile Valley, probably contributing to the cultural cradle at the heart of the later Egyptian civilization. This detection focuses on specific preserved archaeological elements indicating such settlements: the cluster of hut foundations of the type named "slab structure" and, when it is possible, the big open-air fireplaces of the type named "steinplatz". The combination of the distribution of these two built elements contributes to our understanding of these communities' mobility patterns. The primary satellite datasets used in this research were derived from numerous sources: Hexagon KH-9, Corona KH-4B, Bing Satellite, Google Satellite, and ESA Copernicus Sentinel, various DEM sources. The dataset was assembled and processed through various local and cloud computing platforms (USGS, Google Earth Engine, ESA SNAP, QGIS) for site detection and further geospatial analyses. The methodological approach developed for this project includes applying filters (Graphical filters, Spectral Indices, PCA, Mean, etc.) to enhance archaeological proxy indicators of site presence. Then a visual detection protocol and sequence of trained machine learning algorithms (Unsupervised and Supervised Classifications) are applied and compared to detect these sites. The resulting classification showed many possible new sites in the entire oases' region that are currently undertaking a process of ground validation and spatial analysis. Furthermore, considering the difficulties of the pedestrian survey in arid environments, these cheap, time-saving and effective

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approaches aim to vastly enrich the archaeological records and better plan all the ground-based archaeological investigations.

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Key words: Egyptian Western Desert; Prehistory; Remote Sensing; Satellite; Detection.

The occurrence of obsidian artefacts in the Eastern Maghreb: Tracing the Holocene seafaring activities across the Central Mediterranean through archaeometric approaches

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The research presented here provides the results of the analysis performed on five obsidian artefacts collected in Central and Northern Tunisia.

The five artefacts come from different sites: the Neolithic shelter of Djebba, in the Beja Governorate; the Capsian-Neolithic rammadiyat of Sidi Aïch, in the Gafsa region, and Khanguet Feriana, in the Kasserine region; a tumulus from Khanguet N'am, and a shelter from Oued Bou Haya, both in the Kasserine region. This study is part of a broader project conducted in the Eastern Maghreb, which aims to investigate the transition between the Early and Mid-Holocene among Epipalaeolithic Capsian and Neolithic groups inhabiting Northern Tunisia. During this period, the region witnessed the gradual adoption of features that are typically associated with a Neolithic economy, while still maintaining a hunting-gathering lifestyle. These contexts showed the presence of pottery, the introduction of domesticated animal species, the use of pressure techniques, and the utilization of obsidian.

All the artefacts are stratigraphically decontextualized, as they were collected by surface surveys, except for the one collected in the shelter of Djebba. Despite the lack of archaeological context and since sources of obsidian are not present in Tunisia, their exceptional discovery suggests that the Capsian/Neolithic groups inhabiting the Eastern Maghreb were already engaged in seafaring activities across the Central Mediterranean, especially within the Strait of Sicily.

Consequently, two geologic samples from the nearest obsidian deposits, the islands of Pantelleria and Lipari, have been analysed. The techniques applied to analyse the samples are the XRF (non-destructive method) and LA-ICP-MS (micro-destructive method) for the elemental characterization. The results obtained show that measurements of the concentration of the major oxides (SiO₂, Fe₂O₃, Mn₂O₃, CaO, K₂O, TiO₂) and trace elements (Cl, V, Zn, Ga, As, Br, Rb, Sr, Y, Zr, Nb, Ce, Pb, Th) ensure to define a peculiar chemical fingerprint for each deposit and each archaeological sample. The data obtained through the application of these laboratory techniques and the comparison with the bibliographic data reveals that the obsidian exploited to manufacture the artifacts found in the Tunisian sites originated from Pantelleria, thus confirming that the human groups of the Eastern Maghreb were part of exchange networks across the Strait of Sicily.

Key words: Eastern Maghreb; Raw materials; Obsidian; Archaeological science; Archaeometry.

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L'autruche dans les sociétés Holocènes en Afrique Du Nord

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Compléter et unifier les données réunies depuis plus d'un siècle sur l'autruche holocène du Maghreb et préciser la nature et l'originalité de la perception que s'en sont faite les populations successives, est l'objectif de cette présentation. Cette synthèse conduit à souligner l'importance d'un facteur climatique majeur installant un déplacement des faunes typiquement sahéliennes, antérieurement présentes en zone tellienne vers les régions méridionales. Cet événement, contemporain de la transition vers l'Holocène, subi par les populations de Mechta-Afalou, de culture ibéromaurusienne, a pu se prolonger selon les régions jusque vers 8200 Cal BP, caractérisé par l'installation de l'épisode froid et sec survenu en région méditerranéenne.

L'autruche et d'autres espèces animales ayant migré vers les piémonts et les lagunes bordant les territoires atlasiques ont trouvé des biotopes attractifs, comme de nombreuses populations de chasseurs-cueilleurs-collecteurs, de culture dominante Capsienne, constituées en sociétés stables, parmi d'autres communautés migrantes de culture post-ibéromaurusienne.

Entre le IX-IVème millénaire, en dépit de conditions climatiques fluctuantes, plutôt humides jusqu'à l'Holocène moyen, s'asséchant ensuite progressivement durant l'Holocène supérieur, ces peuplements fauniques et humains se sont maintenus et ont accueilli la néolithisation pastorale en zone atlasique en particulier. Dans toutes les régions collinaires, lagunaires, atlasiques du Maghreb continental l'autruche, installée dans un biotope, sahélien et humide a prospéré en grand troupeaux, ne faisant pas l'objet de capture, ou de chasse

On doit à la perception éthologique de cet animal, longuement observée par les sociétés pré-pastorales capsiennes en particulier, d'avoir constaté sa stabilité comportementale. Et d'avoir greffé leur mode de vie sur celui de l'autruche, bénéficiant de sa disponibilité régionale, de ses pontes abondantes et renouvelées, enfin de son développement, non affecté par les prédateurs carnivores, voire indifférent aux prélèvements réitérés des communautés prédatrices, gourmandes. Si le thème de l'œuf a été amplement examiné à travers les témoins mobiliers recueillis en fouille, traitant des usages divers depuis la création d'une bouteille, jusqu'à celles d'éléments de parures de type rondelles dans les sociétés pré-pastorales et pastorales, c'est à travers la gravure et la peinture (coquilles, plaquettes, parois), que s'est le mieux exprimée la perception spéciale des populations préhistoriques. En s'attardant plus précisément sur celles du Maghreb oriental, on découvre, présente au sein des équipements et des parois ornées, une dimension symbolique, iconique, reconnue à l'autruche, témoin fusionnel de leur quotidien. Enfin le domaine funéraire des communautés pré-pastorales et pastorales du Maghreb, contribue à envisager l'accompagnement du défunt paré d'ocre et de colliers façonnés à partir de milliers de rondelles d'œuf d'autruche, comme un potentiel transfert du haut pouvoir symbolique détenu par l'autruche, dans les mentalités d'alors.

Les multiples témoignages graphiques de la présence de l'autruche que portent les parois rocheuses du Sahara vert de l'Holocène ancien-moyen, puis ceux qu'attestent en Libye les représentations de hauts personnages aux ornements de plumes d'autruches ont continué d'accorder un pouvoir magico- religieux à cet emblématique autruche.

Key words: Autruche, Holocène, Maghreb, Art, Epipaléolithique, Néolithique.

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L'industrie lithique Capsienne de Bir Oum Ali et ses caractéristiques technologiques et pétrographiques

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Au Sud-est du site princeps El Mekta, se trouve le site de Bir Oum Ali, qui a délivré une industrie lithique typiquement Capsienne datant du VIII^{ème} millénaire B.P.

Il s'agit d'une production lithique caractérisée essentiellement par: un débitage par pression, un outillage basé sur les pièces à coches et denticulées, des microlithes géométriques, des lamelles à bord abattu et des microburins.

Dans le monde Capsien, la technique de la pression est une véritable nouveauté dont les stigmates de cette nouveauté sont reconnus à partir des plusieurs critères, trouvés sur les produits lamellaires, laminaires et les nucléus.

L'analyse pétrographique du matériel étudié nous renseigne sur la source de provenance de la matière première.

A travers le matériel lithique attesté sur le site de Bir Oum Ali, nous reconnaissons le développement et la diffusion d'un savoir-faire novateur, qui reflète la naissance d'une certaine intelligence sociale. La gestion et le choix de la matière première exprime le potentiel intellectuel de l'Homme Capsien de Bir Oum Ali.

Mots-clés: Industrie lithique; Capsien; technologie; typologie; pétrographie.

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Session 21-2

Pendant or not a pendant? Identification, uses and meanings

SESSION ABSTRACT

Notched or perforated objects, commonly called pendants, constitute one of the main categories of finds in the archaeological contexts. Different methods have been used to create various suspension systems, which facilitated their attachment to the clothing or other items. Some of them were intensively worn, while others may not have been used, and served for other purposes, including social communication and construction of identities. The contexts in which these artefacts are discovered vary and include (broadly defined) both settlement and ritual ones. Nevertheless, the environmental setting and the availability of resources and supply networks, as well as the chronological framework suggest notable differences in the choice of raw materials used for the production of the pendants. In many regions, bone materials, especially teeth, are commonly used for making pendants, while in others shells, various stones, metals and other mineral and organic materials have been favored. Some of the raw materials could be suspended in their natural state, while others were heavily modified to achieve a certain shape or otherwise worked to fulfill particular needs or reflect specific meanings. At the same time, not all suspended objects can be classified as pendants.

This session wishes to explore what defines the pendant and what differentiates these artefacts from other objects. How and with what methods and tools were the pendants produced? How were they suspended and used? What meanings were given to pendants and how these changed when the artifacts were moving between different contexts and communities? With this session, we want to bring together the material, technological and interpretive studies to discuss pendants regardless of the organic or inorganic material. Even though the emphasis is on technological and use-wear analyses, including the modes of attachment and suspension, we also welcome studies dealing with the choices of raw materials, the contexts of use and the meanings of these artefacts. We encourage interdisciplinary contributions studying pendants from different regions and chronological contexts in prehistory.

Main Organiser

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Various meaning in same attributes through suspended bone items (fishhooks) in Stone Age Norway

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Bone fishhooks from prehistoric sites in western Norway present a very high morphological diversity. Apart from the hook itself, the other attributes of the fishhook show additional aspects in the shape of notch, perforation, etc. Compared to suspended pendants sharing equal attributes, these mostly reveal the hook binding system enabling the hook to remain attached to the fishing line during use. In order to examine reasons for the observed diversity, it appears important to reconstitute the overall binding system as suggested by the bone morphologies retrieved from most complete archaeological specimens.

The attributes are analyzed here in an integrated approach to technology through 1) their arrangement on the bone shaft, 2) the manufacturing techniques involved and 3) some use-wear patterns (possibly related to the location of the attachment area where the fishing line was bound to the bone shaft with stigmata from incidental alterations deriving from use and from distribution of fish baiting marks on the hook). Our results account for functional principles used in binding systems applied on the shaft of fishhooks where, it is assumed, certain attributes of similar aspects were eventually more decorative than functional.

Applied for that it regards the sociocultural evolution in chronology based on fishing evidence in prehistoric Norway (Bergsvik & Ritchie, 2020), single change in the functional principle of recorded binding procedures from Mesolithic fishhooks suggests a real change in the long line fishing practice. In the following period, the Neolithic, new kinds of hooks for long line fishing appeared adorned. These are also quite large and unique, meaning a formal shift in how long line fishing became a prestigious event, thus with a visibly notable fishermen status, compared to the Mesolithic where, conversely, longline fishing was a regular activity commonly achieved.

The presentation will thus focus on how the binding attributes of a single equipment – the fishhook with its additional component (bone spoon, engraving, etc.) – points to various functional interpretations out of its diversity, through time.

Key words: Suspended Artefacts; Fishhook; Bone; Binding System; Stone Age; Norway; Functional principles analysis.

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Tooth beads: local fabrication, network commodity and heirloom with examples from two Late Mesolithic cemeteries in southern Sweden

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In two cemeteries from southernmost Sweden the late Mesolithic period (c 5000 BC), tooth bead decorations are included in several of the graves (Larsson, 2016; Larsson & Price, 2022). On teeth from the buried as well as on tooth beads, strontium measurements by laser ablation have been carried out to determine the origin of the interred and the animals that contributed teeth to this form of decoration. Most of the tooth beads come from animals, such as red deer (*Cervus elaphus*) and wild boar (*Sus scrofa*) that grew up in the same region as the cemeteries. This also applies to the interred people. Other animals such as elk (*Alces alces*), bears (*Ursus arctos*) and wolves (*Canis lupus*) show slightly different strontium levels, probably due to the larger territorial areas of these species. There are also tooth beads derived from animals that grew up in a completely different region than in the site of deposition. These are not exotic animals obtained by exchange, but those that were well represented in the region where they were deposited. They have probably been attached to objects with a special value that have been transported over significant distances. In addition, teeth from aurochs (*Bos primigenius*) are included where strontium measurements indicate that the animals grew up in the region of deposition but did not exist in the area for several centuries when the tooth beads ended up in graves. It is probably a form of heirloom that has been deposited in a grave after having been carried for several generations.

Key words: Beads; Animal Teeth; Mesolithic; Burials; Southern Sweden; Archaeometric Analysis.

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Recurrent associations in the tooth pendants from the Mesolithic graves at Donkalis and Spiginas (Lithuania)

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In the burials of Mesolithic hunter-gatherer societies on the islands of lakes, such as Biržulis in West Lithuania, many important aspects can be reconstructed with the studies of tooth pendants associated with individuals. In the two Mesolithic cemeteries, Donkalis and Spiginas in the undisturbed and with red ochre filled graves 193 mammal teeth both with and without artificial modification have been investigated. One pendant, made from elk tooth was found in ochre-filled funeral feast hearth from Donkalis ritual complex (Butrimas, 2017).

Predominant majority of pendants have a perforation in the animal tooth root bored from both sides of the pendant. Second, much smaller group consist of pendants with roots, carved on both sides and a perforation shaped through a flattened part from both sides. There are some pendants in third smaller group with conical-shape perforation on one side and usually in this group clear concentric perforating lines can be seen. The fourth, smallest group contain pendants without any perforated holes: they bear traces of a root cut from all sides to form a small incision for hanging. The most common type of perforation was a small, symmetrical hole, very close to the tip.

A question when the pendant was produced have several suggested answers. The larger group are pendants with not very clear signs of wearing and was produced for the deceased in the burial ceremony (David, 2006). According to the radiocarbon dates from both burial sites the Mesolithic societies had a tradition of making tooth pendants lasting more than 2.000 years (Butrimas, 2016). The most common technology was the perforation: the average diameter of the drilled holes was 3.6 mm.

The preliminary results of species identification show that aurochs (*Bos primigenius*) was the most common species followed by the Eurasian elk (*Alces alces*). In general, it can be confirmed that teeth for pendants were extracted from adult aurochs and juvenile elks. Pendants from animal teeth were an inseparable decorative part of their grave goods used to adorn the deceased and decorate ceremonial burial clothes, as well as using the bird feathers in the burial for the same purpose. Donkalis 2 grave with symmetrically adorned pendants on the head stands out for the symmetrical and symbolic placement of the pendants (Butrimas, 2012). The symbolical decoration of the head (two pendants on the eyes, two – placed in each ear, two in nostrils, two protrude from the mouth) suggest the important indication that such symmetrical decoration of the head had a symbolic meaning and shows the special social status of the person buried here.

Key words: Pendants, Animal Teeth; Mesolithic; Burials; Lithuania; Zooarcheological Analysis.

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Unworked animal teeth in Holocene hunter-gatherer burials at Zvejnieki (Latvia) – pendants or not?

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Animal teeth constitutes the largest part of the grave inventory at the well-known Zvejnieki cemetery in northern Latvia. More than 2000 teeth, mainly from elk (*Alces alces*), wild boar (*Sus scrofa*), red deer (*Cervus elaphus*), aurochs (*Bos primigenius*) and numerous carnivore species have been documented in 76 human burials. In previous studies, animal teeth from Zvejnieki burials dated to the Mesolithic and the Neolithic (8th to 3rd millennium BC) have usually been referred to as pendants or personal ornaments (e.g. Larsson, 2006). Most teeth are worked and have perforation holes or notches for suspension. Few perforated human teeth were also found in burials at Zvejnieki. However, a recent examination of this important material shows that many teeth are not perforated or bear no traces of working (Macāne, 2022). Through several case studies from the Zvejnieki cemetery, this presentation discusses the role of unworked teeth in burial assemblages. What can unworked animal teeth tell us about the mortuary traditions, the identities of buried people and animals whose teeth were chosen for those burials?

The presentation will focus on animal teeth that do not show perforations or other traces of working. Some of the questions that are explored include: Which animal species and teeth are without perforations or working traces? Were they used and suspended? Where are the unworked teeth placed in relation to the deceased body? By problematizing the concept of the pendant, the final part of the presentation will discuss alternative ways of using and suspending animal teeth in hunter-gatherer burials in northeastern Europe.

Key words: Pendants; Unworked Animal Teeth; Hunter-Gatherers; Burials; Zvejnieki; Latvia; Zooarchaeological Analysis.

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“Upside down” - a strange way of wearing pendants in Stone Age Baltic

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Zoomorphic and anthropomorphic pendants have been found in Stone Age monuments in the Baltic region. Some of them are accidental finds, but the shape and context of the pendants suggest that they can be attributed to the Stone Age. The holes drilled in some of them or the features cut for hanging them indicate that they were worn "upside-down". Such upside-down hanging positions have been observed on zoomorphic and anthropomorphic figurines from Stone Age sites in Latvia, Estonia and Finland: Abora, Sārņate, Tamula, Valma, Astuvansalmi and Metsäpirtti. "Upside-down" staffs with elk's heads have been found at the Šventoji settlement in Lithuania (Iršėnas, 2010). Such "upside-down" carrying is also recorded in ethnographic evidence, for example, in the costume of a shaman.

We can see that there is a tradition of wearing pendants and larger objects "upside-down", which seems a little strange today. Today, turning symbols upside down is associated with occult rituals and other negative connotations. Even more interestingly, objects worn "upside down" in the Stone Age, such as staffs from the Šventoji settlement with elk's heads, are today sold as souvenirs, already intended to be worn "normally".

At the same time, Stone Age and ethnographic material shows that the wearing of pendants "upside down" was not universal. Some anthropomorphic and zoomorphic pendants were worn "normally". This tradition of "normal" wearing is characteristic of pendants with geometric shapes made of amber, bone or stone, and pendants made of animal teeth. So what are the frequencies, patterns, possible causes and implications of the choice to wear "inverted" anthropomorphic and zoomorphic pendants? Perhaps the drilling of a hole in the top of a person's head and neck is linked to the obliteration of a previous hole and the need to drill a new one, without too much thought as to how the position of the object's appearance will change (*cf.* Kretuonas 1C, Lithuania)? Maybe it is an important idea that has been conceived in advance and has a deep symbolic load? It could also be a local tradition, specific to a particular site, as, for example, the finds from Lake Astuvansalmi, Finland (Grönhagen, 1991). Some of the pendants may have functioned both "upside down" and "normally", as in the case of anthropomorphic pendants from the Tamula site in Estonia (Kriiska *et al.*, 2007).

Key words: Figurines; Inverted-Disposed Anthropomorphic and Zoomorphic Items; Stone Age; Baltic Region.

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Neolithic pendants from the Mariupol type cemeteries (Ukraine)

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Mariupol Neolithic cemetery on the bench of the Azov Sea is one of the most outstanding burial complexes in Eastern Europe. It was excavated in 1930 by Professor Mykola Makarenko on the place of the building of great metallurgic complex “Asovstal” (Makarenko, 1933). The exceptionally rich cemetery gave the name to the group of Mariupol type cemeteries (Late Mesolithic – Neolithic). They are located from the interfluvium of the Prut and the Dniester rivers to the Don River, mainly on the Dniepr rapids and the Lower Dniepr. Burial inventory, particularly, adornments analyzed M. Makarenko (1933), D. Telegin (1991), N. Kotova (2010), N. Mykhailova (2020a) and others.

Pendants from the Mariupol type cemeteries are made from animal teeth; freshwater shells, bone and stone. Pendants made of deer canines are numerous. The perforated deer canines in the Mariupol type burials marked important parts of the buried skeletons – the head, neck, pelvis and feet. Few perforated canines with notches are known in the Dnipro region (Telegin, 1991; Bodyanski, 1951). There, the origin of the ornamented deer canines remains, however, uncertain. Perforated incisors of badger, dog and fox were also used as decorative elements (Makarenko, 1933). Wild boar perforated tusks and ornamented perforated plates from boar tusks are exclusively abundant at the Mariupol cemetery; they are inherent to male, female and children burials (Mykhailova, 2020b). As a singular pattern, these elements adorned the head, the neck and the chest of the deceased (Kotova, 2010; Mykhailova, 2020a). Perforated *Unio* shells are found in few cemeteries. Sometimes, these are single elements in poor burials, where they are mostly found near the sacrum. There are few refined artifacts in Mariupol cemetery: a marble pendant with two grooves near the slot, as found among other pendants near the male burial with a child; and an elegant porphyritic pendant with two holes found on the breast of a child in the double burial (Makarenko, 1933:96 & 105; Mykhailova, 2020:380). Two animal figurines made from boar tusk plates have also been found in Mariupol burial complex (Makarenko, 1933:87; Mykhailova, 2020a:380).

We propose to compare the Mariupol jewelry assemblage with the adornments from Mesolithic and Neolithic burial complexes of Central Balkans (Borić/Cristiani, 2019) Lithuania (Donkalis, Spiginas), Latvia (Zvejnieki – see Zagorska, 2008) and Scandinavia (Vedbæk and Skateholm – see Albrethsen/Brinch Petersen, 1976; Larsson, 1989). If some patterns of the pendants from the Mariupol type cemeteries find analogies with elements from other burial complexes in Europe, the composition of the personal ornaments from Mariupol type cemeteries remains particularly unique in its register.

Key words: Personal Ornaments; Shell; Bone; Stone; Mesolithic; Neolithic; Burials; Mariupol, Dniepr Region.

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An overview of perforated shells in the Neolithic in the southeastern Europe

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Mollusc shells were used for the production of decorative items throughout the prehistory, since the Palaeolithic period; in fact, some of the human's oldest decorations were produced from shells, sometimes just shells with natural holes were collected and used (e.g. Cabral/Martins, 2016). In the Neolithic in the southeastern Europe, shells were used to produce a variety of decorative elements that morphologically may be classified as bracelets, beads and pendants (Ifantidis, 2019; Vitezović/Antonović, 2020). In this presentation we will analyze shells with perforations and their possible mode of use from several Late Neolithic sites from Serbia, Croatia and Bulgaria. Shells used for these ornaments were mainly bivalves – *Cardium*, *Spondylus*, *Glycymeris*, *Unio* shells, etc., while gastropods may be encountered, but very rarely (Vitezović/Antonović, 2020; and unpublished ornaments).

Some ornaments were produced from one (entire) valve of the shell, while others were made from valve segments. Ornaments from entire valves usually have one perforation in the upper part. Such position of the perforation was suitable for these items to be suspended and to be worn on a necklace (as single pendant or combined with ornaments) or added to a bracelet, however, it is also possible that some of them were worn attached to clothes as some sort of application. Some valve ornaments may have differently positioned perforation or may have multiple perforations. Perforated shells also included diverse shell fragments with one or several perforations. Reuse and repair are sometimes noticeable among them, along with modifications in the mode of use, and in particular broken bracelet pieces were sometimes reused and modified by adding one or multiple perforations.

The presentation will provide an overview on morphological varieties of these ornaments, and traces of use that may be observed on them, in order to reconstruct their possible mode of use (following André/Bicho, 2016; d'Errico *et al.*, 1993; Hoareau, 2021). While they are most often described as pendants in archaeological reports, it seems that some of them were, in fact, part of the decoration on clothes.

Key words: Perforated Ornaments; Shells; Mollusc; Neolithic; Settlement Sites; Europe; Comparative approach.

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On the animal origin of ‘drilled’ holes on bones and shells from archaeological sites in Ukraine

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In the faunal materials from various Ukrainian sites, we have analyzed animal bones with pierced or so-called ‘drilled’ holes. According to analogical perspectives, archaeologists usually ascribed such finds there to artifacts drilled by human. The specific shape of the holes, as well as the peculiarities and regularities in their location, allowed us, after conducting an exerted traceological study, to conclude that these holes are of natural origin. As an example, we studied a collection of cattle and horse bones from the Scythian royal Bronze Age Alexandropol mound, totalizing all together 21 pieces. In all cases, the holes were not the result of human exposure, water, plant roots, or any storage or buried conditions of the bones in the ground. As a result of the study of traces on the bones, we assume that these holes were produced, “drilled”, by predator insects, possibly beetle larvae. For instance, identical holes and grooved passages, although seen in a wooden tree, are left by larvae of great capricorn beetle (*Cerambyx cerdo*, L.).

In addition, we studied oyster shells with holes, which archaeologists particularly attributed to man-made perforations, including blanks for pendants. Archaeological materials were obtained during excavations of the Middle Age cave town of Mangup-Kale in Crimea, in 2010. As a result of our study, we perceive these holes were drilled by another agent, a marine mollusk (*e.g.* Kubicka *et al.*, 2020). The purpose of our presentation here is to draw attention to colleagues that some of the so-considered drilled holes on the bones and shells were eventually made by animals as prey-agent responsible for non-anthropogenic degradation of the natural osseous or osseous-originated material which, therefore, enables revisiting a number of erroneous human-made records related to such finds in artefact production from prehistoric or historic sites.

Key words: Pierced Artefact; Bone; Shell; Bronze Age; Middle Age; Burial; Cave-Town; Ukraine; Crimea; Traceology; Zoology; Taphonomy; Comparative approach.

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Under a microscope: analysis of East Baltic Neolithic amber pendants from the Siliņupe site (Latvia), 4th millennium BC

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This paper focuses on rough-outs and final products representing amber pendants from one of three major Neolithic amber processing sites in Latvia – 4th millennium BC Siliņupe site – located on the southwestern coast of the Baltic Sea's Gulf of Riga. The settlements favorable position between marine and freshwater environments allowed for year-round habitation providing diversity of the necessary resources. After sea-level rise during Littorina Sea Stage, raw amber would have been washed up on the nearby beaches, transported by the longshore sediment drift from Sambian Peninsula (Bērziņš *et al.*, 2022). It was then collected and worked into jewellery, the majority of which, in contrast to other major amber working centres in the region, consisted of artefacts classified as amber pendants.

Siliņupe amber assemblage is especially favorable for macro-/microscopic and *chaîne opératoire* analysis as most of the retrieved pendants are in semi-manufactured condition allowing to trace steps of processing of the material (Bērziņš & Čakare, 2022). Initial analysis suggests that both local and imported materials such as flint, antler and stone tools were used for this purpose. The domination of pendants amongst amber artefacts in this site could be related to the skill level of the amber workers or the availability of materials used in amber processing, as well as the demand or use for such jewellery. To better explain these relationships, the material in question will be considered in the context of other key amber working sites in the region.

Key words: Pendants; Amber; Neolithic; Siliņupe; Latvia; Technological Approach

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Prehistoric hour-glass shaped pendants from western Sweden

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Hour-glass shaped pendants are quite rare and appears across Europe in Late Neolithic and Early Bronze Age contexts (see Behrens, 1970; Grose, 1989; Kleine, 2016). I have found six examples of similar pendants in Sweden, and four of them in the inland western part of the country. All were recovered in megalithic graves, and were made of bone, slate, and amber. A few similar ring-shaped bone pendants have been reported from a couple of megalithic graves in Denmark and northern Germany. The most spectacular one of the Swedish pendants, was made from a rather large piece of amber and must be considered as a rather valuable goods. A comparable pendant was recovered from the Moshka barrow in Ukraine, and similar pendants, stemmed rings or key shaped pendants, occur in Eastern Europe. Different interpretations of the hour-glass pendants have been brought forward such as: pendants, belt rings, accessories to archery equipment, and loops for lasso throwing. The aim of this paper is to open for a discussion of the date, origin and function of the ring-shaped artefacts recovered in the west Swedish megalithic graves.

Key words: Hour-glass Shaped Artefacts; Amber; Bone; Neolithic; Early Bronze Age; Megalithic context; Burials; Sweden; Comparative Approach.

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Paw or pendant? Multi-species perspectives on the Iron Age bear claw burial tradition in Southern Norway

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The presentation addresses the topic of pendants through a contextual study of burnt bear phalanges, interpreted as bear claws, found in Iron Age burials in Southern Norway (e.g. Grimm, 2023). So far, bear claws have been identified in more than 150 cremations, mainly dated to the Roman- and Migration periods (1,550 AD). Most burials contain only one claw. In one instance, the claw has a drilled hole, suggesting it was potentially used as a pendant. Bear claws occur in male, female, and mixed cremations, occasionally also with children. Their presence is independent of economic status, age, or gender. Rather than representing chiefs, shamans or warriors as previously assumed, the archaeological evidence indicate that individuals cremated with bear claws were also farmers, herders, and hunters.

By employing a retrospective approach, and drawing on Norwegian folklore and multi-proxy perspectives, relations between humans, livestock and bears are discussed in the context of hunting and transhumance, where real and symbolic bears were encountered. In these settings bear claw possibly used as pendants may have functioned as powerful objects, imbued with a potential essence of “bearness” turned towards therapeutic, safeguarding and protective purposes.

Key words: Pendants; Bear; Phalanx; Iron Age; Burials; Norway; Anthropological Approach.

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Thinking outside the pelt: A quantitative approach to establish the function of expedient osseous tools

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Establishing the function of osseous technology is essential to understand how this aspect of material culture was integrated in past technological systems. Identifying behavioural recurrences within an assemblage or in a given region is indeed the first step that allows to investigate evolutionary trajectories of past cultural adaptations. Although the best approach to infer the function of osseous tools remains unchanged since the seminal work by Semenov, i.e., combining archaeological experimentation and use-wear study, developments in material sciences, i.e., tribology, are only marginally solicited by bone tool specialists in spite of the fact that they offer the possibility to investigate use-wear development from both a qualitative and quantitative perspective. In the present communication, I detail a novel analytical protocol that introduces flexible discriminant analysis of surface textural data obtained by confocal microscopy. This protocol offers the advantage of quantifying use-wear development, therefore making use-wear approaches reproducible and less subjective. I provide two examples of its application on smoothed tools, i.e., the bevelled bone tools from Sibudu Cave, South Africa, dated between 80 and 60 ka BP, and the expedient bone tools from Lingjing, China, dated between 125 and 105 ka BP. In both instances, traditional use-wear studies concluded that these objects may have been used in activities related to hide working. Yet, when adding a quantitative dimension to the study, I demonstrate that they were more likely to have been used to process plants. At Sibudu Cave, the bevelled bone tools were used to debark trees and access roots, while at Lingjing, the expedient bone tools served to process a number of plant species, including splitting bamboo. These results emphasize three key points. First, owing to the equifinality of use-wear patterns produced in distinct activities, it becomes increasingly necessary to implement mixed analytical methods in order to ensure functional interpretations are as accurate and as precise as possible. Second, smoothed surfaces should not be equated to smoothing activities, at least when dealing with osseous remains used as tools. Third, although the importance of animal exploitation in Pleistocene subsistence strategies is self-evident, use-wear specialists should explore alternative subsistence activities, e.g., those evidenced by pollen or phytoliths, to shed light on behavioral realms in which bone remains may have been used, and that are otherwise lost owing to the perishable nature of plant materials.

