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Scales of Social, Environmental & Cultural Change in Past Societies

ABSTRACT BOOK

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ABSTRACT BOOK
KIEL CONFERENCE

Scales of Social, Environmental & Cultural Change in Past Societies

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CENTRAL KEYNOTES

Key-01

BECOMING NEOLITHIC: Transformation of Hunter-Gatherer Communities of Upper Euphrates -Upper Tigris Basin to Become Neolithic

Mehmet Özdoğan

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The Northern arc of the Fertile Crescent, the homeland of wild ancestors of almost all primary components of Neolithic subsistence, has conventionally been considered the region where a new way of living based on food production came into being. In 1964, Çayönü was selected as the first site in this region to expose an early sedentary farming community. The site instead revealed an unexpectedly complex settlement of hunter-gatherers with substantial remains of non-domestic structures and sophisticated findings, all being controversial to what was expected of a Pre-Pottery site. Making excavators uneasy that despite several seasons of excavation, 'un neolithic' looking findings were somewhat concealed by the more conventional findings of lithic, faunal, and floral finds, with architecture taking the front line. The Çayönü findings were backed up first by those of Nevalı Çori and Caferhöyük, making it possible to speak of 'cult building' and of artistic finds concerning the Pre-Pottery Neolithic. However, the recent discoveries not only from Göbeklitepe-Karahan-like sites of the Urfa region but from all over the Upper Euphrates-Tigris basin, featured by the presence of monumental cult buildings, extensive presence of non-utilitarian, time-consuming, sophisticated objects, evidently the works of craftsmen selected according to artistic talent, drawing the picture of an innovative but stratified social structure that sustained for more than a millennium by hunting and gathering. Addressing the culture of these settlements as 'Neolithic' underscores the urgent need to reconsider what the term 'neolithic' implies or whether they should not be considered as Neolithic.

By the final stages of PPNB, with the beginning of agricultural practices no longer possible to sustain on the limestone plateau, these communities moved into alluvial plains. Their social system seemed to break down, triggering migrations to other regions. As they began practising husbandry and farming, they changed into modest, simple, egalitarian communities in perfect accordance with what is implied by the term Neolithic.

Key-02

Low-density urbanism and landscape engineering in Pre-Columbian Llanos de Moxos, Bolivia: Scales of socio-environmental transformation

Carla Jaimes Betancourt

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The Llanos de Moxos, situated in the southwestern Amazon, constitute one of South America's most extensive savanna ecosystems and a nexus of extraordinary linguistic and ethnic diversity. With a cultural history spanning nearly 10,000 years, this region exemplifies profound socio-environmental transformations driven by pre-Columbian societies. Monumental earthen constructions, including mounds, ditches, raised fields, canals, and reservoirs, embody the intricate landscape engineering that harmonizes human ingenuity with natural systems. This presentation explores population dynamics in the Llanos de Moxos during the last millennium, highlighting two case studies that illustrate distinct scales of socio-environmental interaction.

The first examines the Casarabe culture, whose low-density urbanism has been uncovered through LiDAR research. The 4,500 km² study area is a hierarchical network of settlements that includes central sites up to 315 hectares in size with monumental civic-ceremonial architecture. These settlements are interconnected by extensive causeways and supported by sophisticated water management systems, and they redefine tropical urbanism by exemplifying a symbiotic relationship between social organization and environmental adaptation.

The second case study focuses on the societies around the Great Tectonic Lakes of Exaltación, where communities have adapted to a lacustrine environment, developing unique resource management and landscape modification strategies that complement the low-density urban networks elsewhere in the region.

These case studies underscore the heterogeneity of cultural responses to environmental challenges across the Llanos de Moxos. This presentation emphasizes the interplay between cultural practices and environmental transformation by examining these examples, shedding light on the region's historical complexity. Furthermore, it underscores the critical role of archaeological research in addressing contemporary challenges, such as agricultural expansion and extractivism, which threaten the region's biodiversity and invaluable biocultural heritage.

