UNIVERSITY OF JOHANNESBURG

PALAEO-RESEARCH INSTITUTE

14th Conference of the Worked Bone Research Group

Funded by the Palaeontological Scientific Trust

PAST ALL FROM ONE

UNIVERSITY OF JOHANNESBURG

14TH MEETING OF THE WORKED BONE RESEARCH GROUP

Conference Programme
&
Book of Abstracts

30 AUGUST – 3 SEPTEMBER
2021
University of Johannesburg

Worked Bone Research Group

ICAZ
International Council for Archaeozoology

Contents

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Conference prize adjudication panel

Assoc. Prof. Justin Bradfield
Professor Rob Blumenschine
Dr Dipuo Kgotleng
Dr Nonhlanhla Vilakazi
Dr Matt Lotter

WELCOME

It is our pleasure to welcome you to the 14th meeting of the Worked Bone Research Group, hosted by the Palaeo-Research Institute at the University of Johannesburg. This is the first time the conference is hosted by an African institution and the first time by a country in the Southern Hemisphere!

It is appropriate that the 14th meeting is hosted by an African institution as it is in Africa that the oldest and one of the richest records of worked bone technology in the world exists. Archaic hominins knapped bone tools in East Africa as early as 2.1 million years ago and were using bone tools to forage for termites in the Cradle of Humankind 1.8 million years ago. Some of the earliest evidence for complex technology and symbolic behaviour is found in various parts of Africa, expressed through the medium of bone. We are therefore excited to showcase the research of the largest number of Africanist scholars in the conference's history.

It is also the first time that the conference is hosted online. This online forum allows the conference to reach a much larger audience than would have been possible otherwise. We are pleased to welcome 38 presenters representing 51 institutions from 24 countries. Although we would have liked to welcome you to our shores in person, the spirit of a conference is not in its physical location, but in the meeting of peoples to share their ideas, discuss common challenges and to advance the field of research and praxis. To this end, we thank all of our presenters from around the world for contributing to make this conference a success.

The papers presented in the four sessions cover almost two million years of bone tool research from all corners of the world. We hope you will enjoy the diverse offering of research papers that has come to be a hallmark of the WBRG.

Justin Bradfield
Organising secretary

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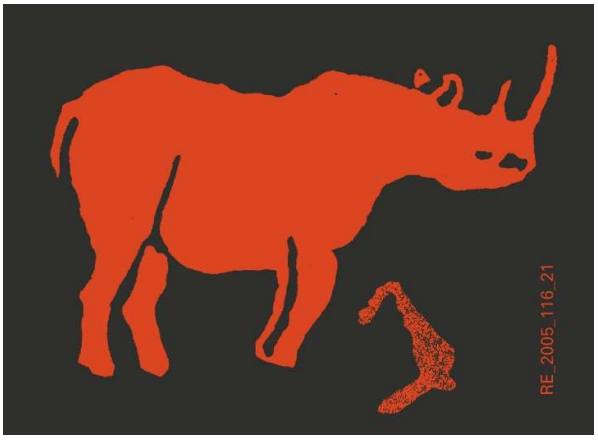
Origins Centre Museum, Wits University, Johannesburg, South Africa

'We are who we are because of who we were'

The Origins Centre museum provides visitors with a unique experience of Africa's rich, complex heritage. The exhibits take visitors on an extraordinary journey of discovery, which begins with the origins of humankind in Africa and then moves through the development of technology, art, culture and symbolism. The journey continues with an exploration of the diverse southern African rock art traditions. These ancient masterworks, and the artists, are illustrated through contemporary art installations by well-known South African artists.

We now also offer a unique augmented reality experience through the (free) OriginsCentreAR app, available on IOS and Android. The animals depicted in the beautiful rock engravings curated in the museum come to life through the app – just use the app to scan the rock engraving label. So, download the app and get a teaser in the comfort of your home by scanning the picture below.



Come and enjoy the Origins experience, interact with Africa's amazing past and indulge in the specialist Africana bookshop and locally-made crafts.

Website: www.wits.ac.za/origins
Contact: tammy.hodgskiss@wits.ac.za; bookings.origins@wits.ac.za; 011 717 4700.
Follow the museum on social media to find out more (facebook and twitter: @originscentre, Instagram: @originscentre_wits).

Hours: Monday – Friday 09h00 – 17h00; Saturday and public holidays 09h00 – 16h00
Tickets: Tickets sold on webtickets (https://www.webtickets.co.za/v2/EventCategories.aspx?itemid=1458362651)
Adult R81; Child R40; Wits student/staff and pensioners R66

UNIVERSITY OF JOHANNESBURG

PALAEO-RESEARCH INSTITUTE

THE UJ PALAEO-RESEARCH INSTITUTE

An Afro-centric approach to Palaeo research

The Palaeo-Research Institute @ UJ is a multi-disciplinary, inter-faculty group with an extensive international training and research collaborative network which represents a holistic approach to human evolution in sub-Saharan Africa covering the past 3 million years, with research endeavours that include:

- The physiological evolution of hominins and other animals who shared their landscape (fossil research)
- The genetic evolution of Homo sapiens and the reconstruction of the African population history (ancient and living DNA research)
- The cognitive evolution of hominins since our split from non-human primates (neuro-archaeology, palaeo-neurology, cognitive archaeology)
- The evolution of indigenous knowledge systems (techno-behavioural studies associated with hominins and early humans),
- The development of novel, state-of-the-art approaches to the dating of fossil records in Africa

Contact details:

The Director: Dr Dipuo Winnie Kgotleng
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UJ Palaeo Institute @UJPalaeo

Executive Summary of PAST

Palaeontological Scientific Trust

ALL FROM ONE

Mission and Vision

Africa is the birthplace of humankind and the storehouse of a fossil record for our origins found nowhere else in the world. PAST is a Johannesburg-based public benefit organization that since 1994 has used the scientific evidence of our shared origins in Africa to benefit humankind's future.

PAST aims to develop global leadership by African origin scientists and to inspire scientific curiosity among Africa's youth. PAST also uses the sciences related to our origins as a powerful tool for building African dignity and for promoting racial harmony, social cohesion and nature conservation.

PAST pursues its mission by bringing together scientists, business, and government to raise and distribute support for research, education and public awareness in the origin sciences. Having been founded in 1994 to raise funds for research at the world-renowned South African fossil hominid site of Sterkfontein, PAST has become the largest independent, African-based supporter of the African origin sciences, spanning the full history of life and humankind across the continent.

Programmes

Support for origin sciences researchers and students at African institutions lies at the core of PAST's activities. PAST funds fossil exploration, discovery, excavation and laboratory analysis. PAST also provides bursaries to postgraduate students, technical training and capacity grants, support for early-career African scientists, and funding for publications and conferences. All funding proposals are vetted by PAST's Scientific Advisory Committee for final approval by its Board of Trustees.

PAST's award-winning Walking Tall Educational Theatre Project offers workshops for secondary school students and teachers that increase scientific literacy through an understanding of the origins of life and humankind. A professional physical theatre production takes the audience on a 4.6 billion-year journey from the origins of the Earth to present day. A subsequent science session explains basic principles of evolution and explores issues such as the biology of skin colour differences in humans. The project is complemented by a Tools4Schools digital initiative on PAST's website that provides curriculum-based resource materials. The educational effectiveness of Walking Tall is demonstrated through a rigorous monitoring and evaluation system. Since 2002, Walking Tall has reached 1.4 million students, teachers and community members across Africa. A planned digital version of the production will expand the project's reach considerably.