Key words: Osseous technology; tribology; experimental archaeology; use-wear study; China; South Africa; Pleistocene; plant processing.

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« manque cruel de données » – Internal technofunctional variability of “smoothers” illustrated on a series from the Grotte de la Verpillière I by Germolles (Saône-et-Loire)

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Osseous artefacts termed “smoothers” (lissoirs in French, Glätter in German) have frequently been described in assemblages of the Upper Palaeolithic, and more recently also of the Middle Palaeolithic. While a general property cluster is in common use that allows the identification of an artefact as a smoother, the variability within the category is unusually high when compared to other broad typological categories in osseous material. This variability pertains to the morphology of the artefacts, the technology reconstructed for their manufacture and the proposed models of their use. Here we present a series of 25 so called smoothers from the Grotte de la Verpillière I by Germolles (Saône-et-Loire), which offers a broad spectrum of differing typological, technological and functional criteria. This series can thus serve to elaborate on the significant variability observed in this loosely defined category of objects, as well as potential pitfalls that are encountered in discussions of them. These ambiguities are at least partially rooted in the research history of these tools, as well as in different research traditions within the field. However, it seems as though the “severe lack of data”, that was attested by researchers almost 30 years ago still necessitates further study of the technology and function of the artefacts known as smoothers.

Key words: osseous technology, bone tools, usewear, research history.

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Chaîne opératoire of Upper Palaeolithic smoothers from the Swabian Jura and the ‘Molly’ experimental workshops

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Ribs of megafauna are an important raw material for several kinds of tools during the Upper Palaeolithic, especially during the Gravettian in the Swabian Jura (SW-Germany). Most mammoth and mammoth-/rhino-sized ribs from the Gravettian layers in Geißenklösterle, Hohle Fels and Brillenhöhle (Ach Valley) show numerous anthropogenic traces, such as cut marks, impacts and scraping marks. Furthermore, a large number of these ribs seem to be part of a chaîne opératoire to produce smoothers and points.

The carcass of an Indian elephant from the ‘Wilhelma’ Zoo in Stuttgart-Bad Cannstatt (Baden-Württemberg), named Molly, gave us the unique opportunity to study the manufacturing of smoother blanks and their possible use in preparing animal skins.

One of our research questions were: are the flat and smooth shape and the shiny appearance of the burnishers part of the manufacturing of the tools or just the result of working with leather. In other words, did cleaning of skins start with raw rib surfaces and during the working process they were gradually worn down and got the polished appearance or were the tools already shaped like this before the work got started.

During a 1st workshop in the ‘Urgeschichtliche Museum in Blaubeuren’ (URMU) we gained experience with the material properties of ribs and the process of manufacturing blanks for tools. The comparison of the experimentally worked ribs with archaeological materials showed similarities and dissimilarities, which gave us important new insights in Palaeolithic techniques.

The 2nd workshop in Blaubeuren dealt with the processing of skins with proboscidian rib smoothers resp. burnishers.

Concerning our experience with smoothers in our workshops the question of how they have been used is still pending. Although it is generally suggested that their shape and appearance is caused by working processes with leather and skin, we could not completely confirm this. In certain aspects of leather working lithic scrapers were more efficient.

While the use-wear analysis of the experimental organic tools is still ongoing, we wanted to share first insights into the chaîne opératoire of the production and use of the artefact group we gained from our experiments.

Key words: Experimental archaeology, smoothers, burnishers, proboscidian ribs, Gravettian, Swabian Jura.

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Smoothers and burnishers-osseous tools from the Upper Palaeolithic cave sites of the Swabian Jura (southwestern Germany)

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The so-called smoother or burnisher is a common tool type we know from the Upper Palaeolithic. These artifacts are made from osseous materials. Such artifacts have been excavated in the UNESCO Heritage cave sites of Vogelherd and Hohlenstein-Stadel in the Lone Valley as well as in Geißenklösterle and Hohle Fels in the Ach Valley in the Swabian Jura, southwestern Germany. These tools mainly date back to the Aurignacian (approx. 42 000 – 35 000 years cal. BP) and Gravettian (approx. 34 000 – 29 000 years cal. BP). The artifacts are largely made from ribs of animals in mammoth/rhino size and horse/bear size (Barth 2007). Oftentimes, the people split ribs in order to carve the tools. Furthermore, some smoothers are decorated with specific patterns such as engraved lines. Rarely, the Aurignacian carvers also transferred this form in mammoth ivory (Wolf 2015, Tafel 1 & 2).

Since the comprehensive publication of Martina Barth in 2007 on the Gravettian inventories of the Ach Valley, the excavation teams in Hohle Fels Cave uncovered additional artifacts that fall under this artifact category (e.g. Conard et al. 2017). We compare the smoothers from the Aurignacian and the Gravettian, observing changes in raw material choice within the early Upper Paleolithic cultures. In all, we shed light on the rich record of artefacts made from osseous materials of the Upper Paleolithic of the Swabian Jura.

Key words: Swabian Jura, smoothers, burnishers, Aurignacian, Gravettian.

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Session 21-4

Interdisciplinarity in the study of rock art: the use of new technologies to understand the artistic dynamics of past societies

SESSION ABSTRACT

Rock art is one of the most phenomenal legacies of past societies. It has repeatedly recognized its heritage value as some of the first examples of the art of humankind. Rock art sites represent some of the most visited heritage sites in the world, generating economic and social wealth. Moreover, the emergence and development of symbolism and imagery expressions are considered major milestones in human evolution and a fundamental source to evaluate the organization and complexity of past societies. A lot of the studies of rock art have been based on individual research, limited to personal capabilities and experiences. However, the development of digital technologies offers unprecedented possibilities for a more accurate, detailed, and complex analysis of rock art and its features. This session intends to explore the multi-inter-disciplinary scientific methodologies and the implementation of cutting-edge technologies used in rock art sites nowadays in different contexts. We want to know which different advanced technologies are being used to obtain accurate, commensurate and transferable results in different rock art sites, their advantages, disadvantages, problems, obstacles, and possibilities for future development. We also want to explore the real impact of the use of these technologies on the research concerning the factor for understanding and interpreting its meaning, filling a gap, and unblocking current research. Furthermore, it is important to understand how the technological way of approaching rock art has been important to unravel questions such as hierarchy, gender, inequality, division of labour, and knowledge transmission in the context of past societies.

Main Organiser

Sara Garcês

Co-Organisers

Diego Garate

L'usage de la photographie pour la lecture du relief en 3D: exemple de la grotte Chauvet-Pont d'Arc

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Découverte en 1994, la grotte Chauvet-Pont d'Arc (Ardèche, France) est l'une des plus anciennes grottes ornées sur le continent Eurasiatique ; les dessins noirs sont datés de l'aurignacien et les plus anciens de - 36000 ans. Les outils photographiques sont des supports essentiels aux inventaires archéologiques et aux relevés des parois et des sols. Combinée à des éclairages rasants, la photographie permet de caractériser le geste et la matière picturale. Depuis quelques années, cet outil d'acquisition se développe grâce à la technologie de reconstruction 3D par photogrammétrie et par stéréophotométrie. Au travers de l'exemple du travail de l'équipe scientifique de la grotte Chauvet-Pont d'Arc, nous entendons partager les méthodes pratiquées et en cours d'intégration dans les procédés d'analyse. Nous insisterons sur l'appropriation de ces techniques auprès de chaque spécialiste mais, aussi sur la nécessité de l'interdisciplinarité pour le déploiement des outils.

Dans un premier temps nous aborderons le travail de numérisation 3D par photogrammétrie dans un milieu aussi contraint que la grotte Chauvet. Cette dernière nécessite une adaptation à la taille des œuvres, à l'accessibilité des sols, à la distance de prise de vue, à la gestion de la lumière et à la résolution utile à l'étude. Pour cela nous avons développé une approche multi-scalaire depuis un modèle général subcentimétrique et géoréférencé avec la lasergrammétrie jusqu'à des modèles submillimétriques pour les relevés des différents spécialistes.

Dans un second temps nous montrerons comment sont intégrées les outils de stéréophotométrie dans le travail des archéologues grâce au travail interdisciplinaire avec le laboratoire d'informatique de Toulouse (IRIT). A partir d'une série de photographies prises d'un même point de vue tout en changeant l'éclairage et en s'appuyant sur le modèle Lambertien, il est possible de reconstruire la géométrie d'une paroi et de dissocier la couleur de surface. Plus résolue que la photogrammétrie la stéréophotométrie est particulièrement adaptée à l'art pariétal paléolithique qui combine souvent peinture et gravure. Les volumes de la grotte Chauvet nous imposent de moduler les méthodes de captation en fonction de la distance aux œuvres, ainsi nous présenterons les acquisitions libres et celles avec un dôme de Reflectance Transformation Imaging (RTI).

Enfin nous verrons leur intégration dans le processus d'étude interdisciplinaire de la grotte. Cela passe soit par le couplage de la photogrammétrie et de la stéréophotométrie afin de combiner les forces de chaque méthode, soit par la stéréophotométrie multivues. L'objectif est de fournir une lecture multimodale pour la documentation du site.

Mots-clés: photogrammétrie; stéréophotométrie; RTI; reconstruction 3D; art pariétal.

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Recovering Cueva del Toro (Benalmádena, Málaga, Spain) under the light of new interdisciplinary perspectives in prehistoric rock art research

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Cueva del Toro de Benalmádena is a "well-known" cave in Malaga's prehistoric history since its discovery in 1969 by Javier Fortea and Manuel Giménez. However, since its publication in 1972-1973, the number of systematic archaeological interventions at the site has been non-existent, and scientific attention is limited to the physical appearance in compendium works that have highlighted the connection of its graphic record with nearby stratigraphic sequences such as Cueva Bajondillo, Cueva de Ardales, Cueva de Nerja or Cuevas del Rincón de la Victoria. Recent visits by our research team have allowed us to detect unpublished abstract motifs (finger dots, airbrushing, bars, etc.) that demonstrate the enormous potential that still awaits inside Cueva del Toro. With this motivation, and supported by the Ayuntamiento de Benalmádena, we initiated a research project authorised by the Junta de Andalucía with three clear interdependent lines of work. The first of these, pursues the exhaustive prospection and the bi- and tri-dimensional recording of the panels in order to accurately determine the qualitative and quantitative reality of the iconographic horizon of Toro. The second consists of the application of archaeometric techniques such as XRF, RAMAN spectroscopy, DNA extraction, U/Th sampling and C14 dating, among others, to solve historical problems of great interest such as the chronological ordering of the sequence of the imagery, the affiliation of authorship or the determination of the sources of origin of the pigment. Thirdly, we consider an updated approach to the conservation parameters of the cave, whose levels of degradation were initially thought to be extremely critical due to various natural and anthropogenic conditioning factors despite the attempt of physical enclosure by the authorities.

To summarise, this is a wide-ranging project that seeks to bring this classic site closer to the interdisciplinary methodology of prehistoric archaeology that is expected in the 21st century.

Key words: Cueva del Toro of Benalmádena, Bahía de Málaga, Palaeolithic rock art, Origin of human symbolism, Archeometric techniques.

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A reassessment of the discovery of LUP figurative rock art in Cathole Cave, Gower Peninsula, South Wales

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In September 2010, the author discovered a Late Upper Palaeolithic engraving of a cervid in Cathole Cave on the Gower Peninsula in South Wales. Members of the NERC-Open University Uranium Series Facility extracted samples from the surface on which the engraving was made in April 2011, together with a sample from a section of flowstone covering part of the reindeer's muzzle. A single date of 12,572 ± 600 years BP was obtained from the overlying flowstone, suggesting a minimum age for the engraving. A further flowstone sample was taken from the left of the muzzle of the cervid in July 2011 and results gave a minimum age of 14,505 ± 879 years.

This discovery prompted the author to explore the cave with greater scrutiny. In 2011 the author, along with Andy Beardsley, from Terra Measurement Ltd, completed the first 2D/3D laser scan of the cave system. This exercise allowed the author to accurately locate all the engraving discoveries. Following this phase, the author was engaged in a geo-prospection exercise to identify further engravings (Nash 2013). This phase of work coincided with an excavation within the main gallery, undertaken by the National Museum of Wales.

In 2015 a multidisciplinary team from the Centre of Geosciences, University of Coimbra (Portugal) and the Department of Physics and Earth Science, University of Ferrara (Italy) extracted and analysed samples from a haematite spread and for an overlying speleothem to be dated using uranium-series disequilibrium dating. A possible haematite spread was identified within a small section of the western wall of the main gallery of the cave (discovered in 2010). For this discovery, a research question arose: was this haematite spread the result of natural secretion from the substrate or it was applied via human agency? It was noted at the time that no other visible haematite spreads were present within this particular cave. This programme involved sampling and laboratory research, including Raman Spectrometry, Scanning Electron Microscope analysis (SEM) and thin-section analysis on samples of loose substrate. The results of this phase of work confirmed that the samples taken from Cathole Cave may be the result of pigment application through human agency, however, the results were considered inconclusive.

This paper discusses the discovery and staged approach employed to scientifically analyse and date the rock art. The staged approach involved a number of hard science processes that provided an essential baseline for understanding the mindset of hunter/fisher/gatherer communities during the latter part of the Upper Palaeolithic.

Key words: haematite, Late Upper Palaeolithic, Raman spectrometry, rock art, uranium-series disequilibrium dating.

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Experimental archaeology for the comparison of traces in painted rock art the case of Mas d'en Gran rock shelter, Montblanc, Catalunya

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In recent years, one of the subjects about rock art studies lies on the reconstruction of the operational chains related to the production of this symbolical expression of prehistoric societies. Latest research about the topic have been made using new technological and technical approaches, such as component studies of pigments, multispectral photography, 3D scanners and digital microscopy, among others. In order to have a control example for the comparisons with the archaeological evidence, experimental approaches have been made to reconstruct how the pigments did were done and how they were used. In this matter, the experimental archaeology has been a very powerful tool to generate new inferences and hypothesis about the process of production in rock art.

In this paper, we present the evidence founded in the Mas d'en Gran site, located the Mountains of Prades, in Montblanc, Catalunya, Spain. This rock shelter has been approached in other studies for the peculiarity of the painted rock art that presents, from a formal point of view. The site has been cataloged with a Neolithic schematic ascription;

However, the morphological characteristics of its paintings shares similarities with another painted tradition that is very common in the region: the Levantine paintings. Based on a macroscopic photographic record made with a 60mm Macro lens, the painted traces of the motifs were catalogued and measured, and then compared with an experimental record in order to try to identify which type of instruments were used in the creation of the paintings.

The results of this analysis were later compared with records from other sites in the region, as well as with bibliographical information about the characteristic of traces for the Levantine rock art. The aim of this paper is showing the complexity of the paintings in Mas d'en Gran, that poses characteristics from both painted traditions, schematic and Levantine. This argument can be used to hypothesize and propose Mas d'en Gran as a site of transition between two different painted traditions in the Mountains of Prades.

Key words: Rock Art, Experimental Archaeology, Schematic rock art, Levantine rock art.

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Representations of footprints in north Aegean rock art. The site of 'Tsigkri' in the island of Thassos

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The current paper consists of a preliminary report and presentation of the recently studied rock art site of 'Tsigkri' located north of the town of Limenaria at the island of Thassos, north Greece. The site was primarily mentioned and published in 2010 (Archaeological Work in Macedonia & Thrace AEMTH/Thessaloniki) along with early design drawings of the decorated rocks and the rock art motifs. The authors have revisited the site and initiated new works with a research team from Greece and Portugal under the supervision of the Ephorate of Antiquities of Kavala-Thassos (Hellenic Ministry of Culture and Sports). This work is part of an ongoing project that has started in 2019 and aims to the recording and study of prehistoric rock art in the island of Thassos resulting to a more cohesive and complete picture of rock art and its context in the specific area. The majority of the identified themes refer to engraved representations of footprints as well as later additions of medieval and post medieval motifs usually depicting Christian crosses and cruciforms. The footprint imagery is quite unique because, until now, hasn't been identified in studied rock art sites in north Greece such as the ones in the area of Philippi and Mt. Pangaion within the municipalities of Kavala and Pangaion respectively as well as at the sites in north Evros region at the eastern slopes of the Rhodope Mountains (north eastern Greece). In addition, early conservation reports have been drafted in order to address the risks, natural hazards and contemporary human intervention, for the very condition of the rocks and the motifs since the site is located at a remote and unprotected area. The authors opted for 3D imaging and modelling regarding the recording and reconstruction of the site and the engraved motifs but also adopted standard recording techniques when necessary.

Key words: North Aegean Sea; Engravings; Marble; Rock Art Conservation; 3D Modeling.

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Kyzyl Dara Gorge in Uzbekistan the difficult road to full documentation of a high mountain site with rock art

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The Kyzyl Dara Gorge is located in the south-western foothills of the Tien Shan mountain range in Uzbekistan. Discovered in 2019, the high altitude concentration of petroglyphs, which is clearly unique in the region, consists of a few hundred panels and a few thousand individual depictions. The petroglyphs, mainly depicting *Capra sibirica*, were located on a large slope stretching from the bottom of the gorge at 2,600 metres to the nearest peak at 3,100 metres above sea level. Despite the seemingly short distance to the nearest town, the site is not easily accessible and difficult to survey. It takes two days to reach the site on foot from the nearest passable road. Even in summer, the best time for research, there is a lot of snow in the gorge, making it difficult to reach and work at the cluster. Researchers are also challenged by strong storms, winds and temperatures that can reach 40 degrees Celsius during the day but drop below zero at night.

The specific conditions require researchers to use solutions that are adapted to these factors. The fieldwork season must be kept to a minimum while maintaining maximum efficiency of the work carried out. Any prolongation of the season would cause logistical problems in terms of supplying the camp and the electricity needed to recharge the batteries of the cameras and geodesic equipment. During the two seasons, the team was divided into two groups with different tasks. The first group focused on exploring slippery and difficult to access rocks, marking and numbering the panels they found. At the same time, the second group, which only proceeded to the marked points, carried out photographic and photogrammetric documentation and, in some cases, 3D models of the panels. The location of each panel within the site was documented with a high degree of accuracy using a total station. By relying on photographic methods and supplementing the documentation with only simple sketches, the time spent by the team in difficult conditions was extremely limited, while at the same time allowing most of the interpretive analysis to be transferred to the cabinet work.

Key words: Central Asia; High Mountains Areas; Petroglyphs; Bronze Age; Iron Age.

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Tracing the archaeological signs of Anthropocene in Singida Rural District (Central Tanzania)

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African landscapes show more than others the ancient signs of the human impact on the Earth. This work aims to explore for the first time the signs of the anthropic impact in the Singida region (central Tanzania). The area, characterized by an articulated landscape with impressive geomorphologies such as plateaus, inselbergs, escarpments, and impressing rocky hills and granite outcrops, was inhabited until the 1990s by hunter-gatherers' communities. Today the intensive exploitation of the land by farmers and uncontrolled activities of quarries are dramatically transforming the environment and ecosystems. One of the objectives of the interdisciplinary project carried out in the area is to detect since when human actions started to impact the landscape and the natural resources.

During the last few years, archaeological surveys, selected excavations, and ethnographic inquiries are tracing a deep history of occupation, ranging from MSA, LSA to historical tradition. The analysis of scatters of lithic artifacts, stratigraphic sequences preserved in rock shelters, and the impressive rock art evidence will contribute to reconstruct the ancient signs of the anthropic impact in the region. The paper aims to present the project's preliminary results, with a particular focus on the potential of the rock art investigation. The first use of digital tools in the recording, including iDStretch, clearly demonstrates a more complex palimpsest of styles and represented various stylistic motifs than the previous studies, and the new record constitutes an improved archive of proxy data for paleoenvironmental reconstruction and past biomes.

Key words: Holocene, proxy data, rock art, human environment.

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Premières gravures néandertaliennes identifiées sur les parois d'une grotte: La Roche-Cotard (Indre-et-Loire), France

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Sur les parois de la grotte de La Roche-Cotard, près de Langeais, des gravures ont été tracées au doigt dans une mince couche d'altération recouvrant la craie tuffeau. Ces tracés digitaux ont été réalisés il y a plus de 57 000 ans, et vraisemblablement plutôt vers -75 000 ans. Les datations de la fermeture de la grotte, obtenues par la méthode de la luminescence optique (OSL) ont, en effet, permis de les attribuer à Néandertal, faisant de la grotte de la Roche-Cotard la plus ancienne grotte « ornée » de France connue à ce jour. Elle a été classée au titre des Monuments Historiques en 2021.

Les tracés ont été, majoritairement, réalisés avec la partie terminale du doigt, soit par un simple contact de la surface altérée de la craie, soit par un déplacement du doigt sur cette surface, enlevant le film d'altération.

Les panneaux de tracés digitaux ont été photographiés, avec des lumières orientées différemment ; des photogrammétriques ont été réalisées, ainsi que des images dynamiques selon la méthode RTI (Reflectance Transformation Imaging). Enfin, des relevés ont été réalisés in situ.

Les travaux interdisciplinaires réunissant plus d'une vingtaine de spécialistes du CNRS, ainsi que de nombreuses universités françaises et étrangères, vont faire l'objet d'une publication dans la revue Plos One le 21 juin 2023.

Key words: Cave art; cultural behaviour; Neanderthal; engravings; OSL datings; France

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Unraveling Palaeolithic symbolic behaviour: the use of scientific virtual reality for the comprehensive interpretation of the archaeological cave art record

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Traditionally, the study of rock art has been developed in a decontextualized manner concerning the archaeological record itself and the characteristics of the space that contains it. Methodological limitations and the absence of a specific theoretical framework have favoured a very biased and partial approach to the phenomenon. In recent years, the attention of researchers has shifted from the rock images themselves to their context, partly due to the discovery of exceptionally well-preserved cavities, but also thanks to new theoretical approaches such as sensory archaeology. To this has been added the implementation of new immersive technologies that allow a historical recreation that goes far beyond the merely narrative explanations.

In this communication, we present the study developed in the Atxurra cave (Basque Country) from this new perspective, in which holistic research has allowed the reconstruction of the Palaeolithic scenario through the use of scientific virtual reality. This platform for the presentation of the data is at the same time an extremely useful tool for a comprehensive understanding of the symbolic behaviour inside the cave.

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Scientific Documentation and 3D Analysis of Escoural and Maltravieso Cave: Advancing Understanding through Technological Innovation

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The Escoural and Maltravieso caves were the only caves in the Southwest of Iberian Peninsula known to have Palaeolithic rock art. These two contexts share similarities in terms of their geological characteristics, circumstances of discovery, state of conservation, location outside the typical scope of Palaeolithic art, and lack of a tradition of scientific research. The FIRST-ART project - INTERREG V, Spain-Portugal (POCTEP) entitled "*Conservation, documentation and management of the first manifestations of Rock Art in SW Iberia: Escoural and Maltravieso Caves (FIRST-ART)*" aimed to advance knowledge of these caves by examining their technical, stylistic, and iconographic aspects through multidisciplinary research and the application of new analysis and documentation technologies, including digital and three-dimensional techniques. One of the primary objectives was to create an updated catalogue of the graphic contents found in both caves. To achieve this, innovative methodologies were implemented, including the utilization of DStretch[®], photogrammetry, and digital image processing. The integration of a high-resolution three-dimensional scanner enabled the accurate recording of the support structures of the rock art, facilitating a comprehensive modeling of the caves.

The complete cataloging of the graphic content present within caves and the implementation of 3D modeling techniques holds immense significance in the field of archaeological research and cultural heritage preservation. Cataloging serves as a comprehensive inventory, documenting and organizing the intricate details of the artistic manifestations found within caves. This meticulous documentation not only aids in preserving and understanding the art itself but also provides invaluable insights into the cultural, social, and artistic practices of the past. Furthermore, the application of 3D modeling techniques revolutionizes our approach to cave exploration and analysis. By creating high-resolution digital representations of the cave interiors, researchers can virtually navigate and study the intricate details of the cave environment without causing any physical disturbance or damage to the delicate rock art. This technology allows for a comprehensive understanding of the spatial relationships between different graphic elements and their surroundings, providing a holistic perspective that enhances interpretation and analysis. Moreover, 3D modeling allows for the preservation of caves in a digital form, capturing their intricate features and fragile conditions. This digital preservation serves as an invaluable resource for future research, enabling scholars to revisit and analyze the caves from various angles and perspectives. It also provides a means for wider accessibility, allowing individuals around the world to virtually explore and engage with these remarkable cultural treasures.

Keywords: Prehistoric Art, Documentation, Escoural, Maltravieso, 3D.

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Session 21-1

Archaeoacoustics: a novel interdisciplinary way of studying the past

SESSION ABSTRACT

Following several pioneering studies in the second half of the 20th century regarding the use of sound by past societies, it is in the 1990s that the interest in Archaeoacoustics reaches a significant level among researchers. Archaeoacoustics forms part of a multidisciplinary field of research, sometimes still beset by methodological difficulties but is, as mentioned by Scarre (2006), “potentially a vital part of the understanding of the lived experience of past societies”. Following on from a milestone Conference organized in 2003 at the University of Cambridge, other events about Archaeoacoustics have been organized in several different countries since, with contributions that constitute today a considerable part of the specialised bibliography on this theme, and complement several additional publications that provided a broad view of Archaeoacoustics. This new discipline, which attempts to recreate the soundscapes of the past, emerged from various experimental methods, and the organisers encourage these types of approaches, which sometimes may take the form of performances. We should note that Archaeology per se is very much one aspect of the understanding process which is hampered by the survival (or not) of a material culture. We stress that the intangible aspects of the past have long since disappeared. It is our responsibility that we re-colour the past by applying a more sensory approach to the available archaeological record. The organisers intend to have an interdisciplinary session, gathering researchers from different disciplines such as archaeology, experiential archaeology, acoustics, ethnomusicology, archaeoacoustics, anthropology and psychology, among others, with the aim to better understand the ancient human social contexts and sequent behaviours. We are particularly interested in presentations concerning early musical behaviour, shamanism, the representation of musical instruments and/or dancing scenes in prehistoric art, “ringing stones”, the acoustics of classical Greek and Roman buildings and of medieval churches, music archaeology, the effects of specific sounds on the human brain, as well as other possible approaches to the use of sound in past human contexts that interested participants may wish to propose.

Main Organiser

Fernando Coimbra

Co-Organisers

Dragos Gheorghiu

George Nash

A Neolithic archaeoacoustic object: The anthropomorphic vase from Parța

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Recent studies of Neolithic material culture have revealed the existence of a diverse number of archaeoacoustic ceramic objects, including whistles and drums.

It is known that ceramic vessels were used in architecture to amplify the acoustics of rooms and that the ceramic material has acoustic properties. Thus, since the Neolithic period, drums have also been made of ceramic, and are still made today in traditional societies.

It is rare, however, for these objects to have iconic representations, using zoomorphic or anthropomorphic images. One such case is that of the famous anthropomorphic vessel from Parța in the Vinča tradition, which is also the logo of the 2023 UISPP congress.

The ceramic vessel is in the form of a bowl with two openings and shows the image of an anthropomorphic figure with hands positioned in front of the figure and a wide open mouth. Two handles positioned on either side of the vertical opening indicate that it could be hung, i.e. that it was a portable object. The symbolic message that of a man shouting, being obvious, led this author to consider it as representing an archaeoacoustic object. Experiments carried out by replicating the vessel were aimed at testing its acoustics and revealed its possible use as a resonant instrument, altering and amplifying the human voice, like the ceramic hunting pots mentioned by ethnography or hunting howlers, which are still used today. With such an instrument for altering the human voice, it was possible to produce sounds that imitated those emitted by animals, as was common in wolf hunting.

Apart from animal calling, altering, and amplifying the human voice could also be used in various shamanic rituals. Such a hypothesis re-situates the Parța vessel from a functional to a spiritual area.

The paper will present the construction and firing processes of the vessel, followed by an ergonomic analysis of its handling and then a series of acoustic experiments.

Key words: Neolithic, anthropomorphic vase, archaeoacoustics, experiments.

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Acoustic phenomena in late prehistoric architecture: A theoretical approach

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It is not new that the end of the 20th century witnessed a progressive breakdown of boundaries between several disciplines, becoming knowledge more and more multidisciplinary. Despite some previous pioneering works in the frame of Sound Archaeology (Archaeoacoustics), this field of research took a stronger development in the middle of the 90'. For example, acoustic tests inside megalithic chambers in the UK and Ireland revealed a strong resonance with frequencies between 95 Hz and 120 Hz, in the range of the adult male voice, having a larger concentration around 110-112Hz. In a sequent work, neuroscientists of the University California Los Angeles made laboratory tests where volunteers heard sonorities between 90 Hz and 130 Hz, being their brain activity monitored through electroencephalography. It was then noticed that the activity in the temporal left region of the brain was significantly lower at 110Hz than at any other frequency, allowing other processes to become more prominent, resulting in a shift in the activity of the prefrontal cortex, which may be related to emotional processing, also disconnecting language centers.

However, in 1967, much before the concept of Archaeoacoustics have appeared, British anthropologist Rodney Needham had argued that acoustic waves had neurologic results on human beings and that their reverberation produced also bodily effects, similar to some examples of mind/body experiences later observed by different researchers in places such as at Hal Saflieni (Malta), West Kennet Long Barrow (Wales), Maeshowe and Dwarfie Stane (both in Orkney, Scotland), among other cases.

This type of research combining Archaeoacoustics and Neuroscience, carried out at megalithic chambers, reinforce the idea that besides tombs they could have been places for social or spiritual ceremonies, which is also supported by the presence of megalithic art on these monuments.

In this paper, the author discusses acoustic phenomena observed in the context of Late Prehistoric architecture, such as standing waves, reverberation, Helmholtz resonance and infrasound, which can be the cause of several mind/body effects.