Key-03

Sex, gender and the Third Science revolution: can we find gender diversity in European prehistory?

Katharina Rebay-Salisbury
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Ancient DNA and dental peptide analysis have made sex estimations of individuals from human remains significantly more reliable, even for children before puberty and from bone fragments. Archaeologists no longer need to rely on the assessment of sexually dimorphic morphological traits of bones alone. Intellectual reflection on the nature and meaning of scientific data, however, has rarely kept pace with analytical advances, and the Third Science Revolution has not solved the fundamental question of how exactly, if at all, sex and gender are linked. This keynote will explore gender systems in Bronze and Iron Age central Europe, the diversity of gendered identities, including the concepts of motherhood and warriorhood, and ask if and how we can find gender diversity in archaeological contexts.

S 01: Evolutionary Archaeology and the Exploration of Major Transitions in Human History

S01-001

Gene-culture cophylogenetics and the dynamics of major transitions in deep history

Felix Riede

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Major transitions in deep history – recognized by distinct and coordinated changes in material culture pattering – may be the result of several underlying processes. They can (i) relate to tipping point dynamics in climate or the environment, they may (ii) be the result of major demographic changes such as migration, or they may (iii) be generated by internal social dynamics. In teasing apart these different causal pathways, it is helpful to conceptualise human history as the result of parallel transmission processes – genetic transmission reflecting the biological fate of human populations and cultural transmission reflecting the changing dynamics of past communities of practice and their material culture production respectively. This theoretical framework is known as gene-culture coevolution or dual-inheritance theory. Recent decades have seen a substantive maturation of such cultural evolution approaches but their application to prehistory remains yet limited. With focus on the European Palaeolithic, I here develop a cophylogenetic approach that utilizes the increasing wealth of palaeogenomic data together with contextually associated material culture information to infer the degree to which major changes in the genetic and cultural makeup of Palaeolithic populations coincide with each other (an argument for migration as driver), with contemporaneous climate change (an argument in favour of external forcing), or if they are disaggregated (an argument for internal generative mechanisms). The methodology presented here is intended to be case-transferrable and although data on either ancient genetics or material culture may not be equally accessible in all parts of the world, the lessons learned by approaching the record in this theory-driven, epistemically demanding, and methodologically replicable way have clear implications for just how humble or otherwise our interpretations of any major transition in human deep history should be.

S01-002

Evolutionary Archaeology to Socio-Evolution: issues of branding and theory

Artur Ribeiro

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The popularity of Graeber and Wengrow's *The Dawn of Everything* has demonstrated that there is large percentage of scholars who are tired of the same old socio-evolutionary narratives. At the same time, archaeogenomic studies have suffered countless critiques, pointing out that genetic signatures do not necessarily equate with past cultures. Overall, both evolutionary archaeology and socio-evolutionary theory have made great strides in archaeology, yet they both struggle to obtain mainstream acceptance.

One of the reasons for this is the current *Zeitgeist*, one that views past cultures as fluid, transferable, and mobile, and also views major transitions of human history as too complex and convoluted to be captured by long-term narratives. Rather than the same-old long-term narratives of human progress, the current *Zeitgeist* is one that views reality as a complex network, one that is open and flexible. Simply flooding the scientific market with ever more data will not convince the vast majority of archaeologists of the validity of socio-evolutionary theories nor of evolutionary archaeology.

The aim of this talk is to provide a critical view of the context in which both socio-evolutionary theory and evolutionary archaeology are trying to claim a stake, identifying what crucial changes and adaptations these positions need to make in order to garner wider acceptance in archaeology.