PAST's public understanding programme features the *All from One* campaign. Launched in 2015, *All from One* uses the science of the shared origins of humankind to promote respect for diversity and social cohesion. It also uses the shared origins of all living things to promote the conservation of natural environments and biodiversity. The campaign aims to reach a global audience through a multi-facetted digital campaign supplemented by the *All from One* exhibition, transformation and sustainability workshops for professional audiences featuring a digitised theatre production entitled *I See You*, and an emerging ad campaign that will transform All from One into a global movement.

Governance and Accountability

PAST is registered in South Africa as a Trust with section 18a tax status. PAST can also receive tax-deductible donations in the U.S., U.K. and many European countries. PAST has maintained long-term partnerships with major corporate, government and individual donors, and has produced unqualified audits since its inception.

PAST's Executive team has a combined 62 years of experience conducting research and educational projects throughout Africa and in interacting with the continent's origin sciences stakeholders. PAST's Board of Trustees comprises prominent African business leaders, government representatives and scientists. PAST also maintains international advisory committees in the U.S. and the U.K.

Evolutionary Studies Institute Building | University of the Witwatersrand | Johannesburg | South Africa
Tel +27 11 717 6668 | hq@pastafrica.co.za | www.past.org.za
Registration Number 508/95

Conference schedule

Please note that all Zooms rooms will open 15 minutes before the time indicated. Links to the Zoom sessions will be sent to registered participants the day before the session.

Monday 30 August		
12:00–14:00 SAST (GMT+2)		
Session chairs: Justin Bradfield, Dipuo Kgotleng, Stephanie Baker		
12:00-12:10	Justin Bradfield	Opening of the conference
12:10-12:20	Professor Saurabh Sinha Deputy Vice-Chancellor	Official welcome to the University of Johannesburg
12:20-12:30	Dr Dipuo Kgotleng Director: Palaeo-Research Institute	Official welcome to the Palaeo-Research Institute
12:30-12:45	Tammy Hogskiss-Reynard	Introduction to the Origins Centre
12:45-13:05	Christian Gates St-Pierre	Where do we come from? What are we? Where are we going? A summary portrait of the WBRG members
13:05-13:20	Ms Andrea Leenen, CEO; Prof. Rob Blumenschine, Chief Scientist and Ms Thabiso Parirenyatwa, Programmes Officer	Palaeontological Scientific Trust (PAST)
13:20:13:50	PAST	Theatrical production
13:50-14:00	Justin Bradfield	

Tuesday 31 August		
14:00–17:00 SAST (GMT+2)		
Session chairs: Justin Bradfield, Stephanie Baker, Matt Lotter		
Time	**Presenter**	**Topic**
14:00-14:20	Joshua Kumbani	Aerophones or pendants? Four Holocene artefacts from Matjes River site
14:20-14:40	Victoria Gordon	One and the same: An experimental study of the effects of trampling on bone flakes
14:40-15:00	Énio Tembe	A techno-typological analysis of the Middle to Later Stone Age stone and bone assemblages at Daimane Rock Shelter, Maputo Province
15:00-15:20	Annie Antonites	Characterising Limpopo Valley forager and farmer worked bone assemblages (South Africa)

15:20-15:40	Kathryn Croll	Informal bone tools from Ratho Kroonkop, a rain-control site in the Shashe-Limpopo Confluence Area, Limpopo Province, South Africa
15:40-16:00	Natacha Buc	Bone technology in the northern Argentina
16:00-16:20	Aleksa Alaica	Community interactions and processing agricultural staples: Insights from worked scapulae from Ak'awillay, Cusco, Peru
16:20-16:30	Michael Pante	Bone tools from Beds II-IV, Olduvai Gorge, Tanzania, and implications for the origins and evolution of bone technology
16:30-16:50	Erika Ebel	Ivory, Antler, and Bone as Raw Materials in Northern Greenland

Wednesday 1 September		
11:00–14:00 SAST (GMT+2)		
Session chairs: Justin Bradfield, Matt Lotter, Matt Caruana		
Time	**Presenter**	**Topic**
11:00-11:20	Konstantinos Chondros	Bone artifacts from Thessaloniki Toumba in Northern Greece at the end of the 2nd mil. BCE: Tracing variations in raw materials and manufacturing techniques
11:20-11:40	Sarah Skytte Qvistgaard	In the production of Viking combs, the shape and style have a match with raw material and regionality
11:40-12:00	Ágnes Font	Details of the medieval manufacturing processes and techniques: knife handles from Buda
12:00-12:20	Erika Gál	Evidence for a workshop in the late medieval archbishopric palace at Esztergom (Northern Hungary)
12:20-12:40	Marta Blasco Martín	Birds of prey, sharks and other fishes: Unusual worked bones in the Iberian Iron Age.
12:40-13:00	María Fernanda Martínez-Polanco	The white-tailed deer bone industry at Cerro Mangote, a Late Preceramic site in central Pacific Panama
13:00-13:20	Hildegard Müller	Learning by doing: experimental archaeology and microwear analysis on Roman bone artefacts
13:20-13:40	Manuel Altamirano García	Animals as a remarkable source of raw material: Osseous objects in 2nd millennium BC, Southern Iberia
13:40-14:00	Marloes Rijkelijkhuizen	Osseous and keratinous artefacts from the Netherlands

Thursday 2 September		
09:00–12:00 SAST (GMT+2)		
Session chairs: Justin Bradfield, Matt Caruana, Nonny Vilakazi		
Time	**Presenter**	**Topic**
09:00-09:20	Rhiannon C. Stammers	Technology or taphonomy? A study of the world's oldest bone tools
09:20-09:40	Eva F. Martellotta	From bone to wood: first evidence of retouch-induced marks on hardwood boomerangs

09:40-09:50	Yajie Yang	The reuse of several worked bones from the Ma Zhuang site, a late Neolithic site in Northern Henan province, China
09:50-10:10	Sharada Channarayapatna	Analysing the commonalities and uniqueness of Dholavira worked bone assemblage in the context of contemporary Chalcolithic and Bronze Age culture sites of the Indian subcontinent
10:10--10:30	Vinayak	Anthropomorphic osseous objects from Early Iron Age sites of the Upper Gangetic Plain
10:30-10:50	María Borao	The Solutrean antler-working in Hort de Cortés-Volcán del Faro (Valencia, Spain): a preliminary study)
10:50-11:10	Marlize Lombard	The tip cross-sectional areas of poisoned bone arrowheads from southern Africa
11:10-11:30	Alice Choyke	Mobility in the Late Chalcolithic of the Southern Caucasus: What the bone industry of Ovçilar Tepesi, Nakhichevan (Azerbaijan) can tell us
11:30-11:50	Predrag Popović	Perforated elk incisor from the Gravettian layer of the cave Velika Pećina (Žagubica, Serbia)
11:50-12:00	Christoforos Arampatzis	Neolithic bone industries from Greece: a typological overview