Examples of intentionality in the use of sound in those monuments, during Prehistory, are also considered.

Besides the mainly theoretical approach, the author presents the results of preliminary tests using two replicas of Neolithic ceramic drums carried out inside the prehistoric hypogea of Quinta do Anjo and Carenque, both near Lisbon, and in the chamber of the Dolmen of Antelas (Oliveira de Frades, Portugal). It was noticed that the sound of the drums together with the structure of those prehistoric chambers produced a strong resonance with undeniable mind/body effects.

Key words: Acoustic phenomena; prehistoric architecture; sound frequencies.

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A strange sound of silence the audibility ranges inside burial monumentality

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When excavating Neolithic or Bronze Age sites, archaeologists are sometimes fortunate to retrieve 5 to 10% of the total material culture. Depending on the environmental conditions (in particular, the acidity of the substrate), the material could be human burials, lithics, or pottery, as well as sometimes more exotic items. The material culture and the architecture and landscape add potentially further tangible evidence of how communities dealt with the dead 50 centuries ago. What is missing though is the intangible evidence, what we sometimes term as sensory archaeology.

In terms of the normal hearing range in humans (i.e., sound frequency), the usual and safe decibel hearing range is between 0 dB and 103 dB. It is within this range that people of the Neolithic would have heard natural sounds, and human actions that involved ritual activity (chanting, poetry, and performance through music - i.e., percussion, and instrumentation). The question for this paper is, at what levels of privilege would the audience hear these sounds, and could these be tied into ritual actions, such as body preparation and deposition? This concept is based on the assumption that an audience standing outside a monument would not have had visual access to the ritual activity inside. Architectural devices, such as lintels, doorways, bends/kinks in the passage, and side chambers would have made any ritual activity difficult to witness.

For this paper, I will focus my discussion on the Neolithic passage grave site of La Hougue Bie, located in south-eastern Jersey, the Channel Islands. This intact monument, measuring over 50 m in diameter and standing 13 m in height, is one of the largest passage graves in Western Europe.

Key words: architecture, architectural devices, façade, horns, megalithic, ritual activity.

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Engagements with environment – art of echos, traditions and present-day rituals

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Listening to the soundscape of the past in prehistoric archaeological contexts is a challenging research task to fulfill when using fragmentary material sources. In historical contexts, there might be documented practices or living traditions available, but they are often general in nature and not site-specific.

The sources of inspiration for our cultural echological research are the numerous publications in the fields of sound archaeology, music archaeology and archaeoacoustics but also the present-day motives, experiences and interpretations of those people who have engaged with the environments in those places.

This paper explores the interaction and dialogue between sound, natural environment and reception at two historical sites in Finland: Vaskikallio ('Copper Rock') situated in Lieksa, Eastern Finland and Pyhätunturi in Pelkosenniemi, Northern Finland.

The research group led by Riitta Rainio has examined the acoustic properties of Vaskikallio by in situ impulse response measurements. Until the last century, Finnish sages healed the sick through various sonic rituals containing sung or spoken spells, shouting, spitting, shooting and other types of noisemaking. According to the tradition, these rituals were often performed by cliffs, gorges and caves, where echoes or reverberation from surrounding rocky surfaces could have an effect on the healing experiences and practices.

We traced the spells used by a local healer Antti Vinne (1826–1898) from folklore databases and perform and record them in their original acoustic context by the echoing cliff. Also we interviewed the present-day visitors of Vaskikallio in order to find out the meaning (fullness) of this place today.

In Pyhätunturi we will visit and observe the annual festival Pyhä Unplugged in August 2023. Specially very special Aittakuru as a sensitive place of performance as well as some old sami sacred places nearby. We will also interview the organizers, performers and audience of Pyhätunturi festival.

In our paper we will present some examples of from our fieldwork. More specific questions will be: What are the different aspects that make the places alike special and meaningful? What happens if these experiences are put in dialogue with artistic expression? What happens when the artists visit the place for the first time? What are their (first) impression of the acoustics when they play, drum joik, or sing there? What is the role of the natural environments in their art? How do the visitors get inspired by the stories of the past and why do they attract? How has the stories been applied to certain rituals and art? How have the traditions been adopted to the experiences, music and performances?

Furthermore, we will argue that "cultural echology" as a relative to ethnomusicology and acoustic ecology might be a fruitful new window to examine and deal with the different continuums of lived traditions and engagements with the environment.

Key words: Sound, soundscape, acoustic environment, listening, experience, cultural heritage, tradition, archaeoacoustics, ethnomusicology, acoustic ecology, cultural studies, cultural echology.

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The Stones Themselves

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There are certain natural rock features as well as stones incorporated into monumental structures that have the distinctive ability to issue musical sounds when struck with a small hammer stone. They can emit gong-like and 'tin drum' sounds, pure bell-like tones, and other sonorous effects that would normally be expected from metallic rather than stone objects. The kinds of rock involved are usually of an igneous nature, particularly granite and diorite, though there are exceptions – especially calcite deposits in caves. Though not exactly rare, ringing rocks are uncommon. They are known by a variety of names in English: ringing rocks, resonant rocks, lithophones, bell stones, sounding stones and rock gongs, among them. In this paper, the first two of those names will be used interchangeably, but the term 'lithophone' will be used to distinguish ringing rocks that show physical evidence of having been used by people or which at least have folklore or ethnological evidence associated with them.

The study of ringing rocks tends to register down the interest scale of scientific archaeoacoustic research. This is ironic, because ringing rocks have a cross-cultural and cross-temporal pedigree, and can attest to prehistoric and ancient usage or veneration more readily than can most other forms of archaeoacoustic investigation, even those employing electronic equipment, because however sophisticated such methodologies are, the ancient intentionality behind those acoustic findings can, in the final analysis, only be interpretation. That is largely not the case with ringing rocks, which are discussed in this presentation with regard to archaeological and ancient ritual contexts. Examples are cited to demonstrate the significance paid to ringing rocks in the ancient world. Some of the findings of a field study of the soundscape at the Welsh source area of the Stonehenge bluestones are also given. Finally, possible ways to make the study of ringing rocks more scientifically amenable are suggested.

To enable a short delivery, this paper will be accompanied by audio-visual illustrations.

Key words: archaeoacoustics; ringing rocks; lithophones; soundscapes.

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Sound and Silence: Shamanism, Initiation and Acoustics in Folklore

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Evidence for shamanism, ritual initiation and acoustics can be found in intangible heritage such as folklore and mythology. Though such interpretations are not widely accepted this paper endeavours to demonstrate otherwise via comparison, analysis and by using some ethnological comparisons where possible. For example, the use of Jaw harp in folk music, folk tales and recorded in ethnographic findings demonstrates the use of this instrument and its sound in shamanic rites to enter other worlds (altered states of consciousness) which elicits similar effects in non-shamanic cultures. The short myth about Seisyll Esgairhir recorded by Gerald of Wales (Giraldus Cambrensis) during his visit to the Cantreff of Cemais in Wales suggests a shamanic initiation in conjunction with toads. The ultimate sickness, death and defleshing of the individual via animals or spirits is something seen in some shamanic traditions. The tale of Auburn Mary in the battle of the birds suggests a similar shamanic initiation. Alternatively, legends like the Buried Moon indicate the importance of total silence in initiation rites.

The work by Paul Devereux on archaeoacoustics in such places as Wayland Smithy show the use of acoustics in a practical sense in a place inextricably tied to folklore and myth. The Brothers Grimm tale (number 28) of the singing bone where the deceased speaks through a flute has similarities to how Mongolian shamans can speak to their spirits through their harps (via sound) or other instruments.

Whether there are talking bones, music from fairies enticing people into other worlds, entering caves and mountains there appears to be a link between acoustics (or the complete lack of), initiation, shamanism and entering the otherworld within these stories. If so, these stories may have much more to tell us about our own history and ourselves than how they first appear especially when compared to ethnological data.

Key words: Sound; initiation; ethnology; intangible heritage; shamanism.

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Knowledge Production in Archaeoacoustics Epistemic Ephemera

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This paper is an investigation into the nature and types of knowledge produced through the study of archaeoacoustics. The study of an archaeological site's acoustic environment or the acoustic properties of individual artifacts yields data that are correlated with knowledge of contemporary sonic phenomena. This creates knowledge about the ritual practices, musical forms and traditions, architectural and instrument design skills and their understanding of physical, social and mental phenomena concomitant with those skills. We explore here the idea of crafted items as epistemic objects and sound as a carrier of cultural information and its place in sociocultural structural forms. Through an interdisciplinary approach that includes archaeology, anthropology, acoustics and cultural studies, we examine the meaning and knowledge making processes involved in generating, receiving and containing sound.

Key words: Knowledge production, epistemic, acoustic.

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Session 23-1

Prehistory and society: museums, education and media

SESSION ABSTRACT

The role of Prehistory in society has evolved throughout over 150 years of research and education, but fundamentally remains focused on four core and crucial domains: the affiliation of the human past to a natural history of human evolution; the building of expanded scales of time and space when perceiving and understanding life; the approach to the mechanisms of human adaptation to contextual changes, including human agency; the understanding of the integrated nature of analytical sciences, fostering on one hand interdisciplinarity and, on the other, social participation in the construction of scientific data (transdisciplinarity). Also, the means of knowledge socialization have structurally remained the same: the organization of collections of past remains (artifacts and ecofacts) and their interpretation in museums; the construction of new knowledge through research-based education; the promotion of massive dissemination of knowledge through communication media. These latter dimensions include the crucial integrated conservation, study and protection of both sites, moveable heritage and documentation associated to heritage, together with a development dimension that includes daily life of local inhabitants.

Although the tools in each of these chapters may have changed from the mid-19th century to the dawn of the 3rd millennium, they remained fundamentally similar in purpose and strategy: an historical understanding of the past, rooted in reason and science. However, for the past few decades, and particularly since the beginning of this century, social relevance of History has been growingly challenged by discourses on memories and identities, with relevant impact on museums (growingly focused on narratives and performance, and less in remains and processes) and on education (growingly focused on context-based stories and not on human natural history). Even if media has changed less, since its focus has always been “dramatic novelty”, the contemporary trend towards showcasing isolated “scenes” and curiosities, rather than wicked processes also has relevant implication for society.

This session calls for contributions reflecting on these mechanisms and trends, but also on the challenges and responsibilities of prehistorians in these three domains: museums, education and communication. The session calls for a reflection on the need to structure networks of museums as a matrix for promoting the social understanding of prehistory as an integrated approach of diverse human, social, natural and hard sciences. The organizers invite contributors to namely reflect on the interaction between museums, research, education and the structuring of socially shared mindsets.

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Comprendre la pensée humaine par sa préhistoire

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L'émergence de la pensée se traduit par de nombreuses manifestations matérielles dont la succession reconstitue l'emprise de l'esprit humain sur les conditions de sa destinée. Chaque étape renouvelle sans cesse une succession de défis comme si ces actes modifiaient continuellement la pensée.

Allourdir le geste par de simples cailloux sollicite l'intelligence extra-somatique et poursuit l'extension de la volonté sur la matière. L'évolution se poursuit selon les mêmes schémas, en reflétant les concepts nouveaux dans la forme des objets, vers la tendance à laquelle ils participent, vers l'équilibre qui satisfait autant l'efficacité que l'élégance, du biface au Levallois, à Lascaux. Le feu participa à une maîtrise en faveur de la convivialité et contre les lois naturelles. Les pratiques de chasse élaborées, les sépultures, les arts et les mythes, sont à chaque pas dans une position relative aux précédents selon une « structure diachronique » universelle qui fonde la pensée actuelle.

L'ordre de notre espèce se bâtit comme les tuiles d'un toit et va sans cesse dans la même direction. Il est aujourd'hui comme le miroir des étapes traversées, comme le négatif de notre histoire matérielle et spirituelle. Comprendre le fonctionnement de ce mécanisme, revient à nous comprendre nous-mêmes.

L'agriculture, par exemple, fut prévisible, puis documentée plus ou moins tôt selon les milieux. Les soubresauts des périodes actuelles n'ont rien d'aléatoire, car ils paraissent identiques et reproductibles en toutes périodes, en toutes régions.

La préhistoire permet de mieux les comprendre, voire de les prévoir et de les éviter. L'humanité n'est qu'un arbre dont la croissance résulte sans cesse des structures précédentes, fondées sur le même moule: seul le contexte varie.

Mots clés: Pensée humaine, Préhistoire.

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The Miskolc-centered archaeological education, research and tourism an example for organizing a network

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First findings which seemed to be of Palaeolithic origin in Hungary were found in the 1850's in the vicinity of the capital, Budapest. Despite this, the constructive discussion leading to the initiation of Hungarian Palaeolithic studies started in 1891 only. In this year three chipped tools were found in the regional centre of present-day North Hungary, Miskolc, two of which are particularly well worked bifacial leaf shaped tools, still regarded as unique. The debate similar to that of Boucher de Perthes in France, also lasting for one-and-a-half decade, was conducted and successfully closed by the renowned polyhistor Ottó Herman (1835-1914).

Systematic exploration and research on the Old Stone Age in Hungary started with the excavation of the famous Szeleta Cave from 1906, and continuing efforts rendered the Bükk Mts. and North Hungary to one of the most explored areas of Europe. The main basis of these studies became the museum of Miskolc for a long time, founded in 1899 and named in 1953 after Ottó Herman. There was a plan for also founding a separate museum devoted entirely to the age of the Prehistoric Man, but it was not carried out for three decades and then it was abandoned. The idea was taken over in the end of the 20th century by the Public Foundation for the Szeleta Culture. The foundation induced also the publication of the *Praehistoria* international research journal from 2000, supported by the cooperation of the University of Miskolc and the municipality of Miskolc.

The organization of the Prehistoric research and education was taken over by the University of Miskolc in 1994, starting a special course for Prehistory on the Faculty of Arts, then from 2015 an accredited archaeology course. The next step of the development recently is the cooperation of the university and the museum following the lines of the dual education system.

The Bükk National Park is getting near to finish the implementation of the "Szeleta Park and Visitor Centre", added to the network of visitor centres and archaeoparks established for other significant and well-explored prehistoric cave stations, Istállós-kő Cave in the west and Suba-lyuk in the south. We are looking forward to a real continental research and education network with a cooperation of several European institutions, which could effectively contribute as a third integrated partner to the development of the archaeological tourism within the frames of the cultural tourism.

Key words: Ottó Herman Múzeum, Szeleta, Suba-lyuk, Istállós-kői-cave, institutions network.

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Educate about environmental and cultural sustainability through prehistoric collection. The case of the Museum of Paleontology and Prehistory “Piero Leonardi” of the University of Ferrara, Italy

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The collections kept in the Naturalistic Museums have much to tell about their past and to teach about the future, especially the prehistoric collections that through a journey in human evolution show a surprising connection to our present and what will be our future.

The question that the Prehistoric Museum has to ask to itself is: how to educate and teach prehistory in the best way to understand the importance of this discipline and collection to their public?

Nowadays, museums are facing multiple tools and strategies to communicate their collections in innovative and engaging ways by making the visitor an active part of the educational process.

Succeeding in this objective means creating communication paths that stimulate the user's critical thinking and curiosity also by taking advantage of digital tools that are more easily able to engage new generations as well as valid tools for wider accessibility of museum collections.

The importance and relevance of prehistory as a historical science lies in its inter-disciplinary nature, which allows us to reflect on the beginnings of human life in all its aspects.

Learning about prehistory means understanding the different stages of human evolution from how environmental modification influenced and determined the first human migrations to how humans exploited the resources of their territory moving from hunting-gathering to breeding to the Metal Age. These are fundamental topics to analyze and deeply understand human social and cultural progress reflecting on current social phenomena, such as that of migrants, exploitation of natural and mineral resources and climate change.

For this reason, education about prehistory plays a key role and the "Piero Leonardi" Museum of Palaeontology and Prehistory of the University of Ferrara is moving exactly in this direction.

The idea of the “P. Leonardi” Museum is that of enhancing its collections through the power of a multi perspective narrative and digital accessibility, communicating the prehistoric collections related to human evolution with the application of different perspectives and the geographical contextualization of the findings and the historical context.

This methodology aims at facilitating the logical connections between the event and the phenomena, stimulating critical thinking and valorizing the museological collections in a more dynamic way.

Key words: museum; prehistory; education; sustainability.

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Le Musée d'Anthropologie préhistorique de Monaco, centre de recherches et de diffusion scientifique

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Le Musée d'Anthropologie préhistorique, premier musée monégasque, fut fondé en 1902 par le Prince Albert Ier de Monaco. Il s'adapte et se renouvelle depuis plus de 120 ans, grâce à un des programmes de recherches et de médiation scientifiques. Cette contribution étaye quelques clés de réflexion intéressant un institut dédié à l'étude des Origines de l'Homme et à la valorisation du Patrimoine de l'Humanité, au cœur de problématiques et de collaborations internationales.

Key words: museum; Monaco; research; mediation; education; science; history.

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Musées au Maroc entre héritage et évolution, Quelles représentations identitaires

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Les musées marocains ont connu une évolution importante depuis leur création à l'époque protectorale marquant l'héritage patrimoniale local, permettant aux territoires de se mettre en valeur grâce à la collecte, la conservation, l'exposition et la communication des objets muséalisés. Les institutions muséales sont devenues des plateformes de référence et des lieux de rencontre culturelle. Elles reflètent ainsi les préoccupations identitaires et les intérêts patrimoniaux de la population marocaine. Cette proposition met en exergue une réflexion sur le passé-présent des musées marocains en partant de la relecture de l'héritage muséologique colonial qui a profondément marqué les musées marocains. Tout en avançant remise en question de la muséalisation menée par protectorat, de même qu'il sera une occasion pour approfondir la question du reflet identitaire des muséalia et celui de l'institution muséale marocaine en général.

Key words: Musée, patrimoine, identité, héritage, population locale, territoire, tourisme, Maroc.

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Crude stones are the human legacy: Towards a valorisation of prehistoric heritage in small museums through innovative strategies

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The significance of the study of the distant past within the temporal facet of cultural heritage being the legacy of humans passed from generation to generation is underrated in the current general consciousness. The early prehistoric archaeological record provides us with a physical, tangible link to our biological and cultural roots on a global and deep time scale, but these objects generally manifest as inadequate proof whose value lies in the body of knowledge that they represent, often not immediately apparent to the public. The much older Palaeolithic artefacts are the best exemplification to this: lithic industries appear as mere “broken rocks” and “chipped stones” but are some of the foundations of ancient technology, human-environment interactions over time, and human evolution. Such lack of connection to and public appreciation of the existence, meaning, and value of these elements render this heritage rather semi-invisible. In the museum context, this creates the need for a well-grounded strategy that: 1) enhances the promotion of Palaeolithic prehistoric heritage, 2) fosters the divulgence of scientific knowledge, and 3) works well within the limits of public administration, especially in small museums. The potentiality of capitalising on information and communication technology (ICT) to develop innovative tools for promoting especially crude stones and lithic industries as a major element to the human legacy is hereby recognised. Here we present the preliminary phase of this project.

Key words: Prehistory, Palaeolithic, heritage, museum, valorisation, ICT.

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Fostering societal critical reasoning through Prehistory: the experience of the Museum of Prehistoric Art of Mação, Portugal

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As elsewhere in Europe and beyond, the academic and scientific assessment of the past driven by History has been largely captured by a new trend of narrative-oriented approaches, that focus on isolated “moments” and “sound-bites” (discoveries, monuments, etc.), and often ethnocentric discourses, rather than on the understanding of processes, complex adaptation mechanisms or integrated long time series and extended space contextualization’s.

This drive is largely the consequence of post-modern relativism and produced a growing societal consumption of prehistoric “news” as commodities, despite the interest of people in understanding the past. This paper revisits the strategy of the Museum of Prehistoric Art of Mação, re-structured as such c. 20 years ago to become, simultaneously: an advanced international research center; a local museum focused on a highly “abstract” concept; a space for contemporary social debates; and a bridge between those debates and the understanding of mechanisms of human performance through prehistoric studies. After an initial core exhibition on the dawn of food production (to bridge the debate on environment and climate implications for human societies), a new core exhibition focuses gesture in its dimensions of creativity, construction and communication. The paper presents some examples of activities and assesses the impact of such strategy so far.

Key words: Museums, Science, History, Society, Mação.

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Cultural Events and Sustainability a Link between Past and Contemporary Issues, Case Study on the Grand Egyptian Museum and Cosmopolitan Museums

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Event management is an exciting and continuously growing industry. It attracts people who possess creative talent and organizational skills. Culture event can be fundamental in connecting between past and present as well as creating positive change in society by changing attitudes towards museums which are not only a place for displaying objects but rather a place that makes a social change.

Nowadays, in the field of museums, visitors tend to consult interactive and dynamic activities and not only receiving information on the displayed objects. This shift applies to cultural events and their accompanying assets as well as cultural organizations that provide many ideas that may help decide how to spend leisure time optimally.

Cultural events could be special separated planned events or even serious related ones to serve specific messages. It also could vary between outreach events, open-air events, special day events, gallery takes for exchanging ideas, conferences, concerts, and Museum nights. In addition to civilized culture events for special cases related to SDG's, climate change and archeological object with specific themes.

This study aims to highlight the importance of cultural events attached with exhibition that connect archeological object with contemporary issues and link it with sustainable development goals.

This topic will be completely challenging. To manage such events in a fully organized way will be subject to discussion. Local and international examples will be presented to reach a high-quality standard of such participation.

Additionally, the researcher will integrate archeological object and compare it with up to date issues to enhance the social understanding of specific theme.

This value becomes very clear when documenting the numerous events that are increasingly being staged by these museums and art galleries.

Key words: Culture; Event; Sustainability; Social Science; Museum.

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Sensorimotor stimulation in archaeological education - a key concept for teaching and learning the past

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Modern realities are opening up a number of new opportunities for conducting education. However, the amount of stimuli received by a person can have the opposite effect to that intended by the educator. As child pedagogy shows, the best way to achieve tangible results of educational activities is 'learning by doing', which allows to expand the competencies of the audience and their development. This poster presents the sensorimotor advantages of experimental archaeology and the possibility of its use in effective archaeological education at the social level.

Key words: sensorimotor stimulation, archaeological education, child pedagogy, experimental archaeology, teaching and learning the past.

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Time Maps: A digital museum to explain prehistory

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Archaeology in recent decades has become more open to society, and prehistory has begun to be explained with the help of archaeological parks or increasingly sophisticated museums. Apart from these experiences for the public, the study of the prehistory of a place must also involve the communities living in the area, or near archaeological sites, because the discovery of a culture from the past can contribute to the identity of the community in many ways.

Relating prehistory to the local community was the subject of the project "Time Maps: Virtual worlds, real communities, experimented pasts" (www.timemaps.net), which focused on the transfer of prehistoric and ancient technology know-how to different European communities in Romania, Sardinia, Italy, Greece, or Portugal. This archaeological activity, with a high educational and social value, was carried out starting from the real world of archaeological experiments and then transferred to the digital world, to evoke the prehistoric or ancient contexts of different sites using Augmented Reality, Virtual Reality, Augmented Virtuality.

The life of prehistoric societies is difficult to evoke using a traditional museum. That is why in the Time Maps project, to evoke life in prehistory, archaeological experiments have been preferred, which bring, in addition to scientific results, phenomenological information, whose sensory experience captures a fraction of the reality of the past. Also, all the digital techniques already mentioned created visual evocations, in which the observer could immerse himself and have another experience of material culture and space.

The data resulting from the experiments were stored in a digital form and required a special form of communication to the public. Thanks to new digital technologies the concept of the museum has changed radically in the present century. Thus, the Time Maps platform functioned as a complex digital museum, with documentary sources divided into different categories with educational value, directly connecting both local communities and the public with all the know-how resulting from experiments and scientific research. The local communities were also connected to each other, forming a knowledge network for a new vision of European prehistory and antiquity.

The paper will present different ways of evoking European prehistoric sites and how the information was transmitted to local communities and the public.

Key words: Time Maps, prehistory, digital museum, local community.

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“Pamana: Voices of Philippine Heritage” - An Engaged Participative Project created by Archaeologists and Filipino Migrants in Barcelona, now expanding worldwide

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This project is an example of the positive social role that archaeology can take by the means of museography. It focuses on Philippine heritage and is the fruit of a collaboration between archaeologists and a part of the society seldom exposed to the latest findings of science: migrants, here of Filipino origin, living in Barcelona. When they are exposed to archaeological and ethnographic data from their country of origin, migrants living in countries such as those in Europe and the Americas, are presented with information on their heritage by museums whose curators have sometimes never even set foot in the country they are portraying. This situation has been denounced by migrants of all origins, particularly from Latin American countries in the city of Barcelona, which is characterised with a powerful tapestry of associations. In this paper, we present a joint project called “Pamana: Voices of Philippine Heritage,” conducted hand-in-hand by researchers and members of the Philippine community in Barcelona. Together, we organised guided tours and workshops at the Museum of World Cultures in Barcelona, and created an exhibition linking the past to the present through the theme of migrations, “Movements and Trajectories of the Philippine Identity.” Through close collaborations between scholars and the Philippine community, activities and content were designed in order to integrate the voice of Filipino migrants in discourse on heritage of their country of origin, as well as the voices of researchers, members of ethnic minorities, artists, officials, and Filipino researchers. Something repeatedly mentioned during discussions with members of the Filipino community in Barcelona is that they felt like second-class citizens. At the same time, despite the fact that the archipelago was once a Spanish colony, it became increasingly clear that Catalan people were largely ignorant of Filipino past and present cultures. “Pamana: Voices of Philippine Heritage” was designed to tackle these issues, encouraging a feeling of pride in members of the immigrated community and stimulating a reflection about its members’ identity(ies). By doing so, we hope that it contributes to the empowerment and integration of people of Filipino origin in Europe. We will also discuss an unexpected development of the project: due to local demand, the exhibition will now travel to the Philippines, and expand with contributions from other stakeholders from different cultural and professional backgrounds.

Key words: Participative; social; exhibition; diachronic; migration.

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Museums of Angola and their Sociocultural Impact on History Teaching the History

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Museums, all over the world, have grown and stood out, over the last decades, as new modalities of educational spaces. In general, they are studied and understood by researchers as spaces for the institutionalization of memory where it is closely related to the individual and society. Through this approach, the aim is to study more about the sociocultural path of museums in Angola and reflect on their contribution in contemporary times, considering that museums must break free from their traditional missions (collection, conservation and exhibition) and focus on the perspective of research, education, communication and interactivity. This study is of immense importance for the domain of social history, as educators can use the museum, rethink their pedagogical practice and bring meaningful approaches to students, so that they understand history as a living and dynamic discipline, relating it to a way of important and pleasant learning, in addition to arousing the interest of students and researchers to study, more and more, the historical, anthropological and sociological aspects in the musealization processes of the historical and cultural heritage, and to reflect to what extent the institution becomes the agent of change and sustainability.

Key words: Angola, Museum, History, Communication, Change, Society.

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Session 7-1

Archaeometry of prehistoric and protohistoric stone, metal, ceramics and glass

SESSION ABSTRACT

The UISPP Commission for archaeometry presents a proposal for a session covering all aspects of analytical approaches applied to the study of archaeological finds of stone, metal, ceramics and glass. Materials of all periods from Prehistory to the medieval protohistoric cultures and civilizations will be taken into consideration. Special attention will be given to the quality of analytical performances. Special cases on how general problems concerning the various materials can be solved by applying diverse analytical methodologies, case studies on ancient quarries, the production of stone artifacts from various contexts, researches on mining, analyses of smelting remains, metal finds, metal workshop remains, ceramics of all kinds and periods, and researches on glass production, glass workshops, glass/glazed objects, coloring of glass/glaze and pigment will be collected and presented in different sections. A further aim of this session is to share the latest results and experiences that can provide useful information, the comparison of several methods and technologies, and the possibilities of standardization of test and database protocols.

Main Organiser

Béla Török

Co-Organisers

Alessandra Giumlia-Mair

Mohammadamin Emami

Use of spatial analysis of artifacts from colluvial sediments from the mining field at site 24 in Poręba Dzierżna (Lesser Poland Voivodeship, southern Poland) in the reconstruction of the place of their original deposition

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A prehistoric flint mine in the Udorka Valley (site 24 in Poręba Dzierżna, Lesser Poland Voivodeship, and southern Poland) was discovered in 2013. Systematic excavations have been carried out since 2018 and are still being continued by the team led by M. Sudoł-Procyk. The study was supported by the National Science Centre, Poland (grant number 2018/30/E/HS3/00567).

The mining field in Poręba Dzierżna is distinguished by its location on a steep valley slope and its own, well-preserved terrain form. A deep layer of colluvial loess, which largely covered the relics of mining features, has been documented in the area studied so far. The chronological framework of the activity of prehistoric miners at the site was determined on the basis on OSL and radiocarbon dating as well as stratigraphic evidence. The obtained dates indicate that the mining shafts examined so far should be associated with the early Mesolithic. At the same time, dates indicating the Neolithic and the Early Bronze Age were obtained from the upper packages of colluvia filling the objects and overlying them. This could suggest a multi-phase nature of the site, which seems to be confirmed by the analysis of flint products. The inventory structure and the products' technological features in the upper part of loess colluvia indicate their connection with the mine workshop. The inventories in the deeper parts of the shaft backfills differ, suggesting their direct connection with the exploitation.

As one of the next stages of the study of the site, a project aimed at locating the original location of the aforementioned flint workshops is planned. The main analytical tool is a spatial analysis of flint products from displaced layers. It is planned to analyze the concentration of finds, their arrangement's direction and the inclination angle. On this basis, it is planned to trace the directions and characteristics of mass movements that could have caused the transport of materials and the destruction of the site. This will allow to recreate the redeposition process and, consequently, to situate the original location of the workshop.

During the presentation, the authors would like to describe the main assumptions of the project along with its first results based on the existing knowledge about the mining site in the Udorka Valley.

Key words: prehistoric flint mine, flint workshop, geoarchaeology, spatial analysis, southern Poland.

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The antique jewellery road of archaeological gemstones identification and characterisation of neolithic arabian beads

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The recent discovery of new archaeological sites in the Sultanate of Oman unveiled miscellaneous types of gem materials, mainly consisting of drilled beads, and it opened new considerations regarding the ancient exchange roads as well as the technology required for the preparation of the material. A deep archaeometric investigation allows in several cases to formulate hypotheses regarding the origin of the gemstones, the choice behind the materials selections, the techniques involved for cutting, polishing or treating the materials until the object shows the desired aspects.