S01-003

Exploring Transitions in Cognition and Technology Through Material Culture Dynamics

Larissa Straffon

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Recent work by Barron and colleagues [1] suggests that major transitions in cognitive evolution reflect increases in computational power, tied to progressively complex ways of learning. Human cognition, now in a reflective stage, enables both self-correction and instruction. In our evolutionary cultural niche, reflection facilitated knowledge transfer and cooperative labour, for instance in the context of subsistence activities such as foraging and tool-making. Due to

an evolutionary trade-off between efficiency and energetic costs, cognitive transitions were likely driven by resource constraints and changes that allowed for greater efficiency down the line.
Constant et al. [2] have extended this framework by proposing that the co-shaping of artefacts with function and use behaviour can offer predictive models of cognitive evolution. Based on Stout's [3] conditions for technological transmission—emphasizing efficiency, transmissibility, and skill acquisition through instruction—they show that technological and cognitive evolution are mutually reinforcing processes. This suggests that shifts in cognitive capabilities may be traced through the evolution of increasingly efficient and transmissible technologies.
Cognitive technologies—such as language, visual signs, and quantification systems—play a key role in processes like communication, decision-making, and problem-solving [4]. Although these technologies are more difficult to identify in the fossil record compared to for example stone tools, they are often extended on and supported by material culture, evolving to release constraints on learning. This paper explores the dynamic interplay between material culture and cognitive tools in tracing cognitive changes in our species.

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S01-004

Byzantine amphorae in numbers: 'Data-mining' patterns of feature interaction

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This case-study highlights the results of the analysis of morphology of Byzantine amphorae by methods of 'data mining' and aims to obtain information about their structure and type relations.
The generally accepted typology of Byzantine amphorae, developed by Negris Günsenin, includes 37 typological varieties, of which four are widespread (Günsenin 2018). In this study, vessels are examined in terms of the structure and interaction of their morphological features. Traits/ features are approximated using morphometric descriptors derived from elliptic Fourier analysis (Kuhl&Giardina 1982). The application of entropy-based methods has allowed the study of amphorae varieties in terms of feature inference networks (Meyer 2008), behind which the manifestation of the structure and function of objects can be seen. Namely, multivariate mutual information as well as comparison of pairwise mutual information matrices were used to investigate the organisation of the main types (Günsenin 1, 2, 3 and 4). Since evolutionary splitting should change the amount of shared information between groups, an information-based metric was also tested to construct a phylogenetic tree of amphora types. Computations were conducted in R environment. The idea of applying information theory methods to describe archaeological artefact organisation is directly borrowed from: Diachenko, Rivers & Sobkowiak-Tabaka 2023.

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S01-005

Evolution of the Mid-Fraser Phenomenon: Emergence in the Context of Multiple Intersecting Cultural Lineages

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The sudden appearance, rapid growth, and spread of large aggregate pithouse villages in the Mid-Fraser Canyon of western Interior of British Columbia after ca. 2000 cal. BP has intrigued archaeologists of the North American Pacific Northwest for decades. The Mid-Fraser villages are characterized by large housepits with superficial resemblances to earlier dating examples closer to the Coast, an artistic tradition embodying elements of Northwest Coast styles, and yet, an approach to lithic technology with similarities to strategies known to the Rocky Mountains and northern Great Plains. Advanced fitness landscape models predict that situations of intersecting cultural lineages may provide opportunities for rapid evolution on more highly integrated organizational scales. In this paper, we present results of phylogenetic analyses of house architecture, portable art forms, and lithic technological systems in order to assess the potentially diverse evolutionary lineages that contributed to the evolution of the Mid-Fraser phenomenon. Results offer implications for our understanding of ancient Indigenous (St'at'imc in this case) history and the cultural macroevolutionary process.

S01-006

Pioneering model-based Bayesian phylodynamic methods for the study of macro-scale cultural evolution using 2D lithic tool shapes of the European Late Upper Palaeolithic