Friday 3 September		
11:00–14:00 SAST (GMT+2)		
Session chairs: Justin Bradfield, Nonny Vilakazi, Dipuo Kgotleng		
Time	**Presenter**	**Topic**
11:00-11:20	Mihaela Savu	From hook design to angling technique: A preliminary analysis of bone and antler hooks from the Late Neolithic site at Şoimus-La Avicola (Romania)
11:20-11:40	Markus Wild	Skeleton in the cupboard. Search for the Palaeolithic in Southern Scandinavia
11:40-12:00	Justyna Orłowska	Upper Palaeolithic osseous hunting equipment from the Mamutowa Cave in Poland. First results of the traceological studies
12:00-12:20	Grzegorz Osipowicz	Towards the understanding the technology and function of the Bronze Age Bruszczewo-type bone “knives”
12:20-12:40	Selena Vitezović	Bone technology at the Late Neolithic site of Vinča-Belo Brdo (Serbia)
12:40-12:50	Nemanja Marković	The Late Neolithic animal raw materials exploitation and bone industry from Jablanica, the central Balkans (Serbia)
12:50-13:00	Carlos Boavida	Lost and found: Early modern bone and ivory artefacts found in Lisbon (Portugal)
13:00-13:10	Martina Lázničková-Galetová	Aurignacian necklace: “perforated” animal teeth from Mladeč (Moravia, Czech Republic)
13:10-13:20	Zlatko Kovancaliev	Hellenistic bone seal boxes from the House of the Collector at Gortynia, Macedonia
13:20-13:30	Marianne Christensen	1st Bid for 2023
13:30-13:40	Ayça Gerçek	2nd Bid for 2023
13:40-13:50	Justin Bradfield	Details of conference proceedings. Closing and note of thanks

List of Abstracts

Aleksa K. Alaica[1] (aleksa.k.alaica@gmail.com) & Véronique Bélisle[2]

[1]*University of Toronto, Canada;* [2]*Millsaps College, USA*

Community Interactions and Processing Agricultural Staples: Insights from Worked Scapulae from Ak'awillay, Cusco, Peru

Osseous tools are versatile objects that can be used in pressure flaking lithics, weaving organic fibres and in processing plant remains. Processing agricultural staples can take place in households but these practices can also involve the participation of larger parts of a community and undertaken in public spaces. The socio-political and economic factors influencing harvesting and processing of agricultural crops can involve specific places and certain parts of a society that can indicate important aspects of power, social cooperation and access to community networks. The site of Ak'awillay is occupied intensively during the Middle Horizon period (600-1000 CE), a phase in Cusco's history that sees the emergence strong local trade networks and community politics with later contact of the Wari empire. Local practices in the Cusco region during this time sees the use of modified camelid scapulae that have been documented in other regions as a plant processing tool, specifically for corn husking. Brief conversations with the local community of Piñanccay identify this tool as a *tipina*. Our analysis mobilizes morphological, spatial and microscopic techniques to discuss the distribution of the *tipina* tool type throughout Ak'awillay during the Middle Horizon to consider how communities are interacting during harvest seasons and plant processing activities. We argue that high concentrations of the *tipina* in a large public building, not in households, demonstrates the cooperation of households for processing harvests even in the face of local community transformations.

Manuel Altamirano García (manuelaltamirano@colegioalmedina.com)

Independent, Spain

Animals as a remarkable source of raw material. Osseous objects in 2nd millennium BC Southern Iberia.

Animals have played a basic role within human groups since the origins of humankind, being used as a source of very different elements, such as meat, milk or bone. The aim of this paper is to approach the importance of animals as a source of raw material in human technology during the 2nd millennium BC. Our main goal is to spotlight the careful selection of the bones to manufacture a specific item, focusing on the ancient beliefs and myths that human groups might have had towards some animal species and how they could have influenced that choice. Thus, an assemblage of 830 items from four archaeological sites located in the southern half of the Iberian Peninsula: Motilla del Azuer (Ciudad Real), Motilla de las Cañas (Ciudad Real), Peñalosa (Jaen) and Cerro de la Encina (Granada). The discussion involves aspects such as the use of especial raw materials, labour investment, use-wear patterns, as well as curation and maintenance. Thus, it can be pointed out the presence of certain manufacturing traditions for some type of objects whose shape has remained almost unaltered since the Chalcolithic. Furthermore, regarding the available data, we can state that

some of these objects might have been considered as really valuable and even prestigious personal belongings.

Annie R. Antonites[1] (annie.antonites@gmail.com), Tim Forssman[2] & Justin Bradfield[3]

[1]University of South Africa/ The Heritage Foundation; [2]University of Pretoria, South Africa; [3]University of Johannesburg, South Africa

Title of paper/poster: Characterising Limpopo Valley forager and farmer worked bone assemblages (South Africa)

In southern Africa, bone tools have been found in both forager and farmer contexts and at times in great numbers. Their contribution to material culture studies in the region has, however, been underutilised. Here we are interested in their potential to contribute to our understanding of forager/farmer relations in the Middle Limpopo Valley – an area associated with the development of complex societies in southern Africa. While both foragers and farmers likely worked animal bone into tools, there is little systematic study of the possible exchange or influence of technological information between them. To assess this, we performed a technological and use-wear study to establish consistencies in manufacture and use between bone tools from forager and farmer contexts. The study group consist of three sites: Little Muck Shelter, Schroda and Pont Drift. These sites were all occupied contemporaneously, are situated in close proximity and have large bone tool assemblages. Our study included over 300 bone objects for which we recorded various morphological, technological, taphonomic and use-wear aspects. In this paper, we discuss the patterns identified between the bone tools in forager and farmer contexts and explore the nature of interaction between these groups.

Christoforos Arampatzis (christ.arabatzis@gmail.com)

Aristotle University of Thessaloniki, Greece

Neolithic bone industries from Greece: a typological overview

Although osseous artifacts have played a significant role in the everyday activities of prehistoric life, until recently their study has not been considered of great importance. In Greece, the study of the Neolithic osseous artifacts started the last forty years and despite the numerous excavated Neolithic settlements, there is still a small interest in the study of the bone industries. Therefore, there are a few published papers or MA/PhD theses about the bone exploitation in Neolithic Greece and so far there has not been proposed a basic typological system that could have helped Greek researchers or researchers from neighbouring countries. In this short presentation, there will an attempt to present the main typological categories of the bone artifacts, mainly bone and antler tools, from Greece and mainly from Northern Greece and Thessaly, where the majority of osseous artifacts in Greece has been found.

Marta Blasco Martín (marta.blasco@uv.es)

Universitat de València and Sección de Arqueología Municipal (Ayuntamiento de València), Spain

Birds of prey, sharks and other fishes. Unusual worked bones in the Iberian Iron Age.

Among the bone industry of the Iron Age of the Iberian Peninsula we find mostly objects made on long bones of medium and large-sized mammals. However, we have also documented some singular objects made on birds of prey and fish bones. In this way, we have reviewed a small set of modified fish vertebrae from the Iberian Age, manly of various sharks, but also from other fishes as *Salmo trutta*, predominantly recovered in the necropolis of El Cigarralejo (Mula, Murcia). These items were used as beads, selected by its exotic and decorative value. On the other hand, we have identified three objects manufactured on diaphysis of vultures and eagles, which functional interpretation is not quite clear, in three settlements among the Edetanian area. I present their technological and decorative study as we try to understand their uses in comparison with other objects elaborated on birds of prey bones found in prehistoric and historic settlements in the Iberian Peninsula. Lastly, I will discuss their possible uses and meanings and present a global view and analysis for these unusual objects from the Iberian archaeological record.