In the last twenty years, increasing attention has been devoted to studying ornaments from prehistoric sites in Oman, from the chosen material to the developed chain operator. Here we present some beads samples from Maitan (SQJ, UQJ; Southern Rub Al Khali), Sharbithat (SHA-10; Eastern Dhofar), and Khuwaimah (KHU-4; South Sharqiyah). These sites have been surveyed and excavated in the “Arabian Seashores”

Archaeological Mission framework and the side-project “Exploring the Omani Rub al Khali.” The sites’ chronology ranges from the Middle to the Late Neolithic (6500-3200 BC) for SQJ and UQJ, Late Neolithic for SHA-10, and KHU-4. Unlike SQJ, UQJ, and SHA, where most of the beads are made in allochthonous stones, KHU-4 is an extended workshop where these artifacts are found at every stage of manufacture, from raw material blocks to the end product. Ornaments’ raw material, the applied technology, and their association with the other components of the material culture are important indicators of the degree of mobility, interaction, and cultural transmission patterns. Within the several materials discovered, a selection of beads and gemstones have been analyzed for identification. Indeed, starting from the previous experience of the research team [Al Kindi et al. 2021], a multitechniques approach has been developed to carry out a complete materials characterization. Particularly, the samples have been analyzed by combining micro Raman Spectroscopy (spot and mapping modes), Scanning Electron Microscopy with Energy Dispersive Spectroscopy (spot and mapping modes), X-Ray Fluorescence, Optical Microscopy, Manual Spectroscopy and Colorimetry. It is important to note that all those techniques have been applied with no sample preparations. The analytical protocol resulted very suitable for reaching a complete archaeometric characterization of the samples, thanks to the combination of chemical information, phase identifications, and crystallinity considerations with the samples morphology and their proper gemological classifications. Indeed, the samples were found to belong mainly to the apatite, carbonate, chalcedony, and green stones groups, respectively. Of course, several analytical challenges have been faced and discussed here, especially the ones correlated with the possible thermal effects and limitations of rough materials as a reference. An example of this is the identification of the neolithic omani amazonite bead, which opens many discussions about its origin. In fact, it comes from SH10 site, which is dated to 3350-3100 and therefore

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belong to the last phases of occupation; thus it is very rare in large pre-Islamic sites (Khor Rori). Further analysis will be necessary in order to compare it with deposits in Saudi Arabia and East Africa.

Key words: Archaeological Beads; Sultanate of Oman; multidisciplinary approach; Mapping techniques.

Handheld XRF in ceramic studies - pros and cons

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Handheld X-ray fluorescence spectrometer in the last decade become very popular and nowadays is a well-established device in archaeometry. This paper presents critical reflections based on the practice of using a spectrometer over the last years and tries to highlight both the advantages and disadvantages of this tool.

First models of handheld spectrometers used for the analysis of archaeological artefacts appeared in the 1960s. In the next decades rapid development of compact spectrometers enabling field analysis occurred. There are several arguments in favour of using this device. The spectrometer is relatively small and user-friendly, both in the laboratory and in the field. It enables determination of about twenty chemical elements depending on the device model and analytical mode. Data can be collected within seconds or minutes. The character of the analysis is non-destructive: the sample needs no special preparation, at least hypothetically, as the practice shows that for example by grinding the sample it is possible to obtain more precise results.

On the other hand, the scope of analysis is limited only to the surface of an investigated artefact. Pottery is not a homogeneous material and in consequence the results of surface analyses can vary between them. What is more, the temper can seriously affect the overall results. The solution is to perform multiple analyses in different points and calculate the average. The results of investigations using a handheld spectrometer will not be as precise as those obtained through destructive laboratory analyses. However, this device provides valuable information about the elemental composition of the pottery fragment, at the same time preserving the integrity of the artefact.

Spectrometric analysis constitute an important supplement to microscopic observations. Of course they cannot be treated as an automatic solution to the problems of provenance. The paper includes examples of recent research that demonstrate the chemical heterogeneity of pottery that are typologically and technologically very similar or even indistinguishable. It is argued that this diversity is a result of different traditions in clay preparation.

Key words: handheld XRF; pottery; archaeometry.

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Tracing the Cultural and Trade of Pyro-technology in 3rd Millennium BC in “Shahdad” Through Pottery Analysis

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Shahdad is located on the western side of the Lut desert in the south central Iranian Plateau. Shahdad has been a major focus of archaeological research in the region due to extensive metallurgical activities documented at the site during the Bronze Age and also for having the most abundant remains of copper metallurgy in south-eastern Iran. Due to the archaeological studies on the vast peripheral area, the settlement was a permanently occupied city during the 3rd millennium BC. New excavations at Shahdad offer a unique opportunity to reconsider the pottery production which were probably related to metallurgical practices in 3rd Millennium BC. This research will focus on the characterization of typical Shahdad pottery styles which have been scattered across the area in association with amounts of ancient metallurgical remains such as copper ores, moulds, crucibles, furnaces and metallic residues. The typical characteristic style of the pottery are their dense structure and almost heavy with rough fabrication. The potteries have been studied through optical microscopy, environmental scanning microscopy, XRD and XRF, in order to determine their chemistry, micro-chemistry and mineralogy.

The evident complexity of pottery production at Shahdad may eventually allow us to establish more precise knowledge of the timing of innovations and/or the adaptation of technological features which have been observed in the overburden of Shahdad and as yet have not been scientifically documented. The scientific examinations on pottery corpuses were recognized new information regarding the microchemistry and production techniques of potteries and their possibly potential application for metallurgical purposes.

Key words: Pottery Production, Shahdad, Mineralogy, Archaeometry, Pyrotechnology.

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Organic Residue and Trace Element Analyses from Aegean-type ceramics from Roca Vecchia (Le, IT)

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We present the results of Organic Residue Analysis (GC-MS) and Trace Element Analysis (NAA) from 30 Aegean-type vessels – both closed and open shapes – from the Bronze Age fortified settlement of Roca Vecchia in Southern Apulia (IT). This site represents a key case study for investigating interaction dynamics between southern Italian and Aegean communities from the 16th to the 11th century BC, as it is one of the few sites in Italy with a very large number of Aegean-type pottery belonging to different ceramic classes and forms.

These analyses have been carried out in the frame of a wider project aimed at investigating various aspects of the production, exchange and use of ceramics at Roca Vecchia. Residues have been identified in most vessels and can be referred to five organic products, variously mixed: animal fats, plant fats/oils, waxes, resins, fruit and/or fermented fruit. For some of the sampled vessels, trace element analyses (NAA) point to a provenance from Crete (Chaniá), Greece (Achaea/Elis) and Apulia. Several vessels, including a large closed-shape recipient imported from Achaea/Elis, contained a resinated wine. It seems that wine was sometimes mixed with other ingredients, such as dairy products; this practice is documented in the Iliad and Greek, Italic, and Etruscan contexts. Organic residues analysis (ORA) testify to the presence of different contents in the same pot. This is the case, for instance, of the stirrup jar from Western Crete, which contained resinated wine and plant oil, or of the Minoan stirrup jar, which had plant oil but also wine/vinegar and ruminant adipose fats. Sulphur has been identified in different samples. The latter has been primarily interpreted as an ingredient of grape juice derivatives. Still, it could also be interpreted (at least in some specific cases) as the result of the ritual practices carried out in the so-called Cult Center of Roca Vecchia.

Key words: words: organic residue analysis; trace element analysis; Aegean-type ceramics; Bronze Age Italy; Roca Vecchia.

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Cross-craft interactions in the production of a Middle Bronze Age crucible identified in the Lower Danube region

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The Lower Danube region represents one of the most important trade routes used since the early prehistory whereby fundamental innovations and technologies were often transmitted, transformed, and adapted through it. The various Middle Bronze Age groups followed different pathways with distinctive endpoints, which caused a significant degree of variability in the transmission of technological knowledge. The Danube Valley and an extended part of the Southern Plain of nowadays Romania were occupied by Verbicioara culture (cca. 2200/2000 – 1500/1400 BC) well known for its exquisite ceramic repertoire. Besides the very diversified ceramic production, within the Verbicioara sites various gold and bronze artefacts were identified, sometimes associated in funerary contexts. Although no metal production sites were identified in the Verbicioara area, a very specific category of ceramic artefacts used in the various sequences of metal processing was reported.

This study focuses on the Scanning electron microscopy with energy-dispersive X-ray spectroscopy (SEM-EDX) analysis performed on a crucible and on ceramics identified at Rogova (Mehedinţi County) for tracing the degree of technological similarities between these artefacts.

Key words: MBA; crucible; pottery; technology; archeometry.

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A timeline of alloys, impurity patterns and provenance of prehistoric metals in Lleida province (NE Spain)

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The Project 'MOBICEX. Mobility, Circulation and Exchange in the Western Catalanian Plain between the 3rd and the 1st millennium BCE' (PID2019-110022GB-I001) has allowed us to design a sampling of metals and metallurgical remains to detect the evolution and changes from the first metals in the Chalcolithic to the Iron Age, comparing three basic aspects in metallurgical research:

1. 1.- Changes in the alloys, from copper to leaded bronze, including those with arsenic.
2. 2.- Changes in impurity patterns based in the presence/absence of As, Sn Ag and Ni (Oxford model) as a first approach to changes in raw materials.
3. 3.- Provenance based on lead isotopes.

Combining these 3 types of data we can propose a timeline to explain if the cultural changes, that allow us to divide the historical periods, are accompanied by changes in the production and consumption of metals in this inland area of NE Iberia, where there is no maritime connectivity.

The analytical techniques used was pXRF (INNOV-X) for elemental analysis and MC-ICP-MS for lead isotopes.

Key words: Copper-base metals; Alloys; Provenance, XRF, Lead Isotopes

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Where the lead comes from? High-leaded palstaves from northwestern Iberia as case study

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High-leaded bronze is an alloy frequently used for the production of double-looped palstaves in north-western Iberia. These artefacts were usually recovered from hoards containing between two and more than a hundred axes. The interpretation of these hoards is still an open debate, and new insights could be gained from a better understanding of the provenance of lead that usually occurs in such high levels.

Aiming to draw a general picture of this issue, in this paper we present new lead isotope analysis (MC-ICP-MS) of some palstaves from the British Museum collection together with an assessment of some other published data. Local galena must be discarded as a real option to produce lead. Taking into account both the options to obtain these high-leaded alloys as well as which element decrease with the addition of lead in a traditional bronze alloy, we suggest that both copper-lead ingots and galena ores from different regions of south-eastern Iberia arrived to the Northwest, where they were subsequently alloyed with local tin to produce this particular type of axes in the Atlantic region.

Key words: Leaded Bronze, Palstaves, ingots, galena, XRF, Lead Isotopes.

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A multidisciplinary investigation into the Late Bronze Age plano-convex ingots from Portugal Enhancing our understanding of metal circulation on Europe's Atlantic fringe

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This contribution is part of ongoing work concerning the systematisation and analytical study of a collection of Late Bronze Age (LBA) plano-convex ingots from the territory of modern-day Portugal. This type of metal objects are quite rare throughout the region under investigation and their study has thus far received little attention from researchers.

The ingots analysed as part of this work come from two of the largest hoards discovered in central and northern Portugal, i.e., Quinta do Ervedal and Fonte Velha respectively. These are currently the only known examples of plano-convex ingots from the Portuguese LBA.

The main objective of the analyses is to determine the chemical composition (major, minor, and trace elements) of the ingots and their isotopic fingerprints, using a portable XRF spectrometer and a Triple Quadrupole Mass Spectrometer.

According to preliminary results, the ingots are primarily composed of almost pure copper, with small amounts of minor elements. Furthermore, preliminary isotopic data indicate that the raw materials used for their production originated from a non-local source. To sum up, it is expected that the data presented will be essential in contributing to a better understanding of metal circulation mechanisms during the Late Bronze Age on Europe's Atlantic fringe, thus contributing to the ongoing international debate on interconnectedness and interaction between LBA communities throughout Europe and the Mediterranean.

Key words: Western Iberia, Late Bronze Age, metal circulation.

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Metal Supply and Social Networks in the Irish Later Bronze Age

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In contrast to the rich archaeometallurgical dataset available for the Early Bronze Age in Ireland (2500-1500 BC), only a very limited number of chemical and isotopic analyses have been conducted on Irish Later Bronze Age metalwork (1500-800 BC). This is despite a significant increase in metalwork production during that period in Ireland. At the same time, the output of Irish copper mines appears to have plummeted, raising important questions concerning the provenance of the copper fueling that increase and the socio-economic implications of the processes underpinning those contrasting trajectories. We present a new project that, through an ambitious campaign of archaeometallurgical analyses and a corresponding programme of radiocarbon determinations on organic materials directly associated with metalwork, aims to answer some of those questions.

In our contribution, we offer a comprehensive overview of existing chemical and isotopic data for copper-base metalwork from the Irish Later Bronze Age. We also provide a detailed outline of the methodology and objectives of our project, aimed at determining the probable sources of the copper used for metalwork production in the Irish Later Bronze Age and at identifying any shifts in corresponding supply patterns. By contextualizing the results from our planned analytical work against the backdrop provided by the wider archaeological record, our project will ultimately try to assess the socio-economic implications of the observed developments for Irish Later Bronze Age communities.

Key words: Ireland, Later Bronze Age, copper, metalwork production, social networks.

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Huge amounts of iron raw material from the Early Iron Age settlement of Dédestapolcsány-Verebce (N-Hungary).

A preliminary archaeometallurgical study

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The team of the Institute of Archaeological Sciences of the Eötvös Loránd University has been investigating the Early Iron Age hillfort at Dédestapolcsány-Verebce-bérc (Hungary) since 2020. The settlement was destroyed by siege in the late 7th century BC, as evidenced by hundreds of early Scythian bronze arrowheads and burnt buildings. Based on the recovered metal and pottery findings, the settlement had its heyday in the Early and Middle Iron Age. The quantity of the Early and Middle Iron Age iron and bronze artefacts and pieces of iron raw material on the site is exceptionally high. Almost a hundred compacted pieces of iron blooms were found, two of which were forged into preproduction (bar). The average weight of the blooms was 1.54 kg. A few selected objects were sampled and subjected to archaeometric analysis (pXRF, OM and SEM-EDS). The main aim of the examinations carried out by the experts of the Archaeometallurgical Research Group of the University of Miskolc was the material characterisation of the samples to figure out what kind of processing has been applied and reveal how the iron raw materials can be connected in any way to the other iron objects found at the site. In addition, the microstructure of the examined samples was also compared with the results of investigations of other iron blooms found in the Carpathian Basin as well.

Key words: Iron Age; Scythian; raw material; archaeometry; metallography.

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Ring-pommel sword from Počapy (Horní Počaply, Czech Republic) – results of an archaeometric revision of one famous Roman sword

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The sword in question was found in the vicinity of Počapy (today Horní Počaply, Mělník district), a small town located at that time on the estate of the House of Lobkowitz. The date of its discovery is unknown, but it had to be in or before 1892 when the sword was mentioned by L. Píč in "Památky archeologické 15" as an exceptional find in the property of Prince Ferdinand of Lobkowitz. It was kept in the collections of the Lobkowitz family at the Château of Dolní Beřkovice, and was probably still there at the time of the Second World War. After WW2, however, archaeologists considered it lost, and all related publications were since then based on the description and illustrations published by J. Schráníl in his 1928 book "Die Vorgeschichte Böhmens und Mährens" and/or by L. Píč in his "Čechy za doby knížecí" from 1909. In 1978 the sword was offered by a private person to the Military History Institute in Prague, which bought it for its collections. However, the curator in charge at the time did not recognize that the purchased sword is the find from Počapy. It was registered as an "unlocated Roman gladius". In the 1980s, it was even published in a catalogue of the Army Museum exposition held in the Schwarzenberg Palace in Prague but archaeologists still considered it lost. It was discovered only in 2020 when a new permanent exhibition of the Army Museum was being prepared, that the sword is the Počapy find. After a long time, it is now back on permanent display.

The sword is dated to the second half of the 2nd century AD, the time of the Marcomannic Wars. From the beginning, it was said that the pommel was richly inlaid with silver (L. Píč) or even gold (J. Schráníl). Perhaps this is what made the sword famous. However, an archaeometric revision (X-ray CT, XRF, metallography), carried out in 2020, revealed that neither gold nor silver was used, but only brass. Nevertheless, the hilt is still one of the richest decorated within the ring-pommel group. The blade is pattern-welded with four separate untwisted PW stripes. In the past, the blade was broken into three pieces which were forge-welded back together; as a result, the blade is no longer straight and was originally at least 2cm longer. Further details on the original appearance and construction of the Počapy weapon will be given in an oral presentation. The story of this sword will also be used to demonstrate how re-examination of older finds can refine our knowledge of ancient material culture.

Key words: Ring-pommel sword, Roman sword, Počapy, Marcomannic Wars.

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Tracking metal histories and connections in 1st Millennium AD, Britain. Introducing the REMADE project (Roman and Early Medieval Alloys Defined)

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This paper introduces the REMADE project (Roman and Early Medieval Alloys Defined), which is a major new analytical project supported by UKRI (UK Research and Innovation) and hosted by the University of Reading, which studies the copper-alloys of the 1st Millennium AD across the UK. The chemical analysis of copper-alloy reveals the last composition of that material. Through combining published analytical projects and targeted new work, we aim to create a new framework for understanding British copper metallurgy in its wider context, over a prolonged period. Chemical case studies can demonstrate the close links at one time between different object classes, for example coins, brooches, militaria and toilet sets. Later, we can see echoes of key chemical patterns which show the importance of cycles of reclamation, reuse and mixing.

Alongside new chemical models and approaches to metallic histories, it will also discuss the importance of collaboration across all heritage disciplines. REMADE is working with major national museums, large independent archaeological units, smaller regional archives, trusts, and private collectors.

Wherever possible we want to work across boundaries in UK archaeology and help create new discussions. We will explore links and contrasts between: glass, metals, and ceramics; modern English regions, Scotland and Wales; Early and Late Roman, and the Early Medieval; and material recovered by universities, units, and private detectorists. Longer term, through working with small find specialists, theorists, and geographers we aim to support broader research aims; using metal as a lens for understanding identity, value and shifting connections across Europe.

Key words: Copper; Metallurgy; metal histories; chemical analysis; chemical models.

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A multispectral imaging approach integrated into the study of an ancient Egyptian decorated artifacts

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This work explores for the use of multispectral imaging (MSI) techniques in the investigation of polychrome layers and decoration materials (such as colored glass and semi-precious stones) applied to wooden artifacts from ancient Egypt. The aim of this work is to demonstrate how this non-invasive, relatively inexpensive, and portable methodology can be used to map the photoluminescence and reflective characteristics of polychrome layers and decoration materials under different wavelengths of light, as well as to provide qualitative and holistic insights into the chemical nature of the materials that compose them, as well as to evaluate the method's advantages and limitations when integrated into an analytical protocol.

Standardised acquisition and post-processing methods were applied to produce visible-reflected (VIS), ultraviolet-induced visible luminescence (UVL), infrared-reflected (IRR), infrared-reflected false colour (IRRFC), ultraviolet-reflected (UVR) and ultraviolet-reflected false colour (UVRFC) images. Additionally, two recently novel MSI methods (VIVL and multiband imaging) have been explored, which are believed to be of particular value for the study of Polychrome layers.

The application of MSI imaging to a variety of decorated wooden artefacts from ancient Egypt showed that it could help to reveal residual traces of patterns, characteristic pigments such as Egyptian blue, orpiment and indigo, and reconstruct original patterns and past restoration interventions. Furthermore, MSI proved to be a valuable tool in developing more targeted and effective sampling strategies, as well as in facilitating object comparisons. Aside from exploring the use of MSI techniques for the investigation of decorated layers and aiding in the interpretation of the images produced, this work illustrates how these techniques can be integrated into a multi-analytical protocol in combination with single spot analysis such as XRF and vis-RS to provide a better understanding of decoration materials such as colored glass and semi-precious stones applied to wooden artifacts from ancient Egypt.

Key words: Multispectral imaging; Ancient Egyptian artifacts; Pigments; Glass; Semi-precious stones; XRF; Vis- RS.

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12th century blue pigments on the frescoes of Novgorod's St. George's Cathedral

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An extensive collection of fresco fragments that in the 19th century had been removed from the walls and buried under the floor of the Cathedral of St. George was collected during the 2013-2022 architectural and archaeological excavations on the area of the St. George's Monastery at Veliky Novgorod (Russia), conducted by the Institute of Archeology of the Russian Academy of Sciences. Among the pigments employed for the frescoes there were different kinds of blue. A pigment consisting of rather pure lapis lazuli (lazurite) was identified with XRF and SEM-EDS. For its application a special technique was employed. At a conservative estimate, the fresco surface painted with lazurite amounted to around 70-80 m². This represents around 7% of all collected fresco fragments. The overall surface painted with the blue pigment would have covered around 180 m². After our measurements an average layer had a thickness of around 50 μm , the volume of lazurite pigment employed for the entire surface would be then 9.2 liters of dry lazurite (9200 cm³, without taking the binder into account).

Lazurite is considered the most valuable and expensive ancient pigment, as it was extracted and imported from very few deposits, the most important of which was that of Sar-e-Sang in the Afghanistan region of Badakhshan. It was used to decorate interiors in the East, but it got into the palette of Western European artists relatively late i.e., in the Middle Ages, not earlier than the 9th century. Now lapis lazuli is also found in Siberia, near Lake Baikal. It is known that the exploitation of the Baikal deposit began no earlier than the 18th century, but, as there are other possibilities, such as for instance the deposits in Tajikistan, and the minerals from the various deposits differ from each other, it still seemed useful to find out about the place of origin of the blue pigment in the paints of the St. George's Cathedral.

Lazurite contains a significant amount of sulfur, therefore, the $\delta^{34}\text{S}$ values of the blue pigment can be used to identify the lazurite deposit. The sulfur isotope analysis was carried out using the CF IRMS technique with FlashHT element analyzer. Lapis lazuli reference samples from Badakhshan (from +15.7 to 22.3‰), Tajikistan (+17.6‰), and the Baikal (+45.4‰) deposits were analyzed and compared with the sulfur isotope composition of the blue pigment employed at Novgorod. The $\delta^{34}\text{S}$ values of blue pigment from fresco fragments (from +21.1 to +23.5 ‰) are close to the Badakhshan lapis lazuli reference samples. Therefore, we can confirm that the origin of the blue pigment employed at Novgorod was the region of Badakhshan in Afghanistan.

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Ceramic technology at the Late Bronze Age site of Berzo Inferiore - Colle di San Michele (Valle Camonica, Italy)

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The San Michele Hill (municipality of Berzo Inferiore) is located in the middle-lower sector of the Valle Camonica, in the central-eastern Lombardy Alps (northern Italy). The top of the hill was the subject of stratigraphic investigations between 2001 (Rondini 2022) and 2022, which yielded a certain amount of protohistoric ceramic material. Although no remains of structures have been identified so far, the ceramic materials are of considerable scientific interest. First of all, they can be dated on a typological basis to the phase defined in Italy as Final Bronze Age 1 (around the second half of the 12th century B.C.), a period that is poorly known in the area to date but of crucial importance for the subsequent cultural developments in the Iron Age. Another aspect concerns the cultural analysis of this complex: the best comparisons for the San Michele ceramics are those with the Trentino-Alto Adige area, in the 'Luco A' cultural phase (Marzatico 2012), i.e. the main producer of copper in the Northern Italian Late Bronze Age economy. Until now, contacts between the Camonica Valley area and the Luco culture were meagre and sporadic: the data from Berzo Inferiore seemingly indicate a stable settlement, and represent an archaeological novelty of great significance.

The present study presents the first data from the archaeometric analysis of the Berzo Inferiore ceramics, in order to investigate production technology and the exploitation of natural resources. Among the objectives are the identification of the sources of supply of the ceramic inclusions, and to establish a technological comparison between the San Michele ceramics and those of the Luco culture centres, which have already been the subject of recent petrographic analyses (Donadel, Tenconi 2015; Saracino et al. 2018).

The study combines archaeological observations (shape, size, thickness, surface texture) with petrographic study of the mixtures. The methodological approach is reported in Solano et al., 2010.

Investigations conducted on 100 diagnostic sherds showed that more than 90 % of the sherds were made with a medium to very coarse mixture, filled with calcite fragments, predominantly spathic. The percentages of added fillers ranged from 20 up to 35 % vol. These inhomogeneities are partly justifiable by the hand-crafted production and partly related to the archaeological features of the objects. Low percentages of other types of fillers open the problem of the intentionality of their addition.

Key words: Late Bronze Age; Luco culture; Alpine archaeology; petrographic approach; Valle Camonica (IT).

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Focused ion beam (FIB) on FEG-SEM: A new and non-destructive method of investigating precious artefacts

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Focused ion beam (FIB) mounted on a scanning electron microscope with a field emission gun (FIB FEG-SEM) is a new method of investigation which offers new perspectives in the study of soft and multilayer metal artefacts. It enables observation and the making of cross-sections in situ within an SEM chamber, applying a focused ion beam (FIB) for milling the selected surface, and thus obtaining a local cross-section up to 100–200µm wide and 10–20µm deep.

This new approach is of particular interest in the study of precious cultural heritage artefacts, for which sampling is often problematic. Unlike classical metallography, FIB on FEG-SEM allows the making of accurate cross-sections without causing damage to multi-layer materials, as ionic ablation does not deform these soft layers. It is easier and faster than classical metallography and do not cause stress and surface modification. It is therefore particularly useful for observing and characterizing gilded artefacts. After milling, detailed structural information at the nanometer scale can be observed, documented and analysed. Further slicing of the material to extract a lamella of about 2µm thick, allows EDS analysis at 0° tilt and complementary characterization with EBSD (electron backscattered diffraction) analysis.

Applied here on hollow gilded copper alloy pendants (known as gombiky) from Prague Castle, dated to the tenth century AD, FIB FEG-SEM yielded new and accurate information regarding the thickness, porosity, metallurgical structure and general condition of these complex gilded copper alloy artefacts. The method brought new parameters for drawing comparisons between fine products produced by highly skilled jewellers and coarse imitations made by less-experienced craftsmen.

Key words: FIB FEG-SEM; gilding layer; jewellery Analysis.

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Session 8-3

“Simple but not simplistic”: Discussion on Bipolar Technology from different perspectives

SESSION ABSTRACT

Erret Callahan (1987) defined bipolar reduction as a type of rectilinear knapping involving a core between a hammer and an anvil, with the force oriented directly into the anvil rather than obliquely away from it. Bipolar knapping has been reported as a reduction or retouch strategy in different parts of the world from the Early Stone Age up to the 20th century. Even if in the last two decades its definition, description, and the confusion with wedges and chisels have attracted debate on lithic analyses, its identification, either as a knapping method or a knapping technique, still poses difficulties or is a source of controversy amongst many lithic analysts. In lithic technology studies, bipolar knapping has often been associated with a lack of ability in the knapping capabilities of hominins. Following this pejorative vision of this type of knapping, bipolar knapping has sometimes been associated with females or children by those that consider it as a simplistic way of knapping with low skill requirements. However, ethnographic studies, past and present, are helping to break down this negative perception of bipolar technology. Between the 1970s and 1980s, important ethnographic studies were conducted in North America, Africa, Asia, and Oceania that clearly demonstrated the complexity and variability of this type of lithic strategy and dismantled disparaging views and simplistic gender and age associations. The different types of applications of this knapping method or technique have already proved that it is not as simple a strategy as one might think, and it can even demand a notable knowledge of raw materials and rock mechanics. Some analysts have suggested that the lack of predetermination needed and ease involved in producing bipolar blanks is an indicator of an intelligent expedient lithic strategy to get the most out of raw materials. Thus, as Callahan proposed decades ago, it is simple but not simplistic. Besides the technological interpretation of this type of reduction, consideration should also be given to the social and cultural aspects associated with it, attested in many ethnographic works. In light of all of these aspects and issues, the bipolar technique still offers a set of unresolved controversies for Pleistocene and Holocene archaeology. Numerous experiments have been conducted in the last two decades towards the identification of this type of reduction and to clarify the confusion with intermediate pieces. Perhaps the challenge in the coming years is to decipher the variability associated with it and the economic and social implications of this technological choice. In short, the variation associated with bipolar reduction still has to be described and unpacked. Our session focuses on the bipolar technique in archaeological contexts incorporating lithic technology, ethnographic perspectives through archaeological analysis, methodological studies, and experimental work. Our aim is to evaluate and discuss the concept of bipolar knapping with regard to multiple approaches. In our session, all avenues within the framework of the bipolar phenomenon will be considered.

Main Organiser

Görkem Cenk Yeşilova

Co-Organiser

Paloma de la Peña, Andreu Ollé, Josep Maria Vergès, Shixia Yang

What does “controlled” bipolar look like?

An exploratory experiment

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In recent years archaeological experiments involving bipolar production have revealed insights into knapper skill-level, time efficiency, raw material differences, tool recycling, and flake and edge production, among other topics. To our knowledge, however, bipolar experiments are usually high in external validity with respect to certain variables, namely the employment of human knappers and stone nodules. Unfortunately, curiosity got the best of us. We started to wonder what a bipolar experiment higher in internal validity would look like, and what sort of flake products a “controlled” bipolar reduction would produce. So, in this exploratory study (which has not yet occurred at the time of this abstract’s submission), we will use the Kent State University Instron Materials Tester to “knap” glass spheres. For comparison, we – as full-fledged humans – will also knap the glass spheres with bipolar production. We will present the morphological analysis of the resulting flake production, discuss what we learned (if anything), and consider how these results might be applied to archaeological interpretation (or not).

Key words: Bipolar, Experimental Archaeology, Morphometrics.

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The bipolar technique from an ethnographic perspective

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The bipolar technique has been described by pioneering researchers in several ethnographic studies of indigenous peoples in the Americas, Africa, South Asia, and Oceania. Bipolar flaking refers to the reduction of a blank or core on a stabilized element with a moving object. Its mechanics require the use of both passive and active components – anvils and hammerstones. Although its simple application has been viewed by some researchers as an indicator of gender bias or low skill level, the bipolar phenomenon rather provokes significant discussion of technological skill and complexity. Additionally demonstrating this complexity is the ethnographically documented intensity of observation required by novices to learn the technique. This presentation aims to compile the scattered information in the ethnographic and ethnoarchaeological literature on the technological and functional variability of the bipolar technique. The ethnographic record shows that the bipolar technique was highly versatile and utilized to support a variety of functional purposes. Recognizing this variability has crucial implications for interpreting archaeological artifact assemblages and conducting experimental research on this widespread and long-lived lithic technology.

Key words: bipolar technique, ethnography, lithic analysis, ethnoarchaeology.