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It has been argued that the phylogenetic method is perhaps the most important tool for evolutionary archaeology to study cultural evolution on a macro-scale (Mesoudi & O'Brien, 2009; Garvey, 2018). For palaeobiologists, phylogenetic methods have long been the tool of choice when it comes to inferring past patterns and processes of organismal evolution; within that field, cutting-edge model-based Bayesian tools are being actively used and developed. Archaeology, in contrast, lags behind both in terms of phylogenetic applications and in terms of analytical sophistication to reconstruct and analyse historical ancestor–descendant relationships based on cultural traits. Here, we present the results of recent research addressing this method gap. First, we report on a bibliometric literature review mapping the state-of-the-art of phylogenetic methods and applications in archaeology and identifying current shortcomings and research gaps (Matzig et al., 2023). Then, we report on the development – based on the state-of-the-art methods from paleobiology – of a reproducible and case-transferrable Bayesian framework for the inference of phylogenetic and so-called phylodynamic models in archaeology using two-dimensional artefact outline shapes as character traits (Matzig et al., 2024). Bayesian phylodynamics based on artefact shape constitutes a true novelty to archaeology and facilitates novel analytical possibilities for studying artefact evolution in a macro-archaeological way. Drawing on a Europe-wide lithic projectile point dataset (Hussain et al., 2023), covering the Late Upper Palaeolithic between ca. 15 and 11 kya BP, we show how a Bayesian phylodynamic framework in combination with geometric morphometric methods can help understanding in how far climatic fluctuations and environmental changes influenced the social transmission dynamics of past populations as mirrored in the shape of their artefacts. Furthermore, this novel approach is particularly useful for addressing perceived 'major transitions' in the archaeological record – in this case for the transition from the Palaeolithic to the Mesolithic – in that skyline analyses, for example, can shed light on the dynamics of cultural innovation and loss through time. With our methodological framework in place, future efforts could be dedicated to its expansion into the realms of phylogenetic comparative methods, as well as the explicit study of gene-culture co-evolution.

S 03: Neolithic stone-walled enclosures in Western and Northern Europe

S03-007

The Dartmoor Tor Enclosures Survey (DATES) Project, UK

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Tor enclosures, a distinctive class of monument in southwest England, are key features of broader landscape enclosure and monumentalisation practices evident across Britain during the fifth and fourth millennia BC. These practices coincide with significant shifts in landscape use, subsistence strategies, lifeways, and material culture. In Cornwall, ten tor enclosures have been identified, while four are known in Devon (Davies 2010; Basell et al. 2020; 2022). Despite variations in form, their defining feature is the enclosure of high moorland areas with stone banks, often integrating one or more prominent rock outcrops. Of the Cornish sites, only Carn Brea and Helman Tor have been securely dated to the fourth millennium cal BC (Mercer 1981; 1997).
Dartmoor, a granite upland and national park in Devon, boasts one of northern Europe's best-preserved prehistoric landscapes due to its history of landscape use. Since 2019, the Dartmoor Tor Enclosures Survey (DATES) has conducted detailed investigations at two known tor enclosure sites—White Tor and Dewerstone—as well as a newly identified site, Knowle Wood. This paper presents the results of survey work, evaluation excavations, and newly obtained radiocarbon dates, alongside an outline of the project's public engagement strategy. By situating these sites within their broader temporal and spatial contexts, we explore the evolving dynamics of human entanglement with these monumental landscapes.

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S03-008

Recent research on Neolithic hillforts in Ireland

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As in some parts of Europe, the origins of the later prehistoric hillfort in Ireland may be sought in large enclosures of the fourth millennium BC. Several single and multiple enclosure sites are now part of a growing record of Neolithic settlement across the island. Some of these are interpreted as causewayed enclosures, comparable to examples in southern Britain often viewed as places of assembly, ceremony and trade. As in Britain, there is evidence of fortification at some Irish sites, where the use of ditches, banks, stone walls and/or timber palisades created what was essentially a Neolithic hillfort. There is variability in the design, landscape setting and use of these Irish enclosures, with some sites more obviously residential in character, while others had special significance as ritual space. The limited investigation of most sites regrettably provides only a partial understanding of their broader significance.

This paper present results of recent research conducted in the Baltinglass area of Co. Wicklow, where three Neolithic enclosures have been identified within a landscape of a dozen or so hillforts. These discoveries suggest the first hillforts in Ireland were large multiple enclosures built by farming communities of the earlier Neolithic. These sites were part of a wider phenomenon of enclosure of land, settlement and ritual