Carlos Boavida (cmpboavida@fcsh.unl.pt)

Associação dos Arqueólogos Portugueses, Portugal

Lost and found: Early Modern bone and ivory artefacts found in Lisbon (Portugal)

Between the 16th and 18th centuries, Lisbon was one of the main commercial cities in Europe, where a variety of goods from the most diverse parts of the world then known arrived. While a significant part of that trade was destined for other European cities, another part remained in the Portuguese domestic market.

Although bone objects of local production were used above all, the popularity of exotic objects (by European standards) produced in ivory, made them equally frequent in some residential, but also in religious and assistance spaces. However, the rapid wear and subsequent disposal of several products manufactured with perishable materials decreased the probability of finding much evidence of their everyday presence. Moreover, in the case of Lisbon, a significant part of those contexts was hopelessly lost as a result of the fires caused by the 1755 earthquake and the reconstruction that followed.

In the last two decades, due to legislative changes, but also to the relevance that Portuguese researchers have been giving to more recent contexts, several archaeological excavations in Lisbon led to the discovery of many remains of the Early Modern city. Among those are several everyday objects made of bone and ivory, including combs, cutlery and furniture elements. Some of these artefacts were analysed in the present study.

María Borao[1] (m.isabel.borao@uv.es), J. Emili Aura Tortosa[1], Begoña Soler Mayor[2]

[1]*University of Valencia, Spain;* [2] Museu de Prehistòria de València

The Solutrean antler-working in Hort de Cortés-Volcán del Faro (Valencia, Spain): a preliminary study

Hort de Cortés-Volcán del Faro is an important archaeological site in the Iberian Peninsula. The number and quality of the pieces compiles a huge lithic, osseous, and faunal collection from Gravettian to the Magdalenian period. Nowadays, the stratigraphy is being restudied and defined as it was excavated with an old methodology.

In this presentation, we analyze the Solutrean antler-working from Hort de Cortés-Volcán del Faro (Valencia, Spain). The aim is to develop a systematic study, from a technological point of view, to identify and characterize operational schemes and define the modalities of antler-working. The analysis of waste products, blanks, rough-outs, and objects allows us to observe how raw material is obtained and transformed into a toolkit. On one hand, it will help us to analyze some questions about the raw material acquisition and transformation like: 1- the link between hunted fauna for butchering and technical purposes, 2- the existence of planning of tools manufacturing, 3- the presence or not of a standardized industry, and 4- the link between typology and the chosen raw material. On the other hand, we can extract conclusions and analyze different social aspects: 1- identifying technical traditions and compare them with other studied sites and periods, 2- to know a new aspect of the way of life of these human groups. Finally, we can observe the distribution of technical pieces in the stratigraphy and identify possible stratigraphic alterations typical of old excavations.

Natacha Buc (natachabuc@gmail.com)

CONICET-Instituto Nacional de Antropología y Pensamiento Latinoamericano, Argentina

Bone technology in the northern Argentina

The north portion of Argentina was inhabited in the last ~12000 years BP by different human groups until the Spaniard occupation, from hunter-gatherer groups to Inka, Tiwanaku and Guaraní societies. As in other parts of the world, animal bones were used as artefacts in many ways. However, bone artefacts are differentially distributed along the wide spatial and temporal scale. Our goal is to explain the development of bone technology in the area and its role in hunter-gatherer subsistence and symbolic sphere. In this opportunity we evaluate the variability of assemblages, their morphological features and taxa used as raw material.

Jelena Bulatović[1] (j.bulatovic@yahoo.com), Nemanja Marković[2] (nemamarkovic@gmail.com), Velibor Katić[3], Miroslav Marić[4]

[1] University of Belgrade, Serbia; [2] Institute of Archaeology, Belgrade; [3]Belgrade City Museum; [4]Institute of Balkan Studies, Serbian Academy of Sciences and Arts

The Late Neolithic animal raw materials exploitation and bone industry from Jablanica, the central Balkans (Serbia)

The small-sized excavation carried out in 2018 at the Late Neolithic site of Jablanica (c. 5000 – 4700 BC) in central Serbia has yielded 82 bone and antler finished objects and preforms, including production refuse. The assemblage has allowed for a detailed analysis of manufacturing and reconstruction of the *chaîne opératoire*. In this paper, we present the results of the analysis of raw materials selection, manufacturing technique, typological repertoire and use-wear. Dominant raw materials were bones, mainly long bones, metapodials and ribs. The majority of them belong to large-sized mammals, such as cattle and red deer, while the rest belong to medium-sized mammals, i.e., sheep/goat and roe deer. Besides bones, only six red deer antlers and one *Spondylus* shell had manufacturing traces. Awls comprising more than one-third of the assemblage were the most frequent objects, followed by heavy points, polishers and needles. Several preforms (mainly awls) and production debris provide indirect evidence of the existence of a workshop or working place in the settlement. Finally, we put our findings into a broader picture for the central Balkan Late Neolithic by comparisons of other synchronous bone industries from the region.

Sharada Channarayapatna (sharada.c@iitgn.ac.in)

Indian Institute of Technology-Gandhinagar, India

Analysing the commonalities and uniqueness of Dholavira worked bone assemblage in the context of contemporary Chalcolithic and Bronze Age culture sites of the Indian subcontinent

The sites of Chalcolithic cultures and Indian subcontinent's first complex urban society – the Bronze Age Indus Civilization have unearthed a rich repertoire of material remains. Unlike the stone, metal and ceramic counterparts recovered from these sites, osseous artefacts have not been subjected adequately to in-depth studies, from cultural history to post-processual perspective, and collated to highlight their degree of spatiotemporal uniformity or regional variation in terms of technology, craft-specialisation, socio-economic organisation and ideology. In this research, twin objectives are explored. Firstly, a literature summary is provided which locates the status of this archaeological problem in the broader context of South Asian Holocene cultures and endeavours to establish some typological and functional rubrics for their study based on published findings. Secondly, the paper tests these rubrics on a hitherto unstudied worked bone assemblage from Dholavira (n = 395), an Indus site in western India which was inhabited through all chrono-cultural phases (Early to Late) of the civilisation (3000-1450 BCE) and was systematically excavated for 13 years by Prof. R. S. Bisht. Comprising what was initially identified as points, awls, needles, styli, figurines and game objects, a wide range of possible uses have been postulated for them. The analysis of this assemblage and comparisons with other Indus sites help to bring out some of its commonalities and uniqueness and answer the question as to why it co-existed with a conspicuous lithic and metal (copper) industry during the site's occupation and how it could have been utilised?

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Bone artifacts from Thessaloniki Toumba in Northern Greece at the end of the 2nd mil. BCE: Tracing variations in raw materials and manufacturing techniques.

The excavation of the Thessaloniki Toumba settlement mound sheds light upon aspects of prehistoric life in Northern Greece from the Middle Bronze Age to the Iron Age. This presentation is based on a sample of 85 bone artifacts, mainly awls and pins, from two buildings and the adjacent streets at the top of the mound. The assemblage dates to the final stage of the Late Bronze Age and the beginning of the Early Iron Age (1200–1000 BCE). The analysis identifies two major patterns in bone artifact production, one involving the exploitation of bone fractures for shaping awls and another centering on the reduction of deer antler for manufacturing pins, which often bear ornamental heads. The techniques and tools employed for pin production and the spaces where this production was taking place are not as yet fully documented, but current evidence from Thessaloniki Toumba as well as neighbouring sites suggests local selection of raw materials, techniques and artifact styles. Tool shaping echoes production modes established in the earlier part of the Bronze Age to satisfy needs for activities conducted at the household level.