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2D geometric morphometric characterization of bipolar cores from different raw materials, an experimental preliminary assesment

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The identification of bipolar knapping has been a controversial discussion in lithic analyses because of its confusión with intermediary pieces such as chisels and wedges. Furthermore, the distinction between cores and blanks is not neat in anvil percussion. Nonetheless, several authors, such as Jeske and Lurie or Díez-Martínez, have highlighted that bipolar cores are morphologically distinctive and easier to identify than bipolar flakes. In this article, we enquire about the geometric morphometric distinction of bipolar cores. We use different experimental and archaeological collections in order to characterize morphometrically these blanks. Moreover, we also explore if raw material plays any role in the variation of morphology regarding bipolar cores. This exploratory work aims to help with the identification of this type of knapping in different archaeological contexts.

Key words: geometric morphometrics; bipolar knapping; core; technology

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Retouch-Like Scarring as a Byproduct of Bipolar Knapping at the Oldowan Site of Bizat Ruhama, Israel

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Bizat Ruhama, Israel, an Oldowan site in the northern Negev Desert dated to 1.2-1.6 Ma, was originally reported containing retouched tools following excavations carried out in 1996 by A. Ronen and J. M. Burdukiewicz. Retouched tools are occasionally found in Oldowan assemblages, mostly in small percentages and with no standardization. However, subsequent investigations into the Bizat Ruhama assemblage suggested that these flakes may not have been deliberately retouched. Instead, the scarring found on them may be unintentional byproducts created during the bipolar-on-anvil knapping of the flakes. These types of retouch-like scarring, such as Clactonian notches and small removals along a working edge, have been successfully reproduced using the bipolar technique to produce experimental assemblages. However, while it has been shown that the bipolar technique can produce these scars which mimic intentional retouch, no systematic methodology has been produced in order to determine the differences between the two. The aim of this project is to create a methodology which can be used to study and ascertain differences between intentional retouch and the retouch-like scarring produced by the bipolar knapping technique. This project incorporates the use of experimental archaeology to create two different experimental assemblages, one produced through the bipolar technique and one produced and retouched through freehand knapping. The identification of the origins of the scarring on the artifacts in the archaeological assemblage will then aid in the determination of the presence of retouched tools at Bizat Ruhama and Bizat Ruhama South and will help to determine the importance of the bipolar technique in the formation of the Bizat Ruhama assemblages.

This project seeks to contribute to the further understanding of the bipolar technique and its byproducts. It intends to create a methodology which can then also be used in the examination of other Lower Paleolithic assemblages associated with bipolar knapping to aid in the determination of the presence or absence of retouch tools. The determination of scarring as a byproduct of bipolar knapping vs. intentional retouch may also lend towards an additional understanding of the toolkit carried by hominins into the Southern Levant.

Key words: bipolar technique, retouch, retouch-like scarring, Oldowan, Israel.

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Bashing ugly stones to understand. The bipolar on anvil technique on highly-fractured flint slabs: the case of Isernia la Pineta (Italy), an experimental approach

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The role of the bipolar-on-anvil technique within lithic assemblages has witnessed a considerable reconsideration over the last decade, both from an archaeological and experimental perspective, significantly during the Lower Palaeolithic. Its relevance as a reliable and efficient knapping strategy extensively employed by hominins has led the scientific community to a global recontextualisation of this technique, being proof of complex technological behaviours and discriminating it from more expedient or planning-free activities. Despite this, its identification within archaeological contexts is challenging, exhibiting substantial variability and recognizability according to the exploited raw materials and volumes, and the employed technical gestures. As a result, the bipolar-on-anvil technique requires systematic and specific experimental approaches to be adequately recognised and documented. In this work, the authors will approach the identification of this technique on the raw material exploited at the Lower Palaeolithic site of Isernia La Pineta, consisting of flint slabs, by exploring the range of differences – or similarities - with freehand percussion through a technological and functional observation of experimental artefacts. The aim is to provide a qualitative range of valuable data - based on the macroscopic and microscopic observation of flakes and cores – to facilitate the characterisation of the bipolar-on-anvil technique on the lithic assemblage from Isernia La Pineta.

Key words: Isernia La Pineta; bipolar-on-anvil; experimental archaeology; use-wear analysis; technological analysis; Lower Paleolithic

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Strategizing around the anvil in the early Later Stone Age of Umhlatuzana Rock Shelter (South Africa)

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The early Later Stone Age (ELSA) and Robberg technocomplexes distinguish themselves from the preceding Middle Stone Age (MSA) through drastic technological changes. They are characterized by raw material selection of fine-grained rocks, including quartz, and multiple reduction strategies oriented towards the production of miniaturized elements. The use of anvils holds an important place in several ELSA and Robberg contexts for the production of bladelets and small (elongated) flakes. However, the application of different percussion types, the versatile technical solutions, such as cobble splitting or stabilizing of the core, and the blank output in the reduction system as well as techno-economic implications of anvil-based knapping techniques need further exploration.

Umhlatuzana Rock Shelter (UMH) contains a long chrono-cultural sequence including final MSA layers followed by early LSA occupations. Although the site has been known since initial excavations in 1985 directed by Kaplan, the stratigraphic integrity was called into question due to putative rotational slipping of the deposits. New fieldwork in 2018/2019 by Leiden University within the research project 'Finding resolution for the Middle to Later Stone Age transition in South Africa' demonstrated that the sequence was not compromised by large scale sediment movement. Thus, UMH constitutes an ideal case study to examine the early phases of the LSA in comparison with the underlying MSA strata, to examine the significance of anvil and bipolar percussion.

Following the chaîne opératoire approach, we performed a technological analysis of the lithic assemblages from UMH. The knappers exploited, besides the ultra-local availability of sandstone, primarily quartz and to a much lesser extent hornfels. We identify the use of different reduction strategies to obtain bladelets and small blanks, including the application of freehand percussion and the involvement of an anvil. Cores and blanks exhibit diagnostic features indicating that craftspeople used anvils in different ways, namely bipolar and anvil percussion. We examine the significance of these techniques in the technical system of UMH. Moreover, we provide potential distinguishing characteristics between bipolar and anvil percussion. To substantiate the archaeological observations, we present the protocol and results of knapping experiments in this regard. Finally, our data allow to elaborate on the role of bipolar/anvil percussion in the early LSA and to expand our comprehension of the spatiotemporal variability of this technological choice.

Key words: anvil/bipolar percussion, bladelet production, quartz, knapping experiments, early Later Stone Age, South Africa.

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A Comparative Study of Bipolar Flaking strategies in Upper Egypt and Mozambique during the Later Pleistocene

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This paper presents a preliminary comparative analysis of bipolar flaking in Homo sapiens occupations with the aim of understanding its adaptive benefits during the MSA and LSA. The study investigates four archaeological sites in Upper Egypt and Mozambique regions of Northern and Southeastern Africa. The objective is to gain insights into patterns within raw material choices, reduction strategies, and functional utility in relation to bipolar knapping. The research employs a comparative approach that reveals the deliberate applications of bipolar flaking on harder and more irregular raw material volumes across all sites.

The analysis demonstrates that bipolar cores and products are consistently smaller than those created through free-hand knapping. In all sites there seems to be a deliberate choice of when to apply bipolar flaking for harder and more irregular raw material volumes despite the fact diversity of raw materials present. Cobbles of variant knapping quality were initially split on anvil and further reduced in order to a variety of products, typically flakes. This finding suggests that bipolar knapping was strategically employed as an alternative to free-hand knapping for the reduction of small and irregular raw material volumes. By understanding these distinctions and choices made by Homo sapiens, this paper contributes valuable knowledge to the wider field of lithic technology and expands our grasp on the adaptive strategies and methodologies of prehistoric populations.

In conclusion, this study sheds light on the significance and versatility of bipolar flaking in the production and utilization of stone tools by Homo sapiens. Through a detailed examination of four sites in Africa, the paper reveals the deliberate choice in applying bipolar knapping to specific types of raw material and highlights its use as an alternative to free-hand knapping for processing smaller and irregular volumes. These insights enrich our understanding of early human technology and the adaptive strategies employed to overcome the limitations posed by available raw materials and as an answer to environmental pressure.

Key words: Bipolar Technology; Homo sapiens; Lithic Technology.

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Bipolar technique as a resilience response among the hunter-gatherers of the early Holocene in Balma Guilanyà (Southeast Prepyrenees, Iberian Peninsula)

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Environmental changes during the early Holocene endorse an uncertain ecological scenario that is at the basis of a wide variety of human responses. These key transformations define the Mesolithic, traditionally considered a regression phase affecting the hunter-gatherer lifestyle.

The upper unit of Balma Guilanyà rock shelter (Solsones, Barcelona), comprised of levels C1 and C, was ascribed to the beginning of the Holocene, with a range between 11360-9500 cal. BP. The sequence suggests that the occupations of the shelter are not an isolated phenomenon and confirm a palimpsest of events during the Pre-Boreal and Boreal.

In this paper, we analyze the lithic assemblage level C and C1 to characterize the technical decisions linked to the handling low-quality local raw materials. The knapping strategies identified include the bipolar-onanvil with a range of volumetric freehand knapping both methods are interrelated along the chaîne opératoire. The low investment in the preparation and maintenance of the core volumes is a general trend in all the sequences. This fact derives in short knapping sequences oriented to the obtention of low formalized products. The set evidence the simplification of the technical processes compared to those applied in the Upper Paleolithic and underlines the organizational flexibility of these new technical behaviors.

The bipolar method is usually little considered when analyzing hunter-gatherer evolutionary patterns in the south of the Pyrenees. Hence, it is remarkable their persistence in both analyzed units. This pattern indicates that the technical solutions adopted were satisfactory to manage the subsistence risks linked to new environmental constraints arising in this period.

The results provide new perspectives to characterize technical and socio-organizational behaviors related to Mesolithic hunter-gatherer toolkits and provide key elements to characterize the early Holocene occupations in the northeast of the Iberian Peninsula.

Key words: lithic technology; bipolar technique; core reduction, hunter-gatherer lifestyle; Mesolithic; Iberian Peninsula.

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Wrapped and bashed pebbles on the anvil: Is it possible to identify ethnographic variants of bipolar technique in the archaeological assemblage?

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Ethnographic studies provide important data on the bipolar technique. Although this technique has simple mechanics, ethnographic studies based on live observation have shown that there are many variants of this technique. The golden age of ethnography and ethnoarchaeology plays a crucial role in understanding the behavior of native people and the interpretation of archaeological materials. Bipolar technique has been reported by major researchers in the Americas, Africa, Asia and Oceania. Particularly in the western highlands of Papua New Guinea, the use of local raw materials wrapped in bark by Duna people to flake on the anvil has shown that the application of this technique is much more than its simple theoretical definition. In this study, we comparatively analyze this observed variant of the bipolar technique from a technological point of view. The reference point of our work is *Fabricators, Outil écailles or Scalar Cores?*, one of the pioneering ethnographic studies by Peter White in 1968. White highlighted four important points of this variant: 1) production of longer and thinner flakes, 2) smaller flakes less than 30 mm for the hafting, 3) restriction of the scattered area, 4) economic raw material consuming. We focus on this variant, whose mechanics we have already tested in a pilot study, with a controlled experimental group. We concentrate on production traces and residues by multi-technique approach regarding to figure out whether this variant can be detected in the archaeological context.

Key words: Bipolar technique; ethnography; wrapped blank; stone tools; Duna

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A window on a Uluzzian camp. The spatial analysis of layer rpi from Grotta di Castelcivita (Southern Italy)

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The Uluzzian is an Early Upper Palaeolithic cultural entity presently known in Italy and Greece, which has been associated with modern humans (MHs) both for its characteristics in the material culture and the human remains found at Grotta del Cavallo, in Apulia. Several studies have been recently carried out on the multiple behavioral features of the Uluzzian, allowing us to increasingly reconstruct the peculiar nature of this technocomplex which seems to be characterized by a strong cultural identity.

The Uluzzian lithic production is dominated by an extensive use of the bipolar striking on anvil, coupled to a low technical investment for the management of cores. Tools are generally low standardized, although they also include very regular implements like the typical lunates. The bone industry (awls) is also present. The occurrence, sometimes overwhelming, of shell ornaments is another feature common to the Uluzzian sites and testifies both to the importance of these symbolic items among the Uluzzian communities and to the related technology of bead making. The exploitation strategy of faunal resources is typical of the Upper Paleolithic contexts and involves the extensive consumption of anatomical parts, other than those commonly recorded in the Mousterian, thus witnessing to an abrupt break with previous Middle Paleolithic populations. In contrast to this abundance of studies, Uluzzian settlement dynamics are still totally unexplored both from a spatial and multi-scale perspectives.

Therefore, we address for the first time, an intra-site spatial analysis performed by coupling, into an interdisciplinary frame, different geostatistical techniques, aimed both to understand the taphonomy and the spatial organization of a Uluzzian camp. Some specific issues related to the bipolar débitage on anvil are also analyzed with a spatial approach. The selected case-study is the layer rpi from Castelcivita (southern Italy), a key Uluzzian site which has also yielded three anvils used in bipolar knapping. Despite the limited studied area (around 8 sq.m.), the spatial covarying of the patterns from different informative categories, allowed to return an interesting behavioral picture of the Uluzzian groups who settled at Castelcivita at the beginning of the Upper Paleolithic.

Key words: Intra-site spatial analysis; GIS; Uluzzian; Early Upper Palaeolithic; Bipolar débitage

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Not just a technique! An experimental approach to refine the definition of the bipolar anvil reduction in the Uluzzian

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The Uluzzian, first defined in the sixties by A. Palma di Cesnola, is an Upper Palaeolithic technocomplex, geographically localised in Italy and Peloponnese and approximately dated between 45-40 ka ago. It is currently associated with *Homo sapiens* both for its “modern” characteristics in the material culture, and the human remains found at Grotta del Cavallo (Benazzi et al., 2011). The Uluzzian is featured by the predominant and ubiquitous roles of the bipolar technique aimed to obtain small thin flakes and elongated products. Therefore, it represents a deliberate and purposeful technological choice not due to local adaptations to the size and nature of the raw material (Marciani et al., 2020).

This work aims to clarify the specific mode of employing the bipolar in the Uluzzian, which in our opinion cannot be considered only a technique but also a method of debitage. To do so, we made a deep analysis of the Italian Uluzzian sites and a systematic review of the archaeological-ethnographic uses of the bipolar in other technocomplex of the world. These data were corroborated by an intense experimental work based on three of the main Italian Uluzzian sites: Grotta di Castelcivita (Southern Italy), Grotta La Fabbrica (mid-Tyrrhenian Italy) and Riparo Broion (North-Eastern Italy) characterised by different lithological availability and related resource management (Villa et al., 2018, Peresani et al., 2019; Rossini et al., 2022).

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Our work demonstrates that, although the bipolar reduction usually implies less procedural control with the indiscriminate production of extremely varied blanks, within the Uluzzian some principles have been used to control certain morphological features of the products obtained. Indeed, our experimental session allowed us to isolate the criteria useful to control the bipolar technique and to intentionally increase the production of elongated blanks:

- select regular blanks with consistent thickness and straight edges;
- use the natural edges/ribs able to converge the force;
- remove brittle or irregular portions of the core before bipolar exploitation;
- configure suitable guiding ribs/edges by creating partial crests through abrasion or abrupt retouch (like free-hand laminar cores);
- perform a reduction on a single axis of debitage from the beginning to the end of the sequence;
- apply a tangential/oblique gesture (to direct the percussion to the peripheral part of striking platform).

To sum up, the use of the bipolar technique in the Uluzzian cannot be limited only to a means of optimizing lithic resources. Instead, in the Uluzzian we identify a conceptual scheme characterized by common and recurring technical and volumetric criteria, and a specific use of the bipolar technique on the anvil, regardless of the different raw materials used, which we believe can be considered a codified method of debitage.

Keywords: Uluzzian, Upper Palaeolithic, bipolar knapping, elongated products, bipolar method.

Bone breakage and splintered pieces an experimental approach

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Bone breakage using lithic tools represents one of the most significant activity in the animal carcass treatment carried out by Palaeolithic hunter-gatherers. To better understand the methods followed by humans during this activity and provide useful information about what types of lithic tools were employed and how this activity was performed, the use of experimental protocols and interlaced interdisciplinary studies (including, e.g., taphonomy, zooarchaeology, technology, traceology) is required.

This research is focused on the so-called splintered pieces or pieces esquillées, a category of lithic artefacts chronologically and geographically spread all over the world in numerous archaeological and ethnographic contexts, which is still broadly debated regarding its function and typological definition. Essentially, there are two main interpretations about the role of these pieces: bipolar cores or intermediate tools for processing organic material. In this latter case, two possibilities are generally hypothesised: the splintered pieces are either tools a posteriori, in which “scaled” removals are due to their use, or tools intentionally made through façonnage.

Our research is based on the archaeological evidence from the Uluzzian levels of Grotta di Castelcivita (Salerno) in southern Italy, where the lithic production system is characterized by the prominent role of bipolar knapping on anvil. We carried out a series of experimental tests in which cores obtained by bipolar percussion and unmodified artefacts (produced by both direct percussion and bipolar percussion on an anvil) were used as intermediary pieces (i.e., wedges) for processing ungulate bones. In particular, the cracking of metapodial and acropodial bones of cervids and wild boar was performed.

This research has a twofold aim related to the function (1) and characterization (2) of the tools.

Firstly, we test the efficiency of bipolar cores and unmodified blanks in the bone breakage on anvil. Obtained results show that, in many cases, these specimens permit an easy opening of the bone shaft allowing the recovery of marrow without mixing it with bone fragments.

Additionally, we aimed to identify and characterize use-related traces on the lithic tools, precisely to distinguish bipolar cores that were not used from those used as wedges, and to distinguish the bipolar cores made by lithic production from splintered pieces obtained by bone processing. Our preliminary results highlight that discriminating stigmata related to bone breakage from the ones previously obtained during production on bipolar cores is almost impossible. Conversely, the stigmata on blanks used as intermediary tools are different from the ones due to production in bipolar cores. Finally, a detailed comparison has been carried out between the use-wear scars on lithic tools and the percussion marks on bones.

Key words: zooarchaeology, bipolar cores, wedges, unmodified blanks, use-wear analysis.

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Session 8-4

Stone Age engineering techniques and their implication for understanding Neanderthals and early Homo sapiens perspectives

SESSION ABSTRACT

Research into human uniqueness is gaining increasing importance in prehistoric archaeology. Arguably the most striking behaviour unique to early and modern humans is that they used fire to transform the properties of materials. In archaeology, these processes are sometimes termed “engineering” or “transformative techniques” because they aim at producing materials with altered properties. Early engineering may even have been the key factor that separated early humans, such as Neanderthals and early Homo sapiens, from other hominins. However, research on such techniques is still rare and only sporadic data on isolated artefacts are known. This scarcity is rooted in the analytical difficulties imposed by the material leftovers associated with transformative techniques. This session will host talks and presentations of new findings related to such techniques. The three best-known Stone Age transformative techniques, stone heat treatment; glue making; and colour enhancement of pigments, constitute the main focus of the session. But the session is open to presentations on all kinds of engineering techniques in the world and from different periods. This large-scale approach may provide a comprehensive dataset on how these techniques were invented and conducted, discuss new analytical tools and allow to understand the role of technical processes for cultural evolution.

Main Organiser

Patrick Schmidt

A new model for interpreting Stone Age engineering techniques

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Research into human uniqueness is gaining increasing importance in prehistoric archaeology. The most striking behaviour unique to early and modern humans among other primates is perhaps that they used fire to transform the properties of materials. In Archaeology, these processes are sometimes termed “engineering” or “transformative techniques” because they aim at producing materials with altered properties. Were such transformative techniques cognitively more demanding than other tool making processes? Where they the key factors that separated early humans, such as Neanderthals and early Homo sapiens, from other hominins? Here I propose a new framework for interpreting transformative techniques. Three hypotheses are proposed about i) the requirement in time and/or raw materials of transformative techniques, ii) the difficulty to succeed in conducting transformative techniques and iii) the necessity to purposefully invent transformative techniques, as opposed to discovering them randomly. All three hypotheses make testable predictions.

Key words: Cognitive archaeology; Early pyrotechnology; Stone heat treatment; Reddening of ochre; Ancient adhesives.

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Innovating with Fire: Lithic Heat treatment and socio-economic behavior of Late Solutrean groups in southwestern France

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The recent Solutrean is characterized by the appearance of a new and diversified hunting equipment, associated with innovative techniques for stone tool knapping, such as pressure retouch and heat treatment of silica rocks. These innovations have no equivalent in the history of the recent European Paleolithic and are found throughout the Solutrean extension area. Although the use of heat treatment during the Solutrean has been known since the 1960s, the heating technique or the extent of this process remain undefined.

A work of characterization of this technical innovation within the Solutrean technical traditions was carried out within the framework of a PhD thesis. The aim of this work was to discuss the degree of technical and economic complexity associated with this process, and more broadly, to question the socio-cultural conditions of its emergence. This study employed different approaches, including (1) a macroscopic diagnostic of the heating artefacts within twenty lithic collections from southwestern France, (2) an experimental approach that allowed us to observe the effects of heating on different raw materials and to collect the impressions of several knappers, and (3) some analyses involving infrared spectroscopy and surface analyses by confocal microscopy to specify the heating environment set up by the Solutrean groups. The characterization of heat treatment was also completed by (4) a techno-economic study of lithic industry carried out on two major Solutrean deposits from Dordogne (Landry and Laugerie-Haute Ouest).

We propose to present the main results of this study. The use of heat treatment by recent Solutrean groups in northern Aquitaine has been confirmed, revealing a small number of objects involved. Almost exclusively associated with the laurel leaf shaping chaîne opératoire, heat treatment was conducted in a controlled environment allowing a temperature rise not exceeding 250-350°C. These data also question the status of Solutrean lithic points in relation to the spatio-temporal fragmentation of their production. The addition of a heat treatment step during the chaîne opératoire implies a high degree of anticipation. These results have provided new elements to discuss the management and organization of lithic production in Solutrean groups from northern Aquitaine. The synthesis of these results also enables us to discuss the Solutrean mobility system in southwestern France and to question the social links between local and regional groups at the dawn of the Last Glacial Maximum.

Key words: Upper Paleolithic; Technical innovation; Pyrotechnology; Laurel Leaf; Silica rocks.

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Ethnographic heat treatment of Ethiopian chalcedony and its archaeological implications

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Heat treatment (HT) of fine-grained siliceous lithologies is well known from prehistory but less often recorded ethnographically (Collins & Fenwick 1974). The central theme of our research was the documentation of HT of Ethiopian chalcedony from the Konso area to enhance its knapping qualities. Based on microscopic observations, the chalcedony is of inorganic, hydrothermal origin, linked to rhyolitic volcanism. The study was unique in that it provided a first-hand documentation of the process (cf. Arthur 2010) and its outcomes from an ethnographic context, rather than laboratory experiments. In this way, our research has implications for the details of heating techniques (open fire vs underground/sand-bath) which have been the topic of some debate lately. Another interesting aspect is the expectation and perception of the knapper toward HT of rocks, which are often inaccessible to the archaeologist from controlled experiments alone. In addition to unheated and fully heat-treated samples, partially-heated samples were also collected when the craft specialist opened the heating pit to check on the status of the rocks being heated. This enabled us to do two things: a) document the transformations at 12hrs of heating and compare them with the unheated and fully-heated ones, and b) assess the knowledge of the knapper in identifying the right amount of heating received by the rocks. To this end, we applied infra-red spectroscopy (IR) and density measurements and mechanical indentation testing.

The IR-measurement results show there was little to no change in 4545/4469 cm⁻¹ ratio in the fully-heated samples. This change should take place in case of improvement in flakeability (cf. Schmidt et al. 2017). Analogically, no changes were observed in density among unheated and heated samples. This is also surprising as successful heat treatment should lead to increase in density in cherts (e.g., Moník et al. 2021). Finally, indentation hardness and indentation elastic modulus show no change upon heating the chalcedony samples either. These results suggest that whatever transformation the knappers achieved in this case is too minimal to be detected using the standard methods. Our ongoing bending and other physical tests promise further insight.

Key words: Ethiopia; heat treatment; ethnography; mechanical testing; chert.

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Why heat treat? Quantitative evaluation of changes in silcrete blank formation as a result of heat treatment

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In southern Africa, heat treatment of silcrete is documented by 164 ka and is considered an important technological innovation, allowing knappers to improve the flaking properties of rocks for tool production. Previous controlled experiments have explored structural, mechanical, and geochemical changes in silcrete during heat treatment, but most studies have not explored the implications of those transformations for the blanks produced. Experiments that have examined the effects of heat treatment on blank production tend to rely on replicative flintknapping, where small changes in the angle of blow, where the point of impact occurs, or the amount of force used to remove a blank can create “noise” from confounding effects resulting from these uncontrolled parameters. In this study, we provide quantitative data to understand the effects of heat treatment on silcrete blank production. We used a flaking machine to control variables related to knapping in order to isolate the effects of heat treatment on flaking in silcrete. Our results show changes in absolute blanks dimensions and the amount of force required for detachment as a result of heat treatment. However, the data suggest that the benefits of heat treatment may only occur within a limited temperature range. In addition to comparing the absolute size of unheated and heat treated blanks, we also standardized blank length and thickness using platform thickness. After standardization, our results suggest that there is no significant difference between the unheated and heat treated blanks. This may suggest that knappers were heat treating silcrete to increase the “knappability” of cores by reducing the force needed for flake removal to increase knapping efficiency.

Key words: heat treatment; silcrete; controlled flaking; Middle Stone Age; South Africa; experimental archaeology.

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Adhesives in old collections

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In recent years, adhesive technology became the focus of archaeological and archaeometric research. Although adhesives are known from old studies, new methods of investigation allow for a better understanding of production techniques and compositions of these materials. With the focus on these particular techniques, the question arises, to what extent adhesives have been overlooked so far and remain unrecognized in old collections. In this talk, we want to present some examples of adhesives from old collections recently investigated and discuss the circumstances of their conservation. Further, we would like to give advice on what museums and other institutions can do to preserve and detect adhesives in their collections.

Key words: Adhesives, Conservation, Museum, Collection.

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A biomolecular approach to differentiate ancient birch bark tar production methods

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One of the most prolifically discussed ancient adhesives is birch bark tar. Birch bark tar has been identified globally as far back as nearly 200,000 years ago and found in association with Neanderthals, early Homo Sapiens, and later hunter gatherer communities. In order to discuss cognitive complexity and technology of past individuals and societies, experimental analysis has tried to replicate tar production techniques using ceramic and aceramic methodologies. In recent years, Gas Chromatography-Mass Spectrometry (GC-MS) has been used as a key methodology to identify archaeological tars. In addition to confirming the presence of birch bark tar based on an indicative set of pentacyclic terpenoids, new advances in research by residue analysis specialists show that the ratios of these markers can be used to differentiate ceramic-based production methods.

To add another layer to this discussion, we set out to examine experimental birch bark tars that were produced using three aceramic methods: the so-called condensation, pit roll, and raised structure methods. The tars were analysed using GC-MS to identify the relevant terpenoids, and principle component analysis was employed to test whether, as in pottery, the production method can be differentiated based on the relative abundance of the terpenoids.

The results show that tars produced using the condensation and raised structure methods clustered based on the state of biomarker degradation and correspondingly the abundance of so-called soft and strong heating markers. The clustering of each production method was further refined by the presence, absence, and percentages of specific terpenoids. Tar produced using the pit roll method could not be accurately differentiated. However, all three production techniques produced chromatograms that drastically differed from those of tars produced by ceramic methodologies, adding to our ability to differentiate production techniques.

In achieving this, the results of this study provide significant archaeological impact by allowing researchers to identify specific aceramic tar production methods, shedding new light on early hunter gatherers. This moves the research focus from theory based on experimentation to the actuality of the past and offers direct insight into the technological capabilities of Neanderthals and early Homo Sapiens.

Key words: Adhesives; Birch bark tar; residue analysis; biomarkers; Gas Chromatography-Mass Spectrometry.

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Unexpected hints into the transformative potentials of macro-lithic tools by Homo sapiens in the Caucasus

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Ground stone tools are a rich repository of the techniques and gestures used by Homo sapiens to mechanically transform plant materials into everyday objects like baskets, strings, nets, and dyes. These tools bear evidence of wear-traces from processing different materials, demonstrating the sophisticated cognitive abilities of Homo sapiens to transform them into useful items for daily use, such as turning rhizomes into flour, fibers into string, or leaves into dye. While grinding plant materials may be a relatively simple process, dye extraction requires a sophisticated, multistep technology that has been overlooked by conventional archaeological methods.

The uniqueness of natural blue colors in past times is due to the very few plant sources, to the complex processing needed to extract the dye to be used for staining other materials (vegetal fibers first and later animal hair) and also for their antimicrobial properties. This combination makes blue dyes, in the form of woad or indigo –depending on the geographical and climatic provenience of the archaeological record–, socially relevant and supports their role in symbolic behavior.

By using a multidimensional approach that combines imaging and residue chemoprofiling, we gained unexpected insights into the transformative potential of macro-lithic tools as they are directly involved in the transformation of plant materials including dyes.

These findings deepen our understanding of the complex innovations that allowed our ancestors to thrive in a diverse range of environments, particularly when venturing into northern latitudes during the MIS 3 (60-25 ka).

Key words: Perishable technologies, Multidimensional approach, Imaging, Chemoprofiling.

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Naval engineering, maritime technologies, and Late Pleistocene cognition

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In human evolutionary history, once it became possible to travel much farther than what the physical body allowed, a radically new relationship with the physical and cultural environment was born. The construction of a material container for the body is one of the most impressive innovations associated with the evolution of human cognition. Interdisciplinary research into the origins of maritime travel suggests that intentional marine crossings date more than 50ka, yet poor preservation of actual vessels limits our understanding of Pleistocene naval engineering. Boatbuilding traces are particularly rare and questions concerning maritime technologies, chaîne opératoires, and use-life of associated toolkits usually remain unanswered. To date, like work has thoroughly examined the decision-making processes that enacted such technological innovation and might have subsequently led to the major so-called 'transitions' in our cultural past. This talk focuses on the investigation of Pleistocene maritime technologies and boatbuilding techniques and presents an interdisciplinary approach incorporating theory, analytic techniques, and experimental archaeology protocols in order to examine the tools and techniques involved and the decisions taken.

Key words: Maritime technology; naval engineering; Experimental Archaeology; Cognitive Archaeology.