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Mobility in the Late Chalcolithic of the Southern Caucasus: What the bone industry of Ovçilar Tepesi, Nakhichevan (Azerbaijan) can tell us

Think of a world of semi-sedentary pastoralists and horticulturalists, occasionally meeting and interacting with the inhabitants of the permanent villages of the late 5th-early 4th mill. BC in what is now the South Caucasus, Eastern Anatolia and the northern parts of Syria, Mesopotamia and Iran. The tell site of Ovçular Tepesi, in the autonomous republic of Nakhichevan, Azerbaijan supports the case for Chalcolithic mobile herders settling ca. 4350 BC in the Araxes valley in places with access to upland pastures. Small scale cultivation also took place alongside artisanal activities including sophisticated extractive metallurgy. Bone and a very few tooth and antler tools and ornaments were found throughout the Chalcolithic sequence at Ovçular. The archaeological sequence at the site ends around 3800 BC. Compared to other sites in the broader region, the Ovçular Tepesi worked osseous assemblage is much less variable in the choice of raw materials, tool types and techniques of manufacture and maintenance. Most such finds at this site comprise points made from caprine metapodia broken along the midline sulcus. Nearly all were abandoned while still usable, suggesting specialized use. The worked osseous assemblage also contains fragmented scapular hoes, most probably used for digging. Antler is under-represented in the assemblage compared to other sites in the region. The few ornaments or special objects left behind during the long occupation, will also be touched on briefly in the presentation.

The differential use of bone materials and long-lived tool types observed in the South Caucasus from the Late Neolithic through the Late Chalcolithic period facilitate comparisons between sites and allow receptivity to foreign elements or adaptation to local conditions to be detected. The comparison of the Ovcular Tepesi bone industry to similar assemblages from other Chalcolithic sites in the greater region, some connected to a more sedentary and others to a semi-mobile lifestyle, reveals patterns in the data raising broader issues concerning the technical, economic and social contexts of the period.

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Informal Bone Tools from Ratho Kroonkop, a Rain-Control Site in the Shashe-Limpopo Confluence Area, Limpopo Province, South Africa

Ratho Kroonkop forms part of a complex of rain-control sites in the Shashe-Limpopo Confluence Area (SLCA), located in the Limpopo Province, South Africa. These sites were initially occupied by hunter-gatherers and then farming groups. The usage of Ratho Kroonkop dates to the early second millennium AD. The site functioned as a place to control and influence rain (although the exact usage may have changed over time). Numerous informal bone tools were recovered from Ratho Kroonkop. These bone tools are frequently encountered at farming villages in South Africa. However, their exact usage has never been properly investigated. It has previously been suggested that informal bone tools were used for purposes such as preparing hides, or extracting marula pips. A micro-wear analysis of the informal bone tools was undertaken which was combined with spatial and temporal information to infer the usage of these tools.

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Ivory, Antler, and Bone as Raw Materials in Northern Greenland

The archaeological site of Lita in northwestern Greenland is unique in the High Arctic due to the development of unmixed stratigraphic deposits documenting near-continual occupation of the past 1000 years. These layers present an opportunity to examine diachronic changes in the use of animals for food and as resources for raw materials. The first inhabitants of this site were the Late Dorset whose material culture is distinguished by its artistic carvings. Around 1200 AD the site was occupied by Thule people, migrants from Alaska, and the pre-contact ancestors of the Inughuit who live in the region today. The lack of wood in this environment necessarily implies that bone, ivory, and antler were crucial raw materials for a variety of purposes, including tool making. The selection and processing of osseous raw material is expected to reflect changes in the way the two culturally distinct groups at Iita used the same resources in a shifting climate.

As osseous material is reduced, debris is left behind, often with distinct characteristics indicative of the technology and/or method used to create the final product or the steps of production in the *chaîne opératoire*. Often, this debitage has been modified to the extent that few diagnostic features

remain. A sample of these small pieces of manufacturing debris are identified to taxon using Zooarchaeology by Mass Spectrometry (ZooMS) thereby improving the knowledge of species represented at Iita and the choices made by the tool makers. Together, the analysis of bone-tools and faunal remains provides further insight into the species represented in the archaeological record, improving our understanding of foraging and decision-making strategies of the Late Dorset and Thule.

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Details of the medieval manufacturing processes and techniques: knife handles from Buda

The medieval town of Buda, especially the castle district was a blooming place of arts and crafts between during the 14th and 15th centuries. Traces of artisans working with hard osseous material (bone and antler) can be found within different medieval industries and in the spatial distribution of archaeological finds. The inquiry and comparison of certain group of finds may shed light on and provide new details on medieval knife handle manufacturing processes and techniques. From the excavation of the medieval Palace of Buda, fragments of workshop waste material as well as semi-finished objects came to light. In comparison with another group of finds from the excavation of a plot near Dísz tér 17 (former military headquarters), near to the Royal Palace, we were able to identify the exact processes and raw materials which were the basis of one the most important handicrafts in the Middle Ages. In addition to the archaeological material, written sources also provide information on how these products were part of local and distance trade in the Middle Ages.

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Evidence for a workshop in the late medieval archbishopric palace at Esztergom (Northern Hungary)

Excavations carried out at the site of Esztergom-Várhegy-Kőbánya between 2014–2016 brought to light a part of the kitchen midden of the archbishopric palace. The assemblage, very abundant in animal bones, has deposited in several successive layers on the Castle Hill of Esztergom from the late 13th to 15th century. Both the study of the building remains and the zooarchaeological material revealed that the kitchen waste includes the remains of high-quality food of the archdiocese and his visitors, and the items purchased for the common people serving in the palace alike as the two kitchens were placed on top of each other. Another peculiarity of this assemblage is that a number of bone and antler remains representing finished and semi-finished artefacts as well as workshop residue also came to light together with the leftovers from the two kitchens. Despite the religious context of the settlement, however, rosary beads or other artefacts usually produced in greater numbers are missing in this material. Even common objects (e.g. pins and handles) and fine worked decorative items (e.g. belt mounts and other ornaments) were poorly represented in the sieved material. In contrast, the details for crossbow and the antler debris dominated the assemblage linked to manufacturing. All these would suggest that a workshop specialised for the quick

production and reparation of details for crossbow was placed to the archbishop's palace. Since the account books from the late 15th century hardly mention the purchase of wild animals, it is very likely that they used to be hunted on the archdiocese's estate as well as received as peasant services and gifts from the villages around Esztergom.

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Where Do We Come From? What Are We? Where Are We Going? A Summary Portrait of the WBRG Members

As we edited the proceedings of the 13th WBRG Conference held in Montreal in 2019, we reflected on who the WBRG members are, what unites and what distinguishes them, and how they do what they do. Using a basic quantitative analysis of information gleaned through the WBRG membership database and bibliography, as well as previous conference programmes and proceedings, we dress a general portrait of the WBRG members in terms of socio-demography, working environment, and favourite research topics, methods, approaches, and publishing venues. We also look for chronological trends and geographic differences, and try to forecast where we may possibly go collectively.

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One and the same: An experimental study of the effects of trampling on bone flakes

Trampling can produce bone flake modifications – or 'pseudotools' – that are often mistaken for anthropogenically created tools. An experiment was conducted to examine how trampling modifies bone flakes and to document the diagnostic criteria that distinguishes trampling modifications to those created anthropogenically. Bone flakes were created from the tibia and femur of a cow and utilised to replicate foraging activities. Some flakes were used to cut raw meat and scrape dry wood and other flakes were not utilised. The flakes were trampled in four pits containing different types of sediment: fine beach sand, coarse sand, gravel, and clay sand. The trampled specimens were then compared to the un-trampled, utilised bone flakes. The results show that surface modification differed between sediment pits. Fine beach sand showed high proportions of abrasion, while gravel produced the most diverse surface modifications including notches, striations, edge rounding and abrasion. Clayey sediment produced minimal results, likely due to sediment compaction. Notches similar to that of retouch were not found on trampled flakes. Edge rounding was present on both trampled and utilised bone, making this criterion less useful for diagnostic determinations. The most prevalent modification resulting from trampling were striations, notches, abrasion, edge rounding and grooves. Our experiment indicates that trampling can cause removal of modifications, especially in fine beach sand sediment. It was found that trampled flakes and utilized flakes display similar characteristics, including edge rounding and abrasion. Generally, trampled flakes have abrasion

across the entire surface while worked bone display abrasion along the utilised edges. It is suggested that this criterion may be best for differentiating trampled from worked bone.

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Hellenistic bone seal boxes from the House of the Collector at Gortynia, Macedonia

Positioned only 80 km from the Macedonian capital Pella, in the region called Amphaxitis, during the Classical, and the consequent Hellenistic period, the city of Gortynia had its most prosperous period. Ever since it was excavated in 2002/4, the "House of the Collector" has been a unique discovery, mostly due to the collection of works of art, some of which differ up to 600 years in their origin. Mitrevski D., the head of the excavations at the time, rightly named the aforementioned artworks as nice selection/collection of works, with a special aesthetic value, hence the name of the house. However, almost two decades after its discovery, the same house offers new insight once again, in the shape of three bone seal boxes and two styli. Similar boxes for protection of wax seals are also known from the Mediterranean, although they become more common towards north during the Imperial period, when they are made of bronze in triangular, quadrangular or other shapes and enamel decoration on the lid. However, the seal boxes from Gortynia are among the earliest examples of this type, whose exclusivity is further emphasized by their number, perfect condition and context of discovery. Although the content of what they have been sealing remains unanswered, the study examines the morphological features and the role of these boxes, along with their functionality and origin.

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Aerophones or pendants? 4 Holocene artefacts from Matjes River site

Four tear-drop to oval shaped artefacts with drilled holes were recovered from Matjes River site in the southern Cape of South Africa. The artefacts are dated to 7000-5000 years ago and are associated with Wilton industry. These artefacts have been previously interpreted as pendants and it is assumed that they could have been used as jewellery. Morphologically the implements resemble a type of a musical instrument or sound producing implement known as a bullroarer which is frequently a flat, oblong piece of bone, wood or stone with a hole on one end. The bullroarer is spun in complete revolutions above the player's head using a string tied onto the implement and it produces a whirring sound. To test the hypothesis if these artefacts could have been used as bullroarers an experimental study was undertaken. The four implements were replicated using sheep and giraffe bone and were strung with leather and organic strings. The replicas were spun by hand and they all produced sound and they were then spun for 15 hours each using a 40-watt electric motor with the speed adjusted such that each produced sound. The use wear results that developed on the replicas were then compared with the use-wear on the archaeological artefacts. Only one implement developed use-wear on the lateral sides and this matched the use-wear results on the replicas.

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Aurignacian necklace – "perforated" animal teeth from Mladeč (Moravia, Czech Republic) - review study

The collection of 19 perforated animal teeth was discovered dispersed in a layer attributed to Aurignacian at the site Mladeč (Moravia, Czech Republic). This site has been explored since 1881 during several excavation campaigns carried out by several researchers (Szombathy, Knies, Furst, Smyčka). The "perfored" animal teeth have been interpreted as artefacts created by man whose remains have also been discovered at the site. Besides teeth, tools made from hard animal materials have been found: spear tips of Mladeč type - eponyme points defining the Aurignacien technocomplex, awls and modified reindeer metacarps representing further "perforated" artefacts. The collection of animal teeth has traditionally been interpreted as components of one or several necklaces. The revision research of these old findings proves that not all of them were adapted to be worn, perfored or modified by humans. Inspite of that this assemblage is considered as an evidence of activities of symbolic meaning and of adornments dating back to the Aurignacian period.

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The tip cross-sectional areas of poisoned bone arrowheads from southern Africa

Current hunter-gatherers from the Kalahari in southern Africa are well-known for their use of poisoned arrowheads, and it is assumed that this tradition spanned most of the Holocene in the region. Recent archaeological work, however, indicates that the techno-behaviour may have originated sometime during the Pleistocene. Tracing the use of poisoned arrowheads through time is not an easy task. Here I explore the use of the tip cross-sectional area (TSCA) metric to analyse relatively large samples of bone points that are ethnohistorically associated with Kalahari San poisoned arrow hunting. I add the southern African poisoned bone arrowhead TSCA range to the previous ranges established for North American atlatl dart tips, North American arrowheads and large thrusting spears. Based on the results obtained from 445 artefacts spanning historical, Later and Middle Stone Age phases, I show that poisoned bone arrowheads may have been in use in southern Africa throughout the last 72,000 years, and that a methodical effort to trace stone-tipped poison arrowheads may be warranted.

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From bone to wood: first evidence of retouch-induced marks on hardwood boomerangs

Retouchers (implements used for shaping the edges of lithic tools) are among the most ancient bone tools. In Europe, they were mostly made from the butchered remains of large herbivores, and were present through the entire Palaeolithic in the toolkit of Neanderthals and Homo sapiens. Bone

retouchers are often found in stratigraphic association with retouched lithic tools and have been the subject of several studies, many of them enriched with experimental data. Expanding the research out of Europe, several retouched lithic industries are found in Australia as well, but no material evidence regarding the retouch activity, in past or present Aboriginal communities, is currently available.

The analysis of ethnographic reports over the past 150 years found that retouching could have been carried out using various types of wooden tools – especially boomerangs. Based on these ethnographic evidences, we present the analysis of a sample of boomerangs recovered from the collection of the Australian Museum (Sydney). The items belong to different communities in Australia, and retouch-induced marks on their surface have been recognised. Such marks are linkable to the ones observed on the bone surface of the European retouchers.

Bone and wood share some intrinsic mechanical features, and the study of the retouch activity could serve as basis for new ideas about Palaeolithic technology, since in the European contexts wooden tools preserve only in some particular and very rare conditions, making a study of such technology impossible to carry out.

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The white-tailed deer bone industry at Cerro Mangote, a Late Preceramic site in central Pacific Panama

People used the pacific isthmus route to migrate to South America, as the Panamanian archaeological record shows. The first populations took advantage of natural resources and they had a direct impact on the pristine environment that they found. Late Preceramic Communities (7000-6000 BP) located on the coast and in the foothills of Panama practised a mixed economy of fishing, hunting, shore-line foraging, wild fruit collection and farming. Cerro Mangote is a multi-component site whose domestic occupation corresponds to a maximum time-period of 7900 and 4600 cal BP. Cerro Mangote is situated on top of a small hill on the north bank of the Santa María River at Parita Bay. Ancient inhabitants of the site hunted deer (*Odocoileus virginianus*), one of the most important prey because they provided meat, fat and bone marrow. The also used deer bone as tools. The aim of this presentation is to study the deer bone industry of this archaeological site and to identify the purpose of these tools.