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A predictive model for the non-destructive assessment of Stone Age silcrete heat-treatment strategies

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The lengths of - and numbers of steps in - stone artefact production sequences are often used as proxies for the emergence of cultural complexity in our lineage. This line of reasoning has been applied to the heat-treatment of silcrete rocks by past hominins, where both the lengths and numbers of steps involved are contested. To simplify, one position argues that silcrete heat-treatment was an elaborate, multi-level procedure involving the prolonged and indirect exposure of these rocks to fire. Each stage of production (building a fire, burying rocks at a specific depth below the fire, maintaining prolonged insulated heat, managing gradual cooling and making or shaping blanks) was potentially reliant on the stage that came before. Others argue that silcrete heat-treatment was far simpler, involving fewer steps (direct exposure of blanks to embers and/or flames in an open-air burning context), and that this process was managed by hominins no differently to everyday fire-related activities. A more nuanced position draws on the variable fabric-texture and structural response to heating of different silcretes to argue that no single approach to heating may be suitable for all types. Determining maximum temperature exposure and/or heating rate would potentially allow one to differentiate these processes as described, and thus resolve the implications of heat-treatment for cultural complexity. Here we present the results of experiments wherein multiple specimens of two structurally different South African silcretes were systematically heated to a controlled set of temperatures ranging from 110-750 °C, and the infrared responses to each temperature change were quantified. Importantly, measurements were collected non-destructively on stone flakes, providing for the archaeological applicability of the results to the Middle Stone Age record of southern Africa. We then use a combination of multivariate statistics, differential equations and decision trees to develop a framework for reconstructing the annealing temperatures of silcrete flakes, demonstrating that heating temperature range can be predicted at success rates of 79.5% to >95% in a large sample of N=225 observations.

Keywords: Cultural complexity; silcrete heat-treatment; heating environments; controlled experiments; temperature predictions; machine learning.

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Session 8-5

Shape and Beats: Combining technology and computational shape analysis of studying the variability of Large Cutting Tools

SESSION ABSTRACT

The emergence of the Acheulean is one of the major transitions in human evolution and the appearance of its iconic large cutting tools such as handaxes and cleavers, is considered as reflecting a major revolution in many cognitive and behavioural aspects of Early Pleistocene hominins. Nevertheless, the different criteria on which their typological classification is based remain vague and have varied substantially with time and between the different schools corresponding to the significant morphological variability exhibited by these tools across time and space.

Shape is recognised as one of the most important attributes of stone tools, forming the basis for typological, technological and functional reasoning. Nevertheless, its 3-dimensional, complex and irregular nature renders its quantitative description and analysis challenging and non-trivial. In the last decades, the proliferation of 3D digital scanning technologies supported a new computational approach to the analysis of archaeological artefacts. This, in turn, gave rise to numerous methods and tools which now allow to quantitatively characterise, analyse and compare assemblages of stone tools in terms of their shapes.

This session aims to provide a venue for presenting recent studies of Large Cutting Tools applying a combination of classical lithic technology with a computational approach to shape analysis, to discuss:

1. the concept of variability, searching for its sources, limits and consequences;
2. the pros and cons inherent to the use of new avant-garde techniques in the study of the Middle Pleistocene industries;
3. best practice in the combination of qualitative and quantitative research approaches, such as technological and computational shape analysis of stone tools.

Main Organiser

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The Acheulean Large Cutting Tool assemblage from Rodafnidia and other Lower Palaeolithic localities on Lesbos, Greece: A 3D morpho-technological cross-regional comparative analysis

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For the past twelve years systematic surveys and excavations conducted on the Greek island of Lesbos have uncovered a number of Acheulean localities at the Kalloni Gulf and southern Lesbos. Of these, Rodafnidia is the main stratified and chronometrically dated Lower Palaeolithic site that yields archaeological remains from fluviolacustrine deposits. The lithic assemblage recovered from the surface and from the excavated trenches contains, among other cultural remains, an impressive collection of Large Cutting Tools (LCTs) composed of handaxes, cleavers and trihedrals. As a result of meticulous chronological, geomorphological and spatial undertakings, these material remains could be confidently assigned to the Acheulean Technocomplex, and possibly to its earlier manifestations in the European record. In order to obtain insights concerning the cultural affinity, similarities and differences from other Acheulean assemblages a morpho-technological study comprising a combination of 3D landmarks-based geometric morphometric shape analysis and traditional technological attribute analysis was undertaken.

In the following presentation a cross-regional comparative study the LCT recovered from the Acheulean localities at Rodafnidia will be introduced. The various aspects of the methodological approach, supporting a quantitative, objective and repeatable comparison will be presented in detail. In addition, the study's preliminary results will be presented. These indicate an especially homogenous collection, suggesting it is derived from a single morpho-technological population, supporting its contextual integrity. A comparison to five Acheulean assemblages from Israel dated between 1.5 and 0.4 MaBP, and analyzed using a similar methodology shows that the Lesbos collection intricately combines features that are characteristic of both Middle and Late Acheulean industries. This unique combination sets the Lesbos material apart from that known in the Southern Levant, suggesting a separate technological tradition. Finally, the quantitative digital data and results will support further comparisons with Acheulean assemblages from the Aegean region and beyond to provide a better understanding of human dispersals and cultural evolution during the Lower Paleolithic at this least known part of Eurasia.

Key words: Aegean, Lesbos, Acheulean, Large cutting tools, 3D geometric morphometric.

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Face-off: technology vs morphometry

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Despite the apparent stability of the Acheulean shown by the persistent presence of hand axes, understanding the significance of this techno-complex variability continues to be a major research theme. The challenges include distinguishing common shaping strategies that have cultural meaning from those resulting from convergent evolution, and/or identifying new technologies through space and time. Nevertheless, the different traditions of Lower Paleolithic research have hindered inter-regional comparisons. These various analytical systems across Europe have led to problems when attempting to compare results between sites.

Besides, traditionally a long list of measurements has been taken into account to characterize and define tool forms. Since the 1960s, Bordes defined "classical" handaxe morphological types ("triangulaires", "subtriangulaires", "cordiformes", discoid, ovate, and "limandes") according to three main criteria: length against width, thickness against width, and edge shape. Roe added three new measures (distal and proximal widths, and distal thickness) to distinguish between pointed, oval and cleaver-type tools. These groups were related to the existence of different cultural groups. However, the boundaries between the categories were sometimes imprecise, as intermediate shapes exist.

So, now is the time to take advantage of new technologies and perspectives, to move the research forward into more accurate comparisons between sites. One of the solutions is the use of geometric morphometrics (GM) on 3D models to analyze variation in tool shape, without considering fixed typological categories. While there are several morphometric approaches, landmark-based GM is a powerful tool for the quantitative description of shape variability within and between groups of tools. This approach has been used by archaeologists, adopted from biology. The use of semi-landmarks does not represent specific points to define a shape (as in biology), but reproduce a tool's surface and volume according to the creation of a web of points, which are distributed from a centroid. Within this work we explore the contribution of the geometric morphometrics to the technological analysis of Acheulean tool variability and to what extent morphometry can be useful by itself or require the existence of a technological analysis behind it.

Key words: Technological analysis, Geometric morphometrics, Handaxes, shape variability.

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Computational morphological analysis of Large Cutting Tools: Research history, state-of-the-art and future directions

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Despite inconsistency in definitions, and unclarity of categorical borders, the various tool types assigned to the inclusive typological class of Large Cutting Tools (LCTs) are amongst the most studied using quantitative morphological approaches. Beginning in the middle of the previous century, quantitative methods for describing and comparing LCT morphology have been developed and applied. Simple linear distance measurements and ratio-based classifications, analytical methods gradually developed and adopted more sophisticated techniques for comparison and description. These provided results which were incorporated into various theoretical frameworks, addressing different aspects of past human behavior and cultural and biological evolution.

The increased accessibility and immense development in computing, combined with the proliferation of 3-dimensional modeling techniques which occurred over the past two decades provided the basis for an additional step forward. This is manifested in the 3D geometric morphometric approach and the wide array of computational tools which were developed to facilitate its application to material culture in general, and LCTs in particular.

These tools support direct, high-resolution morphological comparisons between assemblages, allowing to quantitatively describe the magnitude and nature of within- and between-group variability. The quantitative observations can subsequently be used in various formal models in order to test hypotheses concerning the dispersal of humans and changes in culture.

However, despite this recent step towards a more quantitative and objective perspective, numerous challenges are still to be solved. Although the morphology of LCTs can be quantitatively described and compared in its holistic sense, its objective segmentation into meaningful informative features and their independent description still heavily relies on subjective qualitative observations. While significant steps were made towards the quantification of aspects such as symmetry, edge regularity and angles, crucial technological characteristics such as cortical coverage, raw material quality and scar patterns still lack a readily available computational solution. These constitute basic requirements for a better understanding of the mechanisms driving the cultural development during the Acheulean.

Key words: 3D geometric morphometric, Computational shape analysis, Large cutting tools, History of research

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Digital Techno-functional Analysis of Handaxes' Edge. A Case Study from French Middle Palaeolithic

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Technological and morphological characteristics of Large Cutting Tools' (LCTs) edges can provide useful insights into their manufacturing processes and functional aspects. These can be used in hypotheses testing concerning economic aspects of prehistoric human behavior and trends in the past movements of people and ideas. However, traditional analytical approaches often rely on qualitative observations (e.g., the presence of cortex, technological aspects of the retouch, etc.) and possibly inaccurate quantitative features (e.g., the 2D measurement of the cutting-edge angle) thus reducing their repeatability and objectivity and weakening the possibility of large crossing and comparison of techno-functional units between different assemblages. In addition, comparing large lithic assemblages is practically impossible based on traditional techno-functional analysis.

In this presentation, we introduce a novel method for automatically and objectively segmenting edges of LCTs into distinct techno-functional clusters and classifying these into active and prehensive areas. Each edge segment is characterized based on a series of technologically and/or functionally relevant quantitative features extracted from digital 3D models, including the 3D-based edge angle, the transversal edge profile, its planar symmetry, and its orientation. The quantitative nature of the features supports statistical analysis of their variability, highlighting trends in manufacturing technique and function at the artifact, assemblage, and inter-assemblage levels.

The proposed methodology is being developed in the framework of the Fyssen Foundation-supported MorphAxe project, which combines digital and traditional technological approaches for tracking geographical and chronological trends in Middle Palaeolithic handaxe assemblages from different regions of France. The preliminary results of the edge analysis are combined with trends highlighted by traditional and 3D-based morphometric analysis, providing a novel insight into the movement of people and ideas in Western Europe during MIS 5 and 3 of the Middle Palaeolithic based on multiple lines of evidence.

Our promising preliminary results suggest that the proposed methodology can be successfully applied to other archaeological questions focused on the edge variability of bifaces and other classes of lithic artifacts.

Key words: Edge Analysis, 3D-based Quantitative Analysis, Handaxes, Middle Palaeolithic, France.

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Looking into the variability of Middle Paleolithic handaxes from south-western France: a morpho-technological approach

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During the Late Middle Paleolithic (-130 / -40 ka) in northern and western Europe, a massive development in bifacial tools productions has been identified at the end of MIS 5 (-90 / -80 ka) and MIS 3 (-60 / -40 ka). These bifacial tools are characterized by substantial morphological variations, suggesting the existence of regional cultural entities within Neanderthal societies. Thus far, several such entities have been identified based on that variability. This is notably the case of a technocomplex identified in southwestern part of France: the Mousterian of Acheulean Tradition (MTA). Based on the distribution of handaxe morphologies, the geographical extent of this entity was initially thought to range from the Loire River to the western Pyrenean Mountains. However, recent research has questioned the homogeneity of Late Middle Paleolithic assemblages found in the northern and the southern parts of Aquitaine region.

In 2018, a collective project supported by the Hubert Curien-Maimonide program has brought together researchers from France, Spain, Portugal and Israel. Our research project applied an innovative methodological approach for analyzing 3D digital models of handaxes using a combination of 3D geometric morphometrics with traditional technological observations.

Within this framework, 280 handaxes from 13 archaeological sites distributed in two chronological phases (MIS 5 and MIS 3) of the Late Middle Paleolithic and two regional settings (Northern and Southern Aquitaine). Sites were selected according to the reliability of their chronostratigraphic context and geographical distribution across Aquitaine region.

Our results provide new information concerning the variability in handaxes assemblages, both from a diachronic and synchronic point of view, and their possible causes (environmental, functional, cultural). A clear shape-based distinction is identifiable between MIS 5 and MIS 3 handaxes suggesting a strong shift in tradition through time. From a geographic perspective, during MIS 5 handaxes do not show clear regional differences, while during MIS 3 assemblages originating from north and south Aquitaine exhibit strong morphological differences between them supporting interpretation of regionally separated cultural entities.

At this geographic scale, this work has the potential to provide quantitative data which can be used to evaluate hypotheses about population dispersals and their chronology in Western Europe as well as the mechanisms of interregional interactions between Neanderthal societies during these phases.

Key words: Handaxes; Late Middle Paleolithic; MTA; cultural geography; AGMT3D.

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Innovations and specialisation on limestone cobble management at MIS11 site of Terra Amata (Nice, France)

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The open-air site of Terra Amata (Nice, France) is located at the foot of the Mont Boron slopes. The Quaternary deposits of Terra Amata correspond to different phases of marine transgression and regression and contain two stratigraphic complexes bearing the remains of human occupations. C1 and C1b complexes are correlated to MIS11 and MIS10. Terra Amata corresponds to a succession of open air habitats which have yielded an abundant Acheulean industry associated with a middle Pleistocene fauna.

Among the large mammals, *Elephas antiquus* is one of the well represented species. Elephant remains have been documented in all the levels attributed to anthropic occupations and their presence has been associated to a selective capture (by hunting or early scavenging) of young individuals. The lithic industry made on local limestone has been attributed to Acheulean. This is characterized by many products coming from the shaping of pebbles/cobbles (choppers, handaxes, cleavers and picks). Flake-tools are composed of a majority of scrapers and secondarily of denticulates and notches. Core technology are characterized by the massive use of simple flaking methods and short centripetal sequences.

Recent discoveries show that some lithic innovations actually appeared earlier in Western Europe, from MIS 12 to MIS 9, contemporaneous with changes in subsistence strategies and the first appearance of early Neanderthal anatomical features. Terra Amata is an example of these new practices. Together with the possible hunting, the use of fire is well documented along the whole sequence, acting as a cohesive element in the human occupation. Nevertheless, within this context it is surprising the non-presence of Levallois technology.

With this work, we present a deep revision of core and large tool components of the technological assemblage of Terra Amata to properly evaluate the innovative traits in the context of a high specialization site on the use of small pebble assemblage.

Key words: Middle Pleistocene, Terra Amata, shaping strategies, innovation, technology, morphometry.

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New Tools for Measuring Handaxe Variability: Edges and Volume Distribution in 3D

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The techno-morphological variability of handaxes has significant implications for hominin dispersals, behaviour, decision-making, skill, and cognition in the Acheulean. The magnitude and pattern of this variability remains contested however. Existing methods of handaxe analysis focus mostly on outline shape, 2D symmetry, and refinement. Recent 3DGM analyses have standardised the comparison of overall handaxe shape and highlighted the importance of a handaxe's third dimension in understanding their variability. Yet, specific technological attributes of handaxes remain difficult to classify or measure. In particular, the edges of handaxes and their volumetric distribution have significant techno-functional, skilful, cognitive, and aesthetic implications. However, these features either suffer from imprecise measurement and classification methods, or are mostly ignored. We present a new suite of computational 3D methods for measuring features like edge angles, edge length, edge concavity, edge transverse asymmetry, sinuosity, volumetric distribution, and 3D bifacial asymmetry. We test these automatic, objective, precise, and repeatable methods on a large and controlled sample of handaxes from the later Acheulean of the southern Levant. Our results show a surprising amount of variability within this sample that is otherwise overlooked by existing methods. By measuring key aspects of a handaxe's third dimension we can start to better understand how handaxes were held, their potential for multifunctionality, as well as how much knapping skill was involved in their manufacture. This toolkit will allow us to better respond to questions like: What does a nicer handaxe look like? Is handaxe-making skill constrained by raw materials? And do handaxes get better over time?

Key words: Acheulean, Handaxes, 3D Geometry.

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Session 25-2

Hunting: a diachronic perspective on its role on human subsistence from the Pleistocene to the Holocene

SESSION ABSTRACT

Hominine hunting strategies during the Pleistocene and the Holocene are broadly characterized by a diversification in the target's choices, variously related to the available animal resources. The accessibility of these prey may have been conditioned by various constraints such as changes in the environment and climate, the natural availability of the animals, technological skills, social organization and even taste preferences. The diachronic perspective of subsistence behavior allows a reconsideration of the human relation with his environment and particularly, the complex relations between humans and animals over the long term. The multidisciplinary approaches permit to contextualize hunting strategies and their evolution. This session aims to bring together specialists who deal with subsistence strategies applying new approaches, methods, and innovative diagnostic techniques and ethnographic comparisons by addressing the following topics:

- Hunting vs Scavenging
- Big game hunting
- Small game hunting
- Selective hunting
- Hunting technologies
- Hunting and breeding
- Hunting and prestige

Main Organiser

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Hominin-carnivore interactions in relation to hunting at the Middle Pleistocene lake site of Schöningen, Germany

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The site complex of Schöningen has caused a major shift in our view on the hunting capabilities of Middle Pleistocene hominins in Europe. The discovery of the Schöningen spears, associated with the skeleton of two dozen butchered horses showed that humans were active hunters, rather than scavengers relying solely on carrion from carnivore kills. On the other hand, the site has yielded a rich carnivore fauna, including several species of large carnivores such as wolves, bears, lions and even sabre-toothed cats. Taphonomic marks on the bones of large herbivores from Schöningen suggest that both carnivores and humans were interested in the same type of prey species. The excellent preservation at the site allows for detailed reconstructions of these hunter/scavenger-prey interactions.

Cut marks discovered on bones from the hands and feet of adult cave bears suggests that hominins were also hunting bears to procure their skins. This not only underlines their hunting capabilities, but also exemplifies that hunting was not necessarily linked to food acquirement. The context of a straight-tusked elephant skeleton that shows both carnivore and anthropogenic impacts provides new insights on the exploitation of the largest animals present at the lake site. In sum, the site complex of Schöningen provides various insights into the evolution of hunting in relation to large carnivores.

Key words: Hominin-carnivore interactions; Middle Pleistocene; Lower Palaeolithic; hunting-versus-scavenging debate.

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Vajo Salsone (North-eastern Italy): a case of stagional monospecific hunt of *Cervus elaphus* by Neandertal groups?

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The Lessini Mountains are a mountain group belonging to the Venetian Pre-Alps (North Italy) and have the largest number of mousterian sites in northeastern Italy. Among the most important are Fumane Cave, Tagliente Rock Shelter and Ghiacciaia Cave. Added to these is the Vajo Salsone site, discovered in 2017 during the construction of a lorry road at 376 m above sea level, a few km from Riparo Tagliente. The site is a small vertical karstic cavity filled with Pleistocene sediments that have yielded abundant artefacts and faunal remains from the Middle Palaeolithic period. Most of the lithic and faunal remains are covered in concretions, the taphonomic similarities found on the lithic tools and bone materials suggest the hypothesis of a short-distance movement of material from a single archaeological deposit. The lithic assemblage of retouched elements includes the presence of foliate points. This typology of artefacts, typical of the Middle Palaeolithic in south-eastern Europe, makes Vajo Salsone an exceptional case because their discovery west of the Balkan Peninsula is rather sporadic. Foliate points are only attested in Italy at Vajo Salsone and in some surface collections in the northern Apennines, without any stratigraphic context. The closest comparisons come from southern Germany and the Pannonian Basin. Red deer, roe deer, chamois and elk are the most common ungulates. Although foxes and bears are less frequent, wolves remain widespread. This faunal association indicates a habitat with a patchy presence of alpine meadows and wetlands, as well as open glades and closed forests. Only the cervid bones show anthropogenic alterations associated with hunting and human exploitation, such as burned alterations and cut marks. Some long bone diaphysis show notches indicating their use as retouchers for flint objects. Nearly all the axial skeleton's components are missing, although vertebrae and ribs classified as Cervidae and Cervidae medium size can be linked to red deer. Astragals are the anatomical elements that are most frequently represented, according to an estimation of the skeletal survival index (MNE/eNE). The remaining parts of the appendicular skeleton, such as the femur, tibia, humerus, and radius, are, nevertheless, inadequately depicted. This might point to a selection of elements that were added to the hunting area. More than half of the red deer individuals may have been transported to the site with a full carcass, according to the marked representation of isolated upper and lower teeth. Evidence could suggest selective hunting of this species as anthropogenic remnants were only found on the remains of medium-sized deer and *Cervus elaphus*. The results of the meso and microwear assessments on the deers' teeth imply that the Vajo Salsone site was inhabited seasonally during the warm season (spring-summer) due to the good state of preservation of the occlusal surface of teeth enamel.

Key words: Hunting; red deer; archaeozoology; mousterian; north-eastern Italy

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Zooarchaeological and taphonomic analysis of Grotta La Fabbrica (MIS 3, Tuscany, Italy)

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Grotta La Fabbrica is located in the southern end of Tuscany, near the Tyrrhenian Sea, and has been recognized as an important archaeological site since the first excavations in the 1960s. Is a unique transitional context in Central Italy because it preserves an archaeological sequence with Mousterian, Uluzzian and Protoaurignacian deposits. New excavations carried out by the University of Pisa from 2008 to 2012 yielded numerous faunal remains in association with Mousterian, Uluzzian and Protoaurignacian lithic assemblages. This study presents the result of the zooarchaeological and taphonomical analyses of the large mammal remains recovered in those recent excavations. The faunal assemblages are characterized by an important quantity of long bone and teeth fragmented due to the post-depositional process and by unidentified bone splinters. Taxonomy of the preys shows diverse habitats exploitation, with eurytherm species of open steppe-grassland (i.e., Equidae and large bovids) and woodland (red deer). Taphonomic analysis revealed butchery marks and food processing within the sequence, but also the activity of large predators, such as cave hyenas, indicating that the cave was alternately used by carnivores and humans, as proved by the presence of lithic tools, too. Similarities between Mousterian, Uluzzian and Protoaurignacian assemblages, with no particular difference in prey selection and butchering practices, are observed.

Key words: Mousterian; Uluzzian; Protoaurignacian; zooarchaeology; Butchery; Carnivore.

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Hunting before and after the eruption the case of Bauma del Serrat del Pont rock shelter during the Mesolithic

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Volcanic eruptions are environmental phenomena that alter the natural conditions of an area and can significantly affect living conditions. Changes in vegetation and wildlife caused by volcanic activity can cause the depletion of the natural resources on which a human group depends. La Garrotxa Volcanic Field (Girona, NE Iberia), is one of the few areas where eruptive episodes contemporary to the last Mesolithic hunter-gatherer societies have been documented, dating back to 8.77 ka cal BP. The Bauma del Serrat de Pont site is located about 15 kilometres from this area. Between 9500 and 8000 cal BP a total of five seasonal occupations are documented (archaeological levels IV.1, IV.2, IV.3, IV.4 and IV.5). Hunting was an important part of daily life at the site during these occupation periods and a basic element of the economy. Hunting was almost exclusively for deer, wild goat, roe deer and boar, all of which were present in the immediate environment surrounding the settlement. The hunting activity was focussed mainly on young individuals that had not reached full maturity. There was also sporadic exploitation of birds, lagomorphs, tortoise, carnivores and fishes. Since some of these occupations occurred at the same time as eruptive episodes, a detailed analysis of the hunting strategies practised by the inhabitants of this settlement is presented in this paper, evaluating in detail whether the changes in vegetation and environment resulting from volcanic activity affected animal communities and their exploitation by the last hunter-gatherer societies in the area. The obtained results from the analysis of the 3588 faunal remains corresponding to these levels indicate a great homogeneity in the exploited mammal species. However, the determination of hunting seasonality, acquisition strategies and diversity in associations allows us to clarify this homogeneity.

Key words: Mesolithic, northeast Iberian Peninsula, Bauma del Serrat del Pont rockshelter, Volcanic eruptions, hunting.

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Northern Chile's Chacu and Caycu: two types of large-scale trap for capturing ungulates in the Andes

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The vast high-altitude lands of the south-central Andes region boast a long-standing research tradition focusing on human-animal relations, from hunting strategies with weapons to the pastoral management of animals. However, the recent discovery of hundreds of chaku and caycu—large-scale dry-stone wall traps for capturing ungulates offers the possibility of expanding this topic toward collective practices of mass trapping and hunting.

Sharing similarities with well-studied traps worldwide (e.g., desert kites), Andean chaku and caycu are less studied and often hastily associated with the Inka period (14th-15th centuries). Yet, newly available satellite imagery interpretation combined with historical, ethnographic, and rock art evidence from Northern Chile suggests their continuous and widespread use from the Late Archaic period onwards (6,000 BP).

This work proposes an innovative but timely, interdisciplinary long-term approach to Andean trapping structures, seeking to clarify their use before the Inka period, understand their geographical distribution and variation, and develop a model for their detection, interpretation, and further cross-cultural comparative study, both in the Andes and worldwide.

Key words: hunting traps, chacu, longue durée, big game, Andes, andean ungulates.

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To hunt or not to hunt? That is the question.
Subsistence strategies of the Late Neolithic site of Sant'Andrea di
Travo (PC, Italy)

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During the Neolithic, northern Italy had numerous settlements from the plain to the mountainous area. Some of these settlements have a long-life span, spanning several centuries, others instead are active only in a short period between the VI and IV millennium B.C. During their life they had the opportunity to choose and test different economies of subsistence with the base, obviously, the breeding. Some macro-distinctions of the choices made by the human groups can be seen in the different composition of domestic animals. Some sites in fact have an economy focused on pig breeding, others on the breeding of cattle and other (more numerous) on caprines breeding. In addition to the domestic animals, in the faunal assemblages also wild species, typical of the environments in which the inhabitants were inserted, are present. At the site of the Late Neolithic (4990-3800 cal BC) of Sant'Andrea di Travo in the province of Piacenza (Italy), the archeozoological analysis confirmed a greater exploitation of domestic fauna (*Ovis* vel *Capra*, *Bos taurus*, *Sus domesticus*). During the archaeozoological and tafonomic study of bones remains, however, some wild species have been identified, such as *Cervus elaphus* and *Capreolus capreolus*, together with bones elements referable to avifauna and small mammals. Despite the proximity of the Trebbia River to the Neolithic settlement, which partly contributed to the erosion of the southern part of the site, no fish remains have been found. Although the primary source of food does not seem to come from the hunting activity, a deer antler was recovered coming from a well-silo. This wells, datable between 4330-4050 cal BC, finds comparisons with other sites in the Po Valley, but also beyond the Alps. The function of this structure initially functional for the storage of food, undergoes a re-functionalization as a drain pit. In a long-lasting site such as that of Sant'Andrea di Travo the archaeological evidence shows the predominance of breeding, especially sheep, then hunting. Despite the small presence of remains attributed to wild animals, it seems clear how hunting should take place near the site. The surrounding environment, characterized by forests on hills, is in fact suitable as an excellent habitat for the wild species identified. Finally, comparing the faunal assemblage of Sant'Andrea di Travo with the contemporary sites present in the Po Valley, it reflects the subsistence economy of the other contemporary settlements.

Key words: Late Neolithic; Breeding; Hunting; Strategies; Domestication

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Hunting and breeding during the Early Bronze Age in the grandi valli veronesi: the case of Oppeano di Vallese (Verona, Italy)

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Consequent to the development of a subsistence economy mainly based on breeding and agriculture, during the Early Bronze Age hunting became a less important activity in north-eastern Italy. In fact, communities were more focused on domesticated animals as a source of meat and secondary products, while wild ones such as deer and wild boar were occasionally hunted to obtain meat, while red-deer and roe-deer were exploited mainly for antlers.

During the preventive excavation in the Veronese Po Plain that took place in 2014 and 2015, two new settlements were discovered in Vallese di Oppeano, about 20 km from Verona: pile-dwelling 4C dated to the Early Bronze Age, between the end of EBA1 (2300-1900 BCE) and the beginning of EBA2 (1900-1650 BCE), and pile-dwelling 4D dated to the Middle Bronze Age. Pile-dwelling 4C represents one of the few Early Bronze Age archaeological sites in the Veronese Po Plain and was excavated in two different area (OVI14 and OVI15) in which several faunal remains were recovered.

The zooarchaeological analysis carried out on faunal remains from Vallese di Oppeano 4C pile-dwelling (OVI14 faunal assemblage) allowed new data to be obtained on the exploitation of wild animals during this period.

The faunal assemblage is dominated by domestic animals: the OVI14 faunal assemblage is mainly composed by sheep-goats followed by pigs and cattle, while the OVI15 faunal assemblage presents a prevalence of pigs, followed by cattle and sheep-goats. It is also attested the presence of dogs in both assemblages.

Composition of wild taxa is almost the same in the two faunal assemblages with a prevalence of red-deer followed by roe-deer and wild boar for the exploitation of meat and hard animal material and the presence of wolf, auroch, badger, beaver, pond-tortoise and bird.

Differences are linked to the presence of fish remains (pike) in the OVI14 faunal assemblage, and of fox and otter in the OVI15 faunal assemblage.

While breeding seems to be more focused on small domestic ruminants, wild animals are hunted for both food and practical purpose testified by several artifacts carved out of animal hard material and by the processing of red-deer and roe-deer antlers. It is also attested fur recovery from wolf, fox, badger and beaver.

This paper aims to present new essential data for the better understanding of wild faunal resources management during the Early Bronze Age in north-eastern Italy.

Key words: Hunting, breeding, taphonomy, Early Bronze Age, North-eastern Italy.

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Sex Estimation and Phylogenetic Characterization of Faunal Enamel

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Hominin hunting practices comprise a dynamic interplay of culture, ecological availability and resource optimization. Deconvolution of these factors often depends on using fragmentary skeletal material to identify the species and sex of hunted animals. We report here that amelogenin peptides in fragmentary faunal enamel can serve as X- and Y- chromosome biomarkers and be detected through proteomic mass spectrometry, using techniques initially developed for human sex estimation. Sex chromosome specific markers have been identified and characterized for a range of relevant prey species and carnivores. A precondition of proteomic mass spectrometry is that accurate protein amino acid sequences are elucidated for use in reference proteomes. Currently, faunal amelogenin sequences are inaccurate, poorly annotated, and incomplete. The authors therefore conducted a systematic bioinformatic analysis of the X- and Y-chromosome amelogenin sequences of relevant species. These sequences were used in conjunction with sample processing and mass spectrometry methods developed for human proteomic sex estimation. Sex estimation was successfully conducted on faunal enamel (20 mg) from Pleistocene contexts: *Bison bonasus* (European bison), *Bos primigenius* (auroch), *Canis lupus* (wolf), *Canis latrans* (coyote), *Equus* sp. (North American horse), *Camelops hesternus* (Western camel), *Ursus spelaeus* (European cave bear), *Mammuthus primigenius* (woolly mammoth), and *Mammut americanum* (American mastodon). Sex estimation was also conducted on modern exemplar species: *Bison bonasus* (European bison), *Bos taurus* (cattle), *Canis lupus familiaris* (dog), *Ursus arctos arctos* (Eurasian brown bear), *Ovis aries* (sheep), *Capra hircus* (goat), *Panthera leo* (lion), *Puma concolor* (cougar), *Lynx rufus* (bobcat), *Felis domesticus* (cat), and *Odocoileus hemionus californicus* (California mule deer). In this study, data were obtained across a 400,000 year time frame with analyses providing phylogenetic resolution to the taxonomic level of Family for all species tested. Proteomic information obtained from faunal enamel fragments can therefore contribute to a deeper understanding of prey selection and the complex interplay between human hunters and their environment.

Key words: Faunal Enamel, Proteomic Sex Estimation, Mass Spectrometry, Paleoproteomics.

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Tracking down small mammal exploitation in Italian Palaeolithic sites

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The exploitation of small mammals, besides the more “usual” ungulates, becomes progressively more evident from the Middle Palaeolithic to increasing importance between the Late Upper Palaeolithic and Mesolithic.

The species involved are many: several species of carnivores, some rodents and even insectivores. Obviously, the mere presence at the sites is not enough to assess their actual capture and exploitation by humans and careful (and open minded) taphonomic analyses are necessary to identify anthropic modifications on the remains of these small taxa. The traces *par excellence* are butchery cut-marks, but also fracture types and burning may be useful elements to recognize human manipulation.

The interest in these small animals was certainly food, but for many of them it is more likely that the primary purpose was to get to the furs; in this case too, taphonomic analyses represent a useful device to assess the actual use of these species.

In Italy during the Middle Palaeolithic, the capture and exploitation of foxes, marmots, and beavers is attested at Grotta Maggiore di San Bernardino, Riparo Tagliente and Fumane, by very few remains with cut marks (Romandini et al. 2018).

Sites with a considerable amount of small mammals are instead present in the Late Upper Palaeolithic, in particular it is worth mentioning two sites in southern Italy Grotta Romanelli and Grotta della Madonna di Praia a Mare, standing out for the wide array of species and number remains.

Grotta Romanelli is notable for the exploitation of the fox (over 4,000 remains) with traces referable to all stages of the butchery process (skinning, disarticulation, defleshing); this taxon is associated with hare, wild cat, badger, lynx and even hedgehog.

At Grotta della Madonna, although in smaller numbers, there are several species with traces of exploitation: the fox is well represented followed by cat, hare, pine marten, and rarer badger and hedgehog (Fiore et al. 2004)

Grotta del Clusantin and Grotte Verdi di Pradis stand out for being two sites of specialized marmot hunting (Nannini et al. 2018).

In this work the data from the above mentioned locations will be compared with other Italian sites where evidence of small mammal exploitation has been detected (e.g., Arene Candide, Grotta di Pozzo, Mora di Cavorso, Grotta Maritza, Grotta delle Mura etc...)

Relationships with other mammals will be addressed in order to understand the importance of these small animals in terms of subsistence and utility (e.g., fur exploitation). Furthermore, possible symbolic relevance of some of these taxa will be explored.

Keywords: Small mammals, Middle Palaeolithic, Upper Palaeolithic, Taphonomy, Italy.

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Woolly rhinoceros populations in Pleistocene Eurasia. A genetic view

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The woolly rhinoceros (*Coelodonta antiquitatis* Blumenbach 1799) and the woolly mammoth are main representatives of the *Mammuthus*–*Coelodonta* faunal complex, which consist of more or less cold-adapted Pleistocene large mammal assemblages with similar or identical faunistic structures known from transregional expansion in Eurasia (Kahlke, 2014). So far, much attention has been paid to the mammoth in the form of morphometric, radiocarbon dating, DNA analysis, and isotope studies study of its remains. There is a surprising dearth of research on the woolly rhinoceros given the relative abundance of its remains.

Our presentation will thus scrutinize the data on rhinoceri from Pleistocene Eurasia, with a particular emphasis on the genetic data, with the aim of shedding light on the characteristics and dynamics of the rhinoceros population. Referring the rhinoceros findings to other taxa will help understand the animal's response to various biotic and abiotic factors.

Key words: woolly rhinoceros, genetic, Pleistocene, Eurasia.

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Faunal sex estimation through amelogenin peptides analysis from the TD10.2 bison bone bed at Gran Dolina (Atapuerca, Spain)

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The analysis of skeletal faunal remains, which are ubiquitously found in Middle Palaeolithic (MP) archaeological sites, has provided new insights into Neanderthal subsistence regarding prey choice and resource strategies. Evidence from osteofaunal assemblages shows that similarly to early modern humans, Neanderthals were also capable of hunting most kinds of herbivore species, exploiting prime-aged, medium, and large ungulate species. Detailed knowledge of what prey species were targeted, including the age/sex-structure of the hunted assemblage, provides important clues about advanced human planning on predatory tactics and its efficiency and allows for meaningful evolutionary interpretations of foraging niches in MP contexts. The ability to differentiate between males and females in zooarchaeological assemblages can provide knowledge on sex-based animal exploitation strategies, a piece of crucial information that has direct implications for hominin planning depth, anticipatory abilities, mobility, and land use. Yet, acquiring information about foraging efficiency and ungulate mortality patterns is not always straightforward, and there is a considerable lack of sex-based data for most MP bone assemblages. While aDNA sequencing can be used, it is expensive, time-consuming, and could fail due to the poor quality of the remaining DNA. Here we report first results from *Bison* sp. enamel samples from TD10.2 bison bone bed at Gran Dolina (Atapuerca, Spain). This sub-unit formed by a dense layer of highly anthropized bison bones, associated with early middle Paleolithic industry has been characterized by early primary access to carcasses and systematic butchering focused on the exploitation of meat and fat with procurement of bison by communal hunting as early as ca. 400 kyr. Enamel samples were processed to identify AMELY and AMELX-specific peptides (i.e. the biomarkers of X and Y chromosomes, respectively), providing proteomic estimates of the sex of each individual through nano liquid chromatography-tandem mass spectrometry. Our results show that the analyzed individuals are female, thus deepening the debate on hunting management of prey among preNeanderthal foragers.

Key words: Fauna; Sex estimation; Amelogenin; Proteomics; Atapuerca.

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Birds exploitation during the Epigravettian occupation at Riparo Tagliente (Verona, Italy)

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The analysis of the bird remains coming from the recent Epigravettian levels of Riparo Tagliente, provides important information for the paleoenvironmental and palaeoeconomic interpretation of the site. The role of birds is considerable and fundamental to define the seasonality of human occupations, the hunting strategies, the fauna exploitation, the function of sites and the mobility of hunter-fisher-gatherers. The analyzed avifauna comes from the field excavation carried out between 1983 and 1999 and amounts to 246 remains, consisting mainly of diaphyseal fragments of long bones, vertebrae and indeterminate phalanges (NR 137; 56% of the sample). The number of identified specimens (NISp) at a specific level are 109 (44% of the sample) and belongs to 6 orders and at least 13 species. Passeriformes are the most represented taxon: 62 remains (58% of the NISp) of 2 families and 4 species: Corvidae (Alpine chough *Pyrrhocorax graculus*, Common raven *Corvus corax* and Spotted nutcracker *Nucifraga caryocatactes*) and Turdidae (Fieldfare *Turdus pilaris*). Anseriformes (25 remains, 23% NISp) represented by Anatidae of medium and small size (Eurasian wigeon *Mareca cf. penelope*, Mallard *Anas platyrhynchos* and Common teal *Anas crecca*) and some larger ones being determined, are less frequent. Galliformes, (Quail *Coturnix coturnix* and large Phasianidae), Gruiformes (Rallidae), Columbiformes (Dove *Columba livia/oenas*), Strigiformes (Common owl, *Asio otus*) and Falconiformes (Falcon *Falco* sp.), which represent 18% of NISp, are rarer. Birds mainly reflect a wooded and mountain environment but there are also water birds, such as Anseriformes and Rallidae. Some seasonality markers are derived from the presence of migratory birds, juvenile individuals and a medullar bone being analyzed. Spatial distribution analysis of these remains will allow to interpret the various areas of the rockshelter, contributing to clarify their functional utilization.

Keywords: Birds, Taphonomy, Epigravettian, Italy.

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The US9 structure of Su Carroppu di Sirri (Sardinia, Italy): first evidence of the exploitation of the Sardinian pika in the Mesolithic

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Su Carroppu di Sirri is located in the Sardinian region of Sulcis (south-western Sardinia), about 300m above sea level; this rock-shelter represents a key site for the studies of the occupation and human exploitation of Sardinia during prehistoric times, preserving so far, the oldest direct evidence of human presence in Sardinia and Corsica. This contribution provides the data of the first archaeozoological and taphonomic analysis carried out on this site, on the fauna remains coming from the US9: a combustion structure near the mouth of the rock shelter's overhang, that appeared in excellent condition and provided, through some radiocarbon dating on charcoals, a chronological classification between IX and VIII millennium B.C. The fauna assemblage analyzed consists of a total of 2,184 remains, 476 have not been identified. The assemblage shows low faunal variety: the most and mainly represented species is the Sardinian pika (*Prolagus sardus*) with 1680 bony remains (NRDt 98,36%). Rare and similarly represented are the murid (*Rhagamys orthodon*) and the vole [*Microtus (Tyrrhenicola) henseli*] with percentages below 1%, which, however, are probably also represented by the remains of Rodentia (0.70%). Moreover, some bird bones (0,18%) have been identified, but now not yet identified at specific level, and one sheep/goat remain due to a reasonable infiltration from the above levels. Interesting data have emerged about the morphology of the fractures and the presence of numerous juvenile individuals. Nevertheless, the high presence of concretion has not made possible the taphonomic analysis on the 78,30% of the findings examined, several cutmarks have been recognized on Sardinian pika bones.

Session 25-1

Percussive osseous industry a human revolution between pre-formation and waste selection

SESSION ABSTRACT

Archaeologists have developed a growing interest in the study of the bone industry related to percussion, particularly for Paleolithic periods. This type of industry became frequent, notably such as the manufacture of bone retouchers, but not only, and recent papers highlight the possible use of some bone fragments as hammer or anvil. Most of these tools originated from herbivore long bones, although some specific elements such as tusk fragments, teeth or antlers were common too. Zooarchaeological analysis, in addition, application of new methodologies such as proteomics, confocal microscopic analysis are complementary to answers to essential questions about this type of animal hard materials (ivory, antler, bones) industry:

1. origin of the bone tools and pseudo bone tools,
2. place in the technical equipment of the hunter-gatherers,
3. blank selection: pre-formation of the blank during the butchering process or selection after, among the butchery waste,
4. *in situ* used or possible transport, regarding the delay after butchery process and use and finally the abandonment.

The inclusion of these artifacts in animal hard material in the *chaîne opératoire* of debitage or lithic tool shaping in a perspective of cross and multidisciplinary analyses allows a global vision of the use of these retouches on lithic tools. The use of animal hard material retouchers responds to technical needs related to lithic knapping. The knowledge of both the lithic material and the hard material of animal origin depends on the skills of the knappers. It also implies a good knowledge of the tool technology and its use.

In this session, we bring together researchers working across the broad field of the osseous and flint industries. We propose studies from different points of view:

- Morphometric and geometric-morphometric analyses (blanks),
- Spatial analyses (blanks and marks),
- Archaeological experiments (neo-taphonomy),
- Functional and use analyses (blanks and marks),
- Technological analyses,
- Raw material (teeth, tusk, bone, flint, quartz...),
- Traceology of different lithic materials,
- Typology and nomenclature of the marks,
- Proteomic and DNA (taxonomy).

Instead of focusing on one method, this session aims at exploring how different methodologies may complement each other within and between cases of study and projects to provide a more nuanced understanding of the technical behaviors related to the bone and lithic industry through the Paleolithic and the diverse humanities. Papers may focus on case studies, theoretical frameworks and the development of specific methodologies related to the percussive osseous industry.

Main Organiser

Ursula Thun Hohenstein

Co-Organisers

Delphine Vettese, Juan Marin, Marco Peresani

In search of traditions in the remote past Identifying and interpreting behavioral recurrences in expedient osseous technologies

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A central issue in research on cultural evolution in our lineage pertains to how and why osseous technologies were integrated in past technological systems. While fully-shaped bone tools appear in the archaeological circa 90 ka BP in Africa, and circa 45 ka BP in the rest of the Old World, the use of osseous materials for technological purposes dates back to at least 2 Ma BP. These early technologies consist of unshaped or partially modified osseous fragments that bear clear evidence of their use in various subsistence activities. However, the study of these tools constitutes a challenging task because they are often difficult to recognize, owing to the numerous taphonomic processes that mimic anthropogenic modifications, and their role in past technological systems remains to be established with reproducible methods. Overcoming these difficulties would prove extremely beneficial to investigate Pleistocene population dynamics as it is done with fully-shaped bone tools. In the present communication, I argue that combining converging clues may help osseous technologists to find behavioral recurrences in the selection, modification and use of osseous remains, which may, in turn, be interpreted as cultural traditions. To illustrate the feasibility of this project, I present a synthesis of the data gathered at Lingjing, China, from a layer dated between 125 and 105 ka BP, which was interpreted as an early Late Pleistocene kill-butcher site. The joint paleontological, taphonomic, and technological analysis of the faunal assemblage from layer 11 shows a marked behavioral standardization in raw material selection. This pattern suggests that the visitors at the site targeted specific taxa and/or elements to undertake distinct types of activities. Experimental archaeology and use-wear studies, combining qualitative and quantitative approaches, allowed the identification of numerous expedient bone tools. Although the morphometric continuum highlighted between bone and lithic tools, and the hypothetical function of the site, appeared to indicate the use of expedient tools in butchery and carcass processing activities, the application of novel quantitative methods in use-wear study rather suggests most tools were used to process a number of plant species, including bamboo. These results emphasize the importance of creating use-wear comparative samples that include subsistence activities not limited to carcass processing. They also highlight the potential of expedient osseous tools to investigate cultural traditions in the remote past. It therefore becomes necessary to increase the number of archaeological assemblages where expedient osseous technologies are documented in details to undertake synchronic, and diachronic regional comparisons that would then allow the documentation of their cultural trajectories.

Key words: Expedient osseous technology; tribology; experimental archaeology; use-wear study; China; Pleistocene; plant processing; behavioral standardization.

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Use of deer antlers as soft hammer in the Lower Palaeolithic: an integrated fauna/lithic study for the Acheulean site of Cagny-l'Épinette (MIS 9, Somme, France)

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The use of antlers is well known in the Upper Palaeolithic and Neolithic periods, both as a soft organic hammer and as a pickaxe, axe sheath, harpoon, assegai, eye needle, cutting board, beads, etc. But what about their use in the earliest periods, particularly the Lower Palaeolithic? To try to answer this question, an initial archaeozoological study of present-day deer antlers was carried out in order to record all natural traces in a reference frame. This study includes the elaboration of a database that provides information on several parameters: antler length, polishing, indentations, fractures, etc. Following the macroscopic observations on the natural antlers, silicone cast and resin prints were made in the laboratory, allowing for a detailed analysis of these various traces with the SEM (scanning electron microscope). Then, with the help of a stone knapper and experimenter, four lithic experiments of biface knapping were carried out using different percussion tools (flint, sandstone, fresh deer antlers and previously used deer antlers) in order to carry out a techno-typological study, in an attempt to highlight the potential stigmata evocative of percussion. These different approaches were then applied in comparison with the lithic industry and deer antlers from the Acheulean open-air site of Cagny-l'Épinette (SIM 9, Somme, France), one of the only sites in the Hauts-de-France region to have yielded numerous faunal remains found in interconnection with lithic industry for this period. At this stage of our analyses, we can assume the use of hard mineral, soft mineral (sandstone) and soft organic (new deer antler and/or worn out) hammers, even though the antlers do not seem to show any obvious traces of percussion type use. This allows us to put forward various hypotheses, such as the transport of deer antler hammer by Human, or the presence of antler hammers in unexcavated areas of the site. We present the preliminary results of a cross study associating lithics and fauna to better understand the behaviour of prehistoric Human and the management of mineral and animal resources in their environment.

Key words: Hammer; antler; Lower Palaeolithic; Cagny-l'Épinette; experiments.

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Middle Paleolithic bone retouchers from Northern France: preliminary results of a multi-proxy analysis

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Over the last decades, important discoveries have deeply reshaped our understanding of Neanderthal behaviors, and notably an increasing number of proofs of non-dietary uses of different kind of animals. The use of bones for a variety of daily activities is now frequently identified, with so-called bone “retouchers” being the most recognizable and the most numerous. But whether those remains were opportunistically or deliberately chosen remains unclear, highlighting two key questions: was there any intentionality in the choice of raw material? Was there any specific preparation of the bones prior their use as retouchers? Only a multi-proxy analysis can allow to answer those questions. We will present here our approach and preliminary results through the study of a collection from Northern France: Biache-Saint-Vaast (thereafter BSV).

The MIS 7 site of BSV yielded three main archaeological levels with Mousterian lithic industries associated with rich bones of large terrestrial mammals remains, with particularly good surface preservation for an open-air site. Over 300 bone remains with impression patches, similar to percussion stigmata on lithic material were identified, making BSV one of the largest known collections of Middle Paleolithic bone tools. We propose to perform a systematic non-invasive zooarchaeological, taphonomical and use-wear study to understand the acquisition and use of the remains. In addition, paleoproteomics analyses are applied to overcome the limitations of classical taxonomic attributions, through a minimally invasive technique.

Our first results indicate that the remains of the three main species identified at BSV were used as “retouchers”: aurochs (*Bos primigenius*), brown bear (*Ursus arctos*) and meadow rhinoceros (*Stephanorhinus hemitoechus*). The specimen observed so far were nearly exclusively used for percussion of flint, in order to retouch flakes or tools. These results highlight the importance of combining different approaches and methods for the knowledge of the use of such bone tools and more generally of the management of large fauna by Neanderthal populations. Further analyses will attempt to characterize the full bone tool collection of BSV. In addition, Middle Paleolithic sites from Northern France where bones are well preserved, will allow the application of such multi-proxy analysis at a large scale.

Such detailed studies, using multi-proxy approaches on bone tools, is still poorly developed among Middle Paleolithic researches and will undoubtedly become mandatory to improve our knowledge of past hunters exploitation of faunal material, and more generally of Neanderthal or other humanities behaviors.

Key words: Neandertal, bone tools, zooarchaeology, paleoproteomics, experimentation

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Bone retouchers from Riparo Tagliente (Veneto, Italy): proposal for a morphological study through 3D analysis

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Bone retouchers are one of the earliest evidences of the use of tools made from animal bones in the Lower and Middle Palaeolithic. Their presence suggests the exploitation of prey not only from a trophic perspective but also from a technological standpoint. The retouchers can also indicate a careful reuse of by-products from other activities, such as bone fracturing for marrow extraction, and a premeditation in the production of diaphysis flakes. Numerous bone retouchers have been found in the Mousterian levels of the (42-40) at the Riparo Tagliente site in Veneto, Northern Italy. These tools appear to have been mainly crafted from fragments of long bone diaphysis of medium to large-sized ungulates, such as *Cervus elaphus*, which is the most prevalent taxon in the studied levels. The purpose of this study is to understand whether the Neanderthals inhabiting the site intentionally selected specific anatomical elements of animal species to produce these retouchers. To explore this, we employed 3D morphological analyses. The initial part of this study focused on identifying these artifacts and distinguishing between modifications of edaphic and anthropic nature. Then the identified retouch areas were subsequently classified based on their morphology and size. Regarding the morphological analyses: seven retouchers from levels 42, 41 and 40, determined as fragments of metacarpals, metatarsals, and tibiae of *Cervus elaphus*, were selected. A 3D model of these artifacts was created using a structured light 3D scanner, and the average curvature on which the retouch area fell was measured. The obtained average curvature values were compared with those derived from 3D models of nine modern *Cervus elaphus* bone samples: metacarpals, metatarsals, and tibiae. By relating the curvature values obtained from the archaeological retouchers to those of the comparative bones, it is noticeable that the average values of the two groups of samples seem to coincide. The Neanderthals of Riparo Tagliente appear to have selected specific bones characterized by similar morphologies useful for the retouching activities of their lithic tools.

Key words: Bone retoucher; 3d analysis; morphology; Mousterian; Riparo Tagliente; northern Italy.

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Last Glacial Maximum retouchers in Southwest Europe

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The unworked bone industry encompasses a collection of domestic tools resulting from unplanned long-term production, primarily due to two main factors: first, their rapid production attributed to their low or nonexistent degree of transformation, and second, the abundance of available raw materials. In the case of retouchers, their expedient nature is reflected in the low degree of surface work, which is nonexistent in most cases. Furthermore, the identification of waste products if they exist, is impossible to differentiate between other bone fragments, so technologically, we cannot a priori speak of other product categories involved in their manufacture.

In this study, we present the results obtained from the analysis of sequences corresponding to the Last Glacial Maximum from the collections of Abri Fritsch, Abri Lachaud (France), Hort de Cortés-Volcán del Faro, and Cova del Parpalló (Spain). Although the number of artefacts is small across the four collections, they reflect various technological and economic aspects related to this period, which we will define in four aspects:

- Identified raw material and its relationship to the hunted fauna.
- Description of technological stigmata and morphometric features.
- Identification and description of use-wear traces and their distribution on the blanks.
- Implications for the overall bone industry and the economy of the Last Glacial Maximum in southwestern Europe.

Key words: Retouchers; osseous industry; osseous technology; Last Glacial Maximum.

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The earliest occurrence of antler hammers in the European Palaeolithic record. New data from southern Italy

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The use of tools made of animal hard tissue, such as bone, antler, tooth and ivory – generally labelled ‘bone tools’ or ‘osseous tools’ – represents a key issue for research on human cultural evolution. Bone tools were used as both raw materials to be shaped or as tools for shaping, mostly deer antlers or distal epiphysis used as hammers or percussors. Among the earliest bone tools, antler hammers are known to have played a key role for the manufacture of finely-flaked handaxes.

The bone tool technology is now well defined and described in European Middle and Upper Palaeolithic assemblages. However, evidence for the use of antler hammers is generally rare. Among others, a reason could be envisaged in the difficulties of identifying knapping damage on antlers.

For this reason, it is essential to integrate the taphonomic and zooarchaeological studies with the results of lithic analysis. In this paper we discuss the state of the art of the earliest evidence for antler hammers in Palaeolithic Europe, in the light of the new data recovered in the acheulean site of Guado San Nicola (southern Italy).

Keywords: bone tools, deer antler, hammers, handaxes, taphonomy.

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General Session 4
Neolithic - The Copper Age

Investigating possible links between Holocene environmental changes and cultural transitions across India

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From the early Holocene onward, the Indian Subcontinent has accommodated a range of diverse human cultures and associated ecological adaptations and lifestyles. Around 10kyrs ago, the Subcontinent has witnessed the development of later Mesolithic hunter-gatherers and their subsequent regional transitions to pastoralist (Neolithic) and agricultural (Chalcolithic) lifeways. The Holocene climate records reveal discrepancies in the timing and duration of climatic events, which can be attributed to a vast geographic isolation, the influence of height, elevation, and local climatic conditions. These changing climatic patterns including the development of a geographically variable monsoon directly impacted these various cultures including the Harappans and their contemporaries as well as younger Historical and Medieval empires across India, at various levels. In some regions, environmental changes led to uneven cultural transitions, geographic migrations, and the development of regionally-distinct material cultures along with establishment of sedentary life- ways. This paper attempts to present a review broadly correlating general climatic patterns throughout the Holocene period of India with regional cultural dynamics. All geomorphic-climatic zones of the Subcontinent showed strong inter-proxy coherence between 9 and 5 kyrs in response to increased precipitation. After this warming period ends, we see a moderate dry period as a result of a weakening monsoon and an overall tendency toward aridity throughout all zones (after 4 kyrs). The temporal variation of human habitation and respective adaptive responses suggest broad linkages to the varying climatic and physiographic features at a regional scale. Learning how this shaped human eco-dynamics in the past can help us expand our understanding of human history and implement lessons for the present as well as the future.

Key words: Holocene; climate; monsoon; cultures; regionalization; adaptations.

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Contextes géologique, géomorphologique et taphonomique des sites néolithiques du Ferlo (Sénégal): Les vestiges archéologiques des sites de Loumbol Amar

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Dans le Ferlo, les Préhistoriques ont bénéficié de contextes géomorphologique et géologique complexes propices à la taille de la pierre et au façonnage de la poterie. Les traces de ce peuplement préhistorique sont attestées par des vestiges lithiques, céramiques et osseux trouvés in situ dans des sites néolithiques de Weddu Asré et Weddu Samba Nar (Loumboul Amar). Mais, cette culture néolithique est peu étudiée. En effet, la seule mention relative aux sites de Loumbol Amar, découverts en 1986, porte sur le site protohistorique de Gnarouwel, sur la route Pattouki-Loumbol Amar. L'objectif de cette présentation est de documenter les sites préhistoriques de Weddu Asré et de Weddu Samba Nar mais aussi de saisir le cadre archéologiques du Ferlo afin d'évaluer le dynamisme culturel la rattachant à l'ensemble néolithique du Sénégal divisé en famille faciès. La zone d'étude se trouve sur les environs des rives de la vallée fossile constituée de multiples unités géomorphologiques. Par conséquent, les sites néolithiques se trouvent incrustés sur les croutes de levées sablo- argileuses décomposées par des réseaux de ravins. Ainsi, la reconstitution de cette culture préhistorique se fondera sur des données sédimentaires, chronologiques soutenues par une analyse du processus technotypologique et des évidences stratigraphiques des cultures matérielles héritées de la région afin de proposer un référent solide et varié des différents types d'artefacts recueillis dans leur contexte chronostratigraphique à Loumbol Amar. Cette étude tente de déterminer les comportements techniques des populations néolithiques à partir de la production « industrielle ».

Mots clés: Loumbol Amar; vestiges archéologiques; Néolithique du Ferlo; taphonomie.

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Indigenous hunter-gatherers and Precucuteni/Early Trypillia groups in the valley of the Southern Buh River

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The later stage of so called 'Buh-Dniester' culture (fishers, hunters, gatherers equipped with pottery) are traditionally thought to be partially contemporaneous with Precucuteni/Early Trypillia cultural aspect. The concept of 'Buh-Dniester' culture have been critically reviewed recently. It cannot be treated as a homogeneous cultural entity any longer. This critique requires a detailed overview of the supposed chronological indicators ('imports') in the collections of the Southern Buh river foragers and their neighbours. This report intends to present such an overview taking into account recent series of radiocarbon dates and revision of the historic field-work documentation.

Key words: Radiocarbon dating, cross-cultural imports, post-depositional processes.

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Chronology and paleoenvironment of the Cucuteni A-Trypillia B1 settlements in the Southern Buh area in the light of recent data

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The Southern Buh region has a rich history of archaeological research. Cucuteni A-Trypillia B1 settlements were discovered during the works in the area. These settlements were presented in many pieces of research. Despite this history, the results of decades of research on the Sabatinivka 1 and Berezivska HES sites have yet to be fully published. These archives and collections are located in the Odesa Archaeological Museum and the Institute of Archaeology of the NAS of Ukraine. In recent years, intensive work has been carried out on processing these collections (settlement structures, ceramic complexes, clay figurines, bone tools, lithics, and stone tools). It also includes interdisciplinary research. For example, data on archaeozoological materials from the excavations of these settlements have been published recently.

During the last decade, the Podillia-Pontic Archaeological Expedition prospected the territory of the Southern Buh Valley during its campaigns. After these works, several new Cucuteni A-Trypillia B1 settlements in the region were discovered and investigated (Shamrai, Kamiane-Zavallia 1, Kozachy Yar 1, Dovhy Yar, and Topoli). Geomagnetic prospection and trenches were carried out in the Kamiane-Zavallia 1 settlement. Due to these results, enclosures around the settlement were discovered. A similar object was traced during the geomagnetic prospection of the site of Kozachy Yar 1. In addition, test trenches and excavations were made for old campaign planigraphy at the Sabatynivka 1 site. Prospection took place at the Berezivska HES site.

In recent years, the data on the radiocarbon dating of these settlements has increased. New AMS dates from the sites of Sabatynivka 1, Berezivska HES, Shamrai, and Kamiane-Zavallya 1 say these settlements could exist in the 44-42 century BCE. Paleopedological analysis was also carried out on two trenches in Sabatynivka 1. The episode of soil formation interruption in Sabatynivka 1 can be associated with the onset of aridization at the end of the Atlantic period. This data fits the results of the new AMS dates. The latest finds, archival documents, and old collections made it possible to draw new conclusions about the Cucuteni A-Trypillia B1 settlements in the region.

Key words: Cucuteni A-Trypillia B1, radiocarbon dating, paleoenvironment, absolute chronology.

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Zooming in and out the outcomes of geophysical research at the settlement of Kamenets-Podolskiy (Tatarysky)

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Application and development of the geophysical research at archaeological sites is significantly contributed by the decades of work at the settlements of Cucuteni-Trypillia cultural complex in modern Romania, the Republic of Moldova and Ukraine. Most recently, megasites in the Southern Bug and Dnieper interfluvium remain the main attraction of the international work on this cultural complex. However, understanding of the formation, development and decline of these unique sites requires contextualization in terms of the research on large settlements in other areas and intensification of the small sites analysis. Contributing to the issues of settlement structures evolution and their underlying processes, we conducted magnetometric surveys and excavations at the settlement of Kamenets-Podolskiy (Tatarysky), 3950 – 3900 BCE. Besides the work on large-scale patterns, our research aims to analyze the challenges and advantages of geophysics applied to the reconstruction of houses' internal structure. The latter is made possible by the correlation of burnt daub mass and magnetization.

Key words: Cucuteni-Trypillia; magnetometric surveys; settlement structure; house interior; burnt daub.

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Chalcolithic habitat in the Moldavian Subcarpathians. Geophysical surveys in the settlements of the Cucuteni-Trypillia cultural complex in the Neamț Depression (Moldavia Region, Romania)

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In recent years we have seen an increase of the non-invasive archaeological research in Neolithic and Chalcolithic settlements, with excellent results. These include geophysical surveys carried out on a large scale or even exhaustively in archaeological sites with remains belonging to the Cucuteni-Trypillia cultural complex. The giant-settlements on the current territory of Ukraine and the multi-layered archaeological sites on the current territory of Romania are the main attractions for specialists.