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Learning by doing – experimental archaeology and microwear analysis on roman bone artefacts

The function of Roman bone artefacts is often defined by scholars using typological assignation. In prehistoric contexts use-wear analysis has been applied with great success in defining the function of bone and stone tools. Here, we present the first attempts to analyse Roman bone tools using a combination of use-wear analysis and systematic experimentation. Rod-shaped bone artefacts

typologically assigned as stili, spindles (1st century AD) or hair pins from (late antiquity, next to *Castrum Rauracense*) *Augusta Raurica*, Switzerland have been used for this study. Various experiments were conducted to recognise and replicate the visible manufacturing traces on the archaeological artefacts. Replicas were crafted using a lathe with fiddle bow drive, and various tools based on the outcomes of these experiments. These replicas were then used as stili on wax tablets; hairpins and clothes pins to perforate wool and linen and as awls to pierce leather. The use-wear analysis on these replicas shows different use-wear patterning related to worked material. The preliminary results are promising, although much more experimentation is needed. It is expected that this type of analysis could significantly contribute to assessing the function of Roman bone artefacts.

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Upper Palaeolithic osseous hunting equipment from the Mamutowa Cave in Poland. First results of the traceological studies

The main objective of the study is to present the first results of the traceological analyses concerning osseous artefacts usually associated with hunting found in the site Mamutowa Cave in Poland. Most of the bone artefacts found on the site are connected with the Aurignacian and Gravettian culture. Bone artefacts in a kind of projectile weapons are represented by more than twenty Mladeč-type points (40,000–35,000 cal BP), baguettes demi-ronde and other pointed and cylindrical artefacts. They are made mostly from mammoth tusk and bone. During the traceological analysis of the mentioned artefacts, a wide spectrum of technological traces was identified that allowed to reconstruct *chaîne opératoire* of their production process. For the purpose of the project, also morphological, technological and functional data about similar finds from Europe were collected and confronted with obtained results.

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Towards the understanding the technology and function of the Bronze Age Bruszczewo-type bone "knives".

Notched implements made of scapulae are known from a number of European sites dated to the Early Bronze Age. Despite many studies conducted in this field, the function of these unique specimens is still unclear. The presentation will present the results of the latest research on this issue based on a collection of over 40 products of this type from the stronghold of the Trzciniec culture in Bruszczewo (Poland). The results of technological analyses will be discussed, which allowed for a precise reconstruction of the chaîne opératoire of standardized production of these products, as well as the results of multi-aspect traceological analyses, which enabled the precise classification of the use-wear traces visible on them. It will be presented the assumptions of the implemented experimental program as well as the results of microscopic tests of the replicas used in its implementation. It allowed for the verification of previous suggestions about the function of the studied artefacts. The results of the physical-chemical analyses of the residues found on the working

edges of tools will be discussed. In the conclusions of the presentation will be proposed the most likely interpretation of the real function of the "knives" from Bruszczewo.

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Bone tools from Beds II-IV, Olduvai Gorge, Tanzania, and implications for the origins and evolution of bone technology

The advent of bone technology in Africa is often associated with behavioral modernity that began sometime in the Middle Stone Age. Yet, small numbers of bone tools are known from Early Pleistocene sites in East and South Africa, complicating our understanding of the evolutionary significance of osseous technologies. These early bone tools vary geographically, with those in South Africa indicating use in foraging activities such as termite extraction and those in East Africa intentionally shaped in a manner similar to lithic tool manufacture, leading some to infer multiple hominin species were responsible for bone technology in these regions, with *Paranthropus robustus* assumed to be the maker of South African bone tools and *Homo erectus* responsible for those in East Africa. Here, we present on an assemblage of 52 supposed bone tools primarily from Beds III and IV, Olduvai Gorge, Tanzania, that was excavated by Mary Leakey in the late 1960s and early 1970s, but was only partially published and was never studied in detail from a taphonomic perspective. Our analysis confirms at least six bone tools in the assemblage, the majority of which are intentionally flaked large mammal bones. However, one of the tools is a preform of the oldest barbed bone point known to exist anywhere in the world and pushes back the initial appearance of this technology by 700 kyr.

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Perforated elk incisor from the Gravettian layer of the cave Velika pećina (Žagubica, Serbia)

Personal ornaments or body adornments are relatively common finds in Upper Paleolithic sites across the European continent. Such items, usually beads and pendants made from shells or osseous materials, might have played a special functional role in hunter–gatherer groups, whether symbolic, cultural or social. In comparison to most parts of Europe, UP sites in Serbia have yielded only a small number of osseous artifacts, despite extensive research in the region over last fifteen years. The focus of this research is the perforated first incisor of European elk (*Alces alces*), discovered in Layer 3 (attributed to Gravettian) of Velika Pećina cave, in 2013. The cave is located in the narrow canyon of the Crna Reka river, a tributary of the Tisnica river, northwest of Žagubica (Serbia). This specimen represents a unique discovery in this region, since no finds nor remains of European elk have been recorded in Pleistocene deposits of cave sites in Serbia. Therefore, it is presumed that the pendant is not of local origin and that it came from a different region by a long–distance movement or trade

between human groups. The goal of this poster is to present the results of taphonomic, technological and functional analyses of the specimen. The results of these analysis were compared with the results of other studies carried out on other analogous pendants from different Eurasian sites with similar chronology.

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In the production of Viking combs, the shape and style have a match with raw material and regionality

The Northern Emporium Excavation project (2017-) has revealed more than 100 000 finds from around AD 700 onwards. The project explores the earliest urban network in Scandinavia through excavation in the emporium Ribe, the earliest Danish town with a unique stratigraphy of subsequent layers, which have enabled a strict stratigraphical matrix and chronology of the plot in the developing Viking town. More than 15 000 finds of mostly workshop debris from worked bone and antler, which have been found in connection with combmakers' workshops proves this line of work to be a major craft in Ribe's emporium and gives important clues to trade and import. The most frequent finished product in the workshop were combs. These were made in a wide variety of styles, which belong to either the style of the North Sea; geometrical style of incised lines and hatches or to the Scandinavian style of marginal lines framing patterns of circle-and-dots. A chronological evolution can be seen in the elaborate ornamentations and shapes of the connecting plates.

New studies in choice of particular raw materials based on sampling for ZooMS (223 samples) proves that there was a clear distinction in styles; the Scandinavian type was always made of Reindeer, whereas the local type of the North Sea was made of either Red deer antler, or horse- and cattle bone. ZooMS also revealed the material of a variety of object types including i.e., pins, handles, spindle whorls and gaming pieces, which could be of Sperm whale or Right whale.

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Osseous and keratinous artefacts from the Netherlands

In the last 20 years Dutch archaeology has experienced a strong growth. This has resulted in a vast number of archaeological objects that have been published in excavation reports or stowed away in depots. No up-to-date overview studies are available, particularly on objects made of organic materials.

In 2020 a large project was started to make an inventory of the archaeological objects that have been found in the Netherlands made of osseous and keratinous tissues. The project was commissioned by the Cultural Heritage Agency of The Netherlands (RCE) in order to improve the (typo-chronological) knowledge of artefacts made of these materials, by means of a systematic inventory and an analysis of the finds. Subjected to this research are all objects from

Palaeolithic to Early Modern period, that were published in research reports, articles or were researched by the individual authors. Over 11 000 artefacts were entered into the newly designed database. This database will also be published online for future research. The resulting scientific synthesis, supplemented by a catalogue, provides a current state of knowledge on this topic.

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From hook design to angling technique: A preliminary analysis of bone and antler hooks from the Late Neolithic site at Şoimus-La Avicola (Romania)

The contribution of fishing to the economy of Late Neolithic (ca. 5400 4500 cal. BC) societies of South-eastern Europe has been until recently regarded as minimal, with an apparent lack of aquatic remains and a relatively low number of fishing tools, even at sites closely connected with large watercourses. Osseous hooks are rather rare occurrences at these sites, with very few examples of hook assemblages. Even less frequent are hooks with perforations as a clasping/suspension mechanism for the line. In this context, we present here the findings regarding a group of 19 osseous hooks from a Late Neolithic site, located in Transylvania, Romania. Drilling was an important stage in the manufacturing process of these items, all of them being designed with one or two perforations at the proximal end. In the total absence of fish remains at the site, our research has focused solely on the osseous hooks. For this, we used an interdisciplinary approach focused on technological and functional studies. Our main aim was to understand how the drilling process had an influence not only on the design of the future osseous hooks, but likely on their functionality as well, with a particular focus on those specimens bearing two perforations.

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Technology or taphonomy? A study of the world's oldest bone tools

The world's oldest purported bone tool technology comes from a series of palaeocave sites in the UNESCO Fossil Hominid Sites of South Africa World Heritage Area, Gauteng Province, South Africa. The identification of these artefacts as bone tools is based on their gross morphology and an associated use-wear pattern. However, the authenticity of this technology is disputed. Excavations at Drimolen Main Quarry have identified fossils with a similar gross morphology to those published as bone tool from the palaeocaves in South African. Through comparative analysis of other faunal assemblages from fossil sites in South Africa, ethnographic collections, actualistic experiments, and utilising the concepts of traceology, a collection of 64 specimens from Drimolen Main Quarry and two specimens from Kromdraai B were identified, and confirmed, as bone tools. Recent dating and stratigraphic analysis of the Drimolen Main Quarry place the Drimolen Bone Tool Collection as the oldest recognised bone technology in the world.

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A techno-typological analysis of the Middle to Later Stone Age stone and bones assemblages at Daimane Rock Shelter, Maputo Province

Southern Africa's transition from the Middle (MSA) to the Later Stone Age (LSA), c. 40 – 20 KYA, is enigmatic. Few sites contain assemblages dating to this phase and even when they do exist chronology is persistently a problem. Moreover, we have a very limited understanding of regional distribution patterns for these assemblages (see Lombard et al. 2012). In Mozambique, for example, no study has attempted to understand, define and describe this transition material. Daimane Rock Shelter in southern Mozambique has an MSA to LSA transitional assemblages with great time depth in a stratified context with datable material.

In an attempt to better understand regional patterns and chronological shifts during the transitional period, this project will analyse and contrast the late MSA levels with the LSA layers at Daimane. A techno-typological analysis of the stone and bones assemblages will be used to examine shifting production technologies and techniques, explore changing preference of manufacturing technology, artefacts representation and behavioural patterns. These findings will be compared directly with Border Cave's MSA to LSA assemblages, west of Daimane, and other well-dated sites in southern Africa. Developing this understanding is important from a regional perspective because it will also develop our understanding of the Stone Age in this side of Mozambique, which has seen significantly less attention than Iron Age studies. In doing so, the project will provide a rare insight into this transition from the MSA to the LSA, transformation of the regional and Mozambican archaeological landscape by exploring a site with great time depth.

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Anthropomorphic Osseous Objects from Early Iron Age Sites of Upper Gangetic Plain

A number of flat anthropomorphic osseous objects with perforations have been recovered from various early Iron Age sites of the Upper Gangetic Plain. The morphology of these objects is mainly employed by scholars to determine their use. Consequently, they are normally regarded as pendants. However, a close microscopic analysis of several objects tells a different story. The use-wears generated by holding threads in and around perforations contradict their hanging by necks. Moreover, remnants of a red coloured material have been observed at various locations within grooves and natural cavities. It might have been used as a decorative agent. In the absence of residue study, it is difficult to say that this substance is ochre; however, this possibility cannot be completely ruled out. These new insights could be useful from the social-economic perspective of the early Iron Age in the Upper Gangetic Plain and an attempt has been made to touch them in this paper.

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Bone technology at the Late Neolithic site of Vinča-Belo Brdo (Serbia)

The site of Vinča-Belo Brdo is the eponymous site for the Vinča culture, phenomenon that marked Late Neolithic in the south-eastern Europe. The site was discovered in early 20th century and excavated intensively through several research campaigns. The researches carried out in the period before the World War II by Miloje Vasić revealed over 9 m thick cultural layer and impressive architectural remains and portable material. Vinča is in every aspect unusual Vinča culture site – it has the longest stratigraphic sequence, and portable finds include numerous unique objects, such as zoomorphic vessels, figurines, significant number of objects made from exotic and rare raw materials, etc. Excavations carried out in the first half of the 20th century also yielded very rich assemblage of osseous artefacts, up today the largest assemblage collected from any Vinča culture site, comprising approximately 1000 items. Although sample bias is present (highly fragmented tools are missing, most likely they were not collected at all), this assemblage provided important information on technology of production, typological repertoire, as well as regarding diachronic aspects – traditions and innovations. While some of the techno-types were widespread on other Vinča culture sites, some seem to be specific for Vinča-Belo Brdo, suggesting specific traits of the economy of the communities that inhabited this site during the Late Neolithic.

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Skeleton in the cupboard. Search for the Palaeolithic in Southern Scandinavia

In Southern Scandinavia worked reindeer remains have been unearthed during peat cutting and clay and sand exploitation since more than 170 years. Different archaeological and zoological syntheses of this material have been published during the first half of the 20th century. However, a modern assessment and analysis of these finds is a desideratum. This is even more surprising as only a handful of dated Palaeolithic sites are known and the understudied stray finds can add to our knowledge of the Palaeolithic in Southern Scandinavia. Here we report about a recent project on this important heritage.

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The reuse of several worked bones from the Ma Zhuang site, a late Neolithic site in Northern Henan province, China

After being manufactured and used, the use life of bone tools can be extended by resharpening, repairing, reworking into other kinds of tools, or simply reused in different task without reworking. The reuse analysis among bone tools is an important issue which has been studied by previous researchers (Russell 2001; Griffitts 2005). However, such studies in China have not been conducted for the reason that scholars are more interesting about the bone manufacture. Several tip broken

bone tools discovered from the Mazhuang site, dating back to 2500-1900BC, could give us an opportunity to explore the bone tools reused condition. At Mazhuang, there were two broken awls which had been reshaped into scrapers and two broken splinters which were reused without reworking. In this research, both broken surfaces and working surfaces near the breakage are observed by using naked eyes and microscope analysis. We found that these surfaces were highly polished, indicating that these pointed tools have been reused after breakage. In the next step, we will develop experiments, including hide-working and plant-working, to analyse the use wear of these working surfaces. The micro wears on control samples and archaeological samples would be compared to try to illustrate the behaviours of reusing bone tools by Mazhang people.