In 2017-2019 and 2022, within the framework of the cooperation project between the Cucuteni Culture International Research Centre of the Neamț National Museum Complex (Romania) and the Institute of Pre- and Protohistory of the „Friedrich-Alexander” University in Erlangen-Nürnberg (Germany), interdisciplinary non-invasive archaeological investigations (geophysical prospection, aerial drone photography, digital terrain modelling) and surface investigations have been carried out in 15 Cucuteni-Trypillia sites from the Neamț (Ozana - Topolița) Depression of the Moldavian Subcarpathians, which becomes the first geographical area investigated in this way for a whole period of time (Chalcolithic) in Europe.

The results obtained on this occasion (which sometimes confirm and sometimes refute the data of previously published archaeological excavations) concerning the exact location of archaeological sites, their boundaries, shapes and sizes, habitat characteristics, types of archaeological features and the current state of preservation of the remains, allow us to efficiently manage the resources at our disposal (human, material, financial), as well as the optimal protection, research, enhancement and promotion of the cultural heritage, for the benefit of specialists and the public, local and central authorities.

Key words: Chalcolithic; Cucuteni-Trypillia; Moldavian Subcarpathians; Neamț Depression; geophysical surveys; habitat.

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Examining Mobility and Land Use at Sultana, Romania during the Eneolithic through Strontium Isotopic Analyses of Plants and Human Tooth Enamel

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Material evidence indicates that the Eneolithic communities inhabiting the tell settlement of Sultana, Romania were fully integrated into a vivid trade network that encompassed most of southern Romania and Bulgaria. However, the question of whether this phenomenon consisted solely of an exchange of goods and ideas or if it also corresponded to an increase in mobility of individuals among the different social groups is still debated. Strontium isotopic analysis of human tooth enamel provides us with direct evidence regarding the extent of mobility during the period. The interpretation of the results obtained on the human material is enhanced by the analysis of contemporary plants at several locations, which constitutes a baseline for the bioavailable strontium (BASr) at a regional level. Samples from forty-four individuals from Sultana-Malu Roșu, two from Sultana-Ghețarie, and three from Sultana-Școala Veche were selected for this study. Fifteen plant samples from five different locations were collected to constitute the BASr baseline, and another forty-five from fifteen different locations were used to assess variations at a regional level. The samples were analyzed on a MC-ICP-MS at the Brussels Bioarchaeology Lab (BB-LAB) of the Vrije Universiteit Brussels (VUB), Belgium. Seven outliers were identified and represent individuals who must have moved into the area after their childhood. These results offer us a precious insight on the mobility of ancient communities in the Northern Balkans during the fifth millennium BC.

Key words: Mobility, Strontium, Eneolithic, Romania.

Incipient mercury poisoning in the Gumelnița population (5th millennium BC, Romania)

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Mercury can be found in two forms: elemental mercury (Hg⁰) and inorganic mercury (Hg⁰, Hg²⁺, or mercury salts). While all forms of mercury exist in various ecosystems, methylmercury is predominantly found due to its bioaccumulation in aquatic animals in contaminated areas through absorption and ingestion. During the Chalcolithic period in the southern region of the Iberian Peninsula, the use of cinnabar (HgS) as a pigment was common, resulting in some individuals experiencing mercury poisoning. Cinnabar pigment has also been discovered in the Vinča culture in Serbia, although there have been no studies on mercury contamination in human bones thus far.

A total of 28 individuals of different ages, along with 5 *Silurus glanis* and one *Cyprinus carpio*, were sampled and analysed for total mercury (THg). All humans had THg values below 1 ppm (mean: 0.05 ppm), except for M15, who had a THg value of 1.1 ppm. The European Food Safety Authority (EFSA) has established a limit of 0.5 ppm for THg in fish. *Cyprinus carpio* fell below this limit (0.2 ppm), but *Silurus glanis* had an average value of 1 ppm. Previous isotopic analysis revealed that a quarter of the protein in the Gumelnița population's diet originated from freshwater resources, including fish and shellfish. This can explain the THg values in humans, except for M15, a young woman, as 90% of ingested mercury is excreted. The THg values of M15 cannot be solely attributed to the consumption of fish and shellfish, suggesting that the use of cinnabar for pigment or mining activities could be the source of mercury poisoning in this individual. These findings provide the first evidence of cinnabar use in Romania.

Key words: mercury, cinnabar, Romania, Chalcolithic.

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Dating millet seeds from Neolithic context: the case of Gumelnița and Morteni sites

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Milletts are a group of small-seeded cereals species used for fodder and human food. Its origin as a domestic crop is in the northern part of China in the 6th millennium BC, from was it extended later through the Eurasian steppe till Europe as part of the “Bronze age package”, like the horse and the bronze.

Millet grains from *Panicum miliaceum* and *Setaria italica* were found in the Chalcolithic sites of Gumelnița and Morteni in Romania. To check if those findings really belong to this chronology or are intrusions, 6 of those seeds were radiocarbon dating, and to check about how these crops were cultivated, 6 grains were subjected to stable isotopes analysis.

The radiocarbon results showed that in fact those grains were not of Chalcolithic age, and in the case of Gumelnița site are of Bronze age (3075 ± 127 , 2301 ± 102 , 1446 ± 69 , 1325 ± 76 and 1188 ± 93 calBP), and iron age date in the case of Morteni (316 ± 93 calBP). Isotopic results showed that the bronze age grain analysed from Gumelnița showed a medium amount of manure (10-15 tons/ha) while than the iron age grains from Morteni had a high amount of manure (>35 tons/ha), highlighting the importance that this crops had over time.

With this communication we want to highlight the importance of dating botanical remains, since they could come from intrusive events, or being deposited and buried later in time, like in these cases.

Key words: millet, radiocarbon dating, stable isotopes, Romania, Bronze Age, Iron Age.

Note: This work of University of Bucharest team was supported by a grant from the Ministry of Research, Innovation, and Digitisation (41PFE/30.12.2021) within PNCDI III.

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Session 17

Multi-faceted Pyroarchaeology: from environmental to cultural proxies

SESSION ABSTRACT

As fire is multi-functional, pyroarchaeology is multi-faceted. Pyroarchaeological research encompasses both natural as well as archaeological fire, while we recognise the latter and its traces as artifacts. The field relies on a large variety of methods to obtain environmental and behavioral proxies informing us on technology, diet, cultural activities and settlement patterns. For example, occupation intensity or fuel choice are some of the proxies that can be obtained by studying fire and their residues. Their analysis can reveal cultural choices or environmental restrictions and variability. This session will be open to contributions from the multiple disciplines concerned with the study of ancient fire, whether these studies provide behavioral or environmental information, or focus on the evolution of different uses of fire, from the origins of fire use to its application in more complex technological innovations. The session is not limited to the analysis of archaeological materials; experimental approaches and contributions from ethnography or ethnoarchaeology are also welcome. We also welcome contributions on pyrotechnology and its cognitive, cultural and social implications; the multiplication of the uses of fire with time comes with a growing impact of fire as part of the human technical repertoire. We encourage the presentation of papers about new approaches to overcome the difficulties related to the characterization of ancient anthropogenic fires.

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Mareike C Stahlschmidt

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Carolina Mallo

Ritual mass destructions by fire of flint artefact during the Neolithic in Southern Scandinavia

Lars Larsson*¹

For several years, research has been conducted on deposition of flint and stone objects in Scandinavia. Deliberate destruction or rather transformation of flint objects by fire is primarily known through the deposition of single or a few objects associated with megalithic tombs and enclosures. Through excavations at three sites, two in southernmost Sweden and one in central Sweden, it has been shown that deliberate mass destruction of objects by heating has been carried out through special ceremonies during significant parts of the Neolithic.

Through surface finds in western Sweden and Denmark, at least three more sites have been identified. The objects included in mass destruction show common features with a clear concentration of axe blades. There are also special differences with, for example, exotic objects, elements of burnt human bones, stone axes destroyed by breaking and the use of barley grain as fuel. As far as the place of burning is concerned, most have a close contact with watercourses or wetlands that have shielded the place of deposit of the burnt objects. Mass destructions occur mainly during a late part of the Middle Neolithic (3000-2800 f.Kr.) but similar activities occur both earlier and later. Most of the fire-damaged objects have been deposited in small shallow pits, which means that most of the fragmented objects have been found in the topsoil when the sites have been subjected to ploughing.

Experiments with the destruction of flint objects by fire have been performed and it appears that a special treatment of the flint objects was carried out first by heat treatment and then deposition on a hearth.

Key words: Neolithic, Southern Scandinavia, fire-damaged objects, axe heads.

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Microfauna as a Proxy for Fire in the Acheulean of Wonderwerk Cave, South Africa

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Microfauna bones, deposited in situ through the activity of raptors, are abundant with potential to provide evidence relevant to the presence of burning in archaeological sites. Recent burning experiments have shown that microfauna bone mineral is more rapidly altered by heat than macrofaunal bone mineral, as detected by FTIR spectroscopy (Shaw 2022). In the Acheulean contexts of Wonderwerk Cave, South Africa, the abundance of microfauna has been determined to be an accumulation of barn owl pellets (Fernandez-Jalvo and Avery 2015). Previously, Berna et al. (2012) have demonstrated that Wonderwerk's Acheulean Stratum 10 contains in situ evidence of fire in association with anthropogenic activity. The burning of microfauna bones in this context can be considered unintentional, and therefore, microfauna can act as sensitive thermometers of background burning. For this study, a small subsample (n=6) of microfauna femurs with different macroscopic indicators of exposure to heat were studied microscopically using histological thin-sections in order to gain an understanding of the structural alteration underlying the diagenetic processes impacting these bones. Thin-section light microscopy shows distinctions between the reactions of lamellar periosteum and endosteum bone structures, and disorganized non-vascular bone structure, to these diagenetic processes (namely burning, bioerosion, and staining). It is likely that the internal bone structural organization and mineral stability influence the way in which the bone reacts to different diagenetic processes. Additionally, macroscopic and microscopic observations did not always align, such that bones appearing macroscopically less diagenetically altered demonstrated a high degree of microscopic structural alteration when observed through thin-section. These preliminary results point to the value of histological microscopy for the study of the transformation of microfauna bone by exposure to heat.

Key words: microfauna, bone mineral, burning, histological thin-section, Acheulean.

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Macroscale descriptions of anthropogenic features in the archaeological sequence at Border Cave, KwaZulu-Natal, South Africa, using a multiproxy geoarchaeological approach

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Border Cave, located on the western face of the Lebombo Mountains of KwaZulu-Natal, South Africa, contains a record of archaeological deposits spanning over 220,000 years. Significant finds include evidence of early burial practices, personal ornamentation, and the earliest occurrence of grass bedding. This contribution, part of a larger geoarchaeological programme, utilised fabric analysis, allostratigraphy and facies analysis to explore deposit formation processes across all stratigraphic units in the sedimentary sequence. These analyses revealed a complex stratigraphic history for the deposits. Facies analysis and allostratigraphy indicate multiple geogenic and anthropogenic site formation processes were active on a local and deposit-wide scale. Geogenic processes are the major contributor to the deposits, and they provide a baseline sedimentological and fabric signature for the anthropogenic units so will be briefly discussed, but this presentation will focus on the anthropogenic processes and features that contributed to site formation. These include combustion feature building and modification through site maintenance activities, compression, and trampling, processes that are far more intense and discernible in the White Ash than in the Brown Sand units. Despite these modification processes, post-depositional particle movement is limited, with fine fractions being more dispersed and >20 mm components having undergone only minimal lateral mobilisation, which was established through facies descriptions and fabric analysis respectively. Fabric analysis revealed that the elongated particles have an anisotropic organisation, suggesting post-depositional processes relating to the deposit slope have affected the organisation of particles. However, fabric data have only been collected in the upper part of the sequence so far, with investigations still ongoing. A slightly more isotropic organisation of particles in the anthropogenic units, for which only a small amount of data has been recorded in a single unit, is suggestive of a greater influence of sediment homogenisation, likely attributable to anthropogenic trampling and combustion feature redistribution. The methods applied provide a cohesive preliminary perspective on the formation of the Border Cave deposits and the activities of people occupying the site, with a more resolute understanding of the upper sequence, but they also raise questions for future geoarchaeological work to clarify.

Key words: Fabric analysis; Allostratigraphy; Facies analysis; Site formation.

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Analytical and experimental study of the Neolithic heated stones fire structures of the Louviers site "Zac Côte de la Justice" in Eure France

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The heating structures of North-West France have very special characteristics in relation to the use of these raw materials and have often created difficulties in defining their functions. This communication will present a recent analytical and experimental study carried out on two combustion structures at the Neolithic Louviers site (Eure- France), based on an analytical and experimental approach of the different types of proxies (anthracological, mineralogical palynological, sedimentary and biogeochemical and physicochemical analyses) carried out to understand the modes of operation and possible functions of this type of structure.

Key words: Fires structures study methodology; Thermal energy history; Fire human uses; Heated stones fires structures; Thermal histories.

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Trapping smoke: experimental approaches to characterising past fire implication in prehistoric human life

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The introduction of fire as a technological resource changed the life of past human groups in many ways as it implied cooking food, lighting, heating and socialisation. These improvements have been studied using several approaches considering earliest evidence of fire use, hearth functioning and maintenance, and fuel procurement, among others. On another note, experimentation has already proved to be a resourceful approach to investigate fire hearth formation, types of fuel used and heat transfer. We present here the latest advances in the experimental fires planification related with fire use and its emissions, dwelling scenarios (open air and enclosed sites), wellbeing (health and habitability) and identification and characterization of evidence of its use (phytoliths and PAHs). In order to address this, we established a series of protocols for the experimental fires with formulation of hypotheses from archaeological cases with a wide chronological span from the Lower Paleolithic to the Chalcolithic (e.g. Abric Romaní in Capellades, Molí del Salt in Vimbodí, El Mirador and Sima del Elefante in Atapuerca, La Cansaladeta in La Riba).

Consequently, our experimental research focuses on two main objectives: first, identify and quantify the presence of PAHs in flat hearths, understand their spatial deposition and degradation. This experimentation is intended to be a current reference to help us better understand PAHs as a biomarker of escape and to support interpretations of data obtained in Pleistocene archaeological sites. Second, to understand how aware were humans about the positive and negative effects on health and how this may have affect the habitability of the places where they lived since the habitual

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use of fire. For this, our research focuses on the identification of patterns that could refer to the decision making regarding the type of dwelling, as well as the size, ventilation and location of hearths and type of fuel used.

The experiments have been carried out so far in open air (12) and enclosed contexts (4). All fires were flat with and some of them had rocks according to the purpose of each one. The experiments protocols considered the recording of different variables including: meteorological conditions (temperature, wind, rainfall, humidity), hearth temperature (4 per hearth K type thermocouples), illumination, heat transfer properties and measured fine particle emissions. The fuel used in all experiments was *Pinus sylvestris* with different sizes, state, and quantity (5kgr to 40 kgrs per hearth). Additionally, dried grasses and pinecones were used during the ignition process. Systematic sampling for anthracology, phytoliths, FTIR, and PAHs analyses was carried out according to the objective of each hearth. Additionally, some fires have also been left exposed to observe the degradation of the compounds after 3, 6 and 12 months. Furthermore, to understand various aspects related to PAHs as biomarkers of fire, several samples have been taken from the different internal fire layers, as well as control samples before and after combustion. These experiments have allowed us to analyse air quality, as well as living conditions and fire use evidence in different archaeological scenarios regarding prehistoric communities.

Key words: Pyroarchaeology; Experimental Archaeology; Fuel Emissions; Chemical Analysis; Fire use.

There's no smoke without fire: a deep time perspective on the effects of fires on air quality, human health and habitability in the Palaeolithic and Prehistory

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The use and control of fire is arguably one of the most important technological advancements of the Homo genus. Prehistoric populations exploit the combustion properties of fires (light, heat and smoke) for daily tasks such as food preparation, insect repellent, extension of daylight hours and modification of technology. The habitual use of fire can however lead to significant health implications through sustained exposure to smoke which can affect air quality resulting in respiratory complications. While smoke is often an important tool in hunter-gatherer activities such as smoking meats, curing hides, accessing highly prized food items such as honey and as an insect repellent; to date, little research has been conducted on the actual levels of exposure to harmful toxins contained in smoke that Palaeolithic hunter-gatherers would have been exposed to during their daily lives. In this paper, we present a new methodological protocol for future studies wishing to examine the effects of smoke from open fires on air quality, human health and habitability in the Palaeolithic using environmental monitoring systems. We present the first systematic study of concentration levels of harmful particulate matter (pm2.5) in smoke relative to the use of other combustion properties of fires (light, smoke and radiative heat) from a wide range of fuels used in Palaeolithic fireplaces, recording different types of fires (smoking, glowing and flaming) and activities. Our empirical findings highlight significant variability in light and heat output, as well as concentrations of harmful particulate matter in smoke (pm2.5), resulting from the use of different fuel types, burning properties of the fires, as well as variation in exposure levels associated with activity types (smoking food items, sleeping and cooking). We argue that this variation and the aim to minimise exposure to the harmful elements of smoke, likely influenced the placement of fixed fire features in habitation spaces whether open, semi open and closed (outdoors, rockshelters, caves, huts and houses) relative to the use of combustion properties. Our results point to the organisation of habitation spaces as a significant element of fire use due to effects on air quality of smoke by Palaeolithic and later hunter-gatherer communities and show how human-environment interactions around fire, fuel and habitability have changed over time from the Palaeolithic through to later time periods (Neolithic and Iron Age).

Key words: Fire, human health, habitability, fuel management, Palaeolithic.

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The role of bone within and between Neanderthal combustion features at Roc de Marsal (Layer 9)

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Pyrotechnology is an important lens into behaviors relevant for our understanding of prehistoric economic and social lifeways. Questions of fire use and management are especially significant for Neanderthals, as there remains outstanding questions regarding variability in habitual fire use between and within the geographic and temporal range of Neanderthal populations.

The site of Roc de Marsal (RDM; Layer 9) presents an opportunity to investigate anthropogenic fire technology variability in a temperate climatic period as there are several (minimum 15) intact and visible features which were excavated with modern methodologies.

This study focuses on a zooarchaeological perspective of Neanderthal pyrotechnology, utilizing both piece plotted (≥ 25 mm) and coarse screened (6-24 mm) burnt fauna as a proxy for fire properties. Burned bone is analyzed here with macroscopic observations to construct burning indices following Costamagno et al. (2010) and to determine species identification and document anthropogenic modification. Spectroscopic techniques (FTIR, XRD) are also used to verify thermal alteration and test for differences in burning atmosphere (reduction or oxidizing), duration, and temperature thresholds. Results are integrated with extensive prior studies, including: the distribution of burnt lithics (Reeves et al., 2019), prey selection and transportation (Hodgkins 2012; Hodgkins et al. 2016), as well as geoarchaeological (Aldeias et al 2012; Goldberg et al., 2012) and paleobotanical data (Wroth et al., 2019). This synthesis takes into consideration the contextual associations between the distribution and orientation of fire proxies.

Key words: Fauna, Fire, Neanderthal, Pyrotechnology, Site Maintenance.

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Inferring temporalities separating ancient fires by multi-method study of sooty speleothems

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Speleothems are known to be very good paleoenvironmental archives and very good dating supports. When they trap anthropic traces (soot, pigments), they are also excellent archaeological archive of human activities, such as those left by prehistoric fires.

Absolute chronology using the uranium-thorium method can be build, and in some cases an annual resolution can be achieved by using laminae counting. They can be formed over long periods of time and thus potentially record long fire sequences.

High-resolution analysis of combustion residues in speleothems can shed light on the multiple visits to archaeological sites and on the occupation surfaces marked by the fires. Multi-methods analyse on sooty speleothems can allow to discuss the temporalities of fire uses (such as the timing and frequency of single or multiple occupation events).

In this presentation, we will present practical cases, and combine several methods (fuliginochronology, U/Th dating, UV fluorescence, Trace elements analysis) to show the potential of sooty speleothems as an archaeological archive. This will allow us to address both relative and absolute temporalities of the anthropic use of fire and to discuss the archaeological implications of access to such data. Especially on the oldest contexts, we will discuss how this approach can inform archaeological questions such as the control of fire, including the ignition capacity of ancient populations.

Key words: Pyroarchaeology, Fuliginochronology, U-Th dating, UV Fluorescence, LA-ICP-MS, Speleothems, Pre-Neanderthals, Fire control.

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Paleolithic Combustion Features of the Swabian Jura, SW Germany

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Excavations carried out for more than a century in the caves of the Swabian Jura document a rich record of Middle Palaeolithic, Aurignacian, Gravettian and Magdalenian occupation. This remarkable assemblages, together with evidence for the earliest musical instruments and mobiliary art, has led to these sites and the surrounding valleys being recently declared UNESCO World Heritage sites. Associated with these occupations are numerous combustion features documenting diachronic patterns in fire use. For more than two decades, these features have been the focus of intense geoarchaeological investigation, employing a wide range of techniques, including micromorphology, μ FTIR, μ XRF, organic petrology and fabric analysis. Here we report on past and on-going analyses of combustion features from the Swabian Jura, focusing on the sites of Hohle Fels and Langmahdhalde, which span the Middle Paleolithic to Magdalenian. These studies document taphonomic processes acting on the combustion residues in the caves, but also provide insights into associated human behaviors, such as site maintenance activities, that track with diachronic changes in settlement dynamics in the region.

Key words: Geoarchaeology; Middle Palaeolithic; Upper Palaeolithic.

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35,000 years of recurrent visits inside Nerja cave (Andalusia, Spain) based on analyses of charcoals and soot micro-layers

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How many occupation phases were there in Nerja Cave, over how many thousands of years was it visited and what was the frequency of occupation? To answer these questions, we analyzed the combustion residues related to lighting (charcoal found on the ground and soot micro-layers trapped in speleothems) found in the interior galleries of Nerja cave in an interdisciplinary study. In our presentation, we will present and discuss the absolute dating of the prehistoric underground activity and the identification of different phases of visits to the deep parts of the cave. The charcoal analysis includes anthracological analysis and SEM-EDX. Soot analysis includes light microscopy, Raman micro-spectroscopy and TEM-EDX, as well as micro-counting of soot micro-layers. ¹⁴C dating of 53 charcoals identified 12 phases of prehistoric visits to the cave between 41,218 and 3299 cal. BP, extending the origin of human occupation of this iconic cave by 10,000 years. Interdisciplinary analysis of soot micro-layers allowed us to zoom in with high precision on the last three phases identified by Bayesian analysis (8003-2998 cal. BP.), demonstrating that these phases contain at least 64 distinct incursions, with an average of one visit every 35 years for the Neolithic period. In addition to the temporal aspect of our study, the spatial analysis showed that not all areas of the cave were used at the same periods, shedding light on differential uses of the space according to phases, and the repetition of visits to specific areas of the cave's lower galleries. The investigations on the traces of combustion in Nerja Cave have thus allowed us to diachronically approach the anthropogenic use of fire for light, but also to reveal behavioral dynamics regarding the temporality and spatiality of visits.

Key words: Pyroarchaeology, Anthracology, Fuliginochronology, ¹⁴C dating, Bayesian modeling, Raman micro-spectroscopy, characterization of archaeological material.

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Looking through the flames: Fuegian shell-midden formation processes and past human behavior on the maritime coast of Tierra del Fuego

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This work presents a synthetic approach to the analysis of combustion structures and their archaeological remains, seeking to understand site-formation processes and spatial organization of maritime Hunter-Gatherers on the northern coast of the Beagle Channel in Tierra del Fuego, as well as past human behavior concerning direct and indirect production and exploitation of thermal energy.

Therefore, the communication will address and integrate different methodological aspects developed for the study of combustion structures in these particular environmental and anthropic contexts. First, the analysis of ethno-archaeological data concerning the use of fire. Second, the study of the functionality and duration of combustion structures by means of an experimental analytical approach. Third, the study of soil transformation processes by thermal action, including experimentation, modelling, soil analysis (soil composition at multiple scales) and micromorphology. Fourth, the analysis of the organic and inorganic content of such soils through the study of biomarkers and inorganic elements, which have allowed to identify what food was consumed or discriminate functionality between several episodes of use. Fifth, the anthracological analysis of fuel wood remains concerning fuel selection strategies. Finally, the stratigraphic and spatial analysis of combustion structures in the framework of shell-midden depositional sequences. Then, all these approaches will be integrated with the objective of reconstructing the microhistories that lead to the formation of three Fuegian shell-middens (Túnel 1, Túnel VII, Lanashuaia), and gaining insights into the nature of maritime Hunter-Gatherer behavior and coastal occupations.

Key words: Thermal energy; Shelle middens social organisation; hunter-gatherer behaviour; environmental adaptation.

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Looking through the flames: Fuegian shell-midden formation processes and past human behavior on the maritime coast of Tierra del Fuego

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Key words: Thermal energy; Shelle middens social organisation; hunter-gatherer behaviour; environmental adaptation.

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Conifer tar in the late Upper Palaeolithic and Mesolithic of north-western Europe

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Adhesives have been an integral component of human technology for hundreds of thousands of years. The earliest Middle and early Upper Palaeolithic European adhesive finds consist of birch tar, conifer resin, and potentially tree gum, and up to now pine wood tar appeared a much later invention. In this paper we discuss and review possible lines of evidence for the use of wood tar during the Upper Palaeolithic and Mesolithic in Europe. First, we review how wood tar can be produced and what the material components are. We also discuss how archaeological wood tar is identified using molecular analysis of biomarkers, and we examine how archaeological production features may be identified. Second, we present and review archaeological evidence for wood tar from the Upper Palaeolithic and Mesolithic periods. Our results of THM-py-GC-MS analyses of two late Pleistocene/early Holocene adhesive residues, show that pine wood tar was also used in these periods: demonstrating that people were not only aware of a range of natural sources, but also of different technological production processes for making adhesive materials. Our review of the morphology and material analysis of Mesolithic hearth pits is used to argue that these features are unlikely tar pits, as they are hypothesised to be. Finally, we stress the importance of (experimental) knowledge of the production processes when interpreting the archaeological record.

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Table of Contents

Welcome to UISPP World Congress 2023 Timișoara, Romania	i
Scientific Committee	ii
Honorary Committee	iii
Organising Committee	iv
Foreword	v
Public Lectures – Keynote Speakers	2
Scientific Sessions	7
<i>Session 15-2: Re-Examining Mortuary Practices and Human Sacrifice through Interdisciplinary Advances</i>	7
<i>Session 2-1: Interdisciplinary studies on earthen architecture</i>	15
<i>Session 11-1: Continuity, variations, and replacement? Lithic techno-functional traditions and population movements during the Final Palaeolithic in Northern Eurasia</i>	23
<i>Session 21-3: The archaeometry of rock art</i>	31
<i>Session 20-2: Exploring the relevance of mountain occupation in prehistoric and protohistoric times: a worldwide perspective with a focus on the Carpathians</i>	39
<i>Session 8-6: Discontinuity, Recycling and Unclassified pieces within knapping processes during the Lower and Middle Paleolithic</i>	49
<i>Session 10-3: Upper Paleolithic portable art in Europe</i>	57
<i>Session 9-1: Middle Paleolithic bifaces from the Caucasus to the Rhine</i>	65
<i>Session 13-3: Crafts and Craftsmanship in the Metal Ages</i>	73
<i>General Session 7: Archaeological Theory and Practice</i>	83
<i>Session 4-1: What’s new in (Paleo)anthropology? - Methodology, concepts and discoveries</i>	103
<i>Session 5-1: Understanding connections between mines and other archaeological contexts</i>	121
<i>Session 10-1: Archaeology in Banat</i>	137
<i>Session 6-2: Traceology and its interdisciplinary approach to the analysis of wear traces and residues for understanding the evolution of human capacities</i>	147
<i>Session 8-1: Lower Palaeolithic all around the world: only Oldowan and Acheulean?</i>	171
<i>Session 24-1: The Critical and Evolving Role of Preventive Archaeology in Creating Cultural Heritage Knowledge</i>	195
<i>Session 13-2: Interdisciplinarity in Prehistoric and Protohistoric Archaeometallurgy</i>	203
<i>Session 8-2: Lithic-based approaches to understand site formation processes, economy, and techno-logical behaviours during Palaeolithic</i>	211
<i>Session 10-2: Current research on the Upper Palaeolithic of Eurasia</i>	223
<i>Session 12-1: Chalcolithisation</i>	239
<i>Session 15-1: Mortuary Practices and Human Sacrifice in Prehistory and Protohistory in Eurasia</i>	247
<i>General Session 1: Lower and Middle Paleolithic/General Session 2: Upper Paleolithic</i>	261

<i>Session 12-2: Dynamics of Neolithisation in the Banat and Neighboring Areas</i>	277
<i>Session 8-7: Characterizing changing technology, subsistence and settlement dynamics of the Middle Stone Age and Middle Paleolithic</i>	287
<i>General Session 5: Metal Ages</i>	305
<i>Session 1-1: Untold stories. "Marginal" scholars and/or intellectual movements in the history of archaeology</i>	327
<i>Session 1-2: History of the History of Archaeology: between Archaeologists' and Historians' Concerns. Figures, Trends, and Perspectives</i>	337
<i>Session 18: Prehistoric art studies in North Africa and Sahara at the beginning of the 21st Century. Contributions from Interdisciplinary Research Approaches</i>	345
<i>Session 21-2: Pendant or not a pendant? Identification, uses and meanings</i>	361
<i>Session 21-4: Interdisciplinarity in the study of rock art: the use of new technologies to understand the artistic dynamics of past societies</i>	381
<i>Session 21-1: Archaeoacoustics: a novel interdisciplinary way of studying the past</i>	393
<i>Session 23-1: Prehistory and society: museums, education and media</i>	401
<i>Session 7-1: Archaeometry of prehistoric and protohistoric stone, metal, ceramics and glass</i>	415
<i>Session 8-3: "Simple but not simplistic": Discussion on Bipolar Technology from different perspectives</i>	435
<i>Session 8-4: Stone Age engineering techniques and their implication for understanding Neanderthals and early Homo sapiens perspectives</i>	449
<i>Session 8-5: Shape and Beats: Combining technology and computational shape analysis of studying the variability of Large Cutting Tools</i>	459
<i>Session 25-2: Hunting: a diachronic perspective on its role on human subsistence from the Pleistocene to the Holocene</i>	467
<i>Session 25-1: Percussive osseous industry a human revolution between pre-formation and waste selection</i>	483
<i>General Session 4: Neolithic - The Copper Age</i>	491
<i>Session 17: Multi-faceted Pyroarchaeology: from environmental to cultural proxies</i>	501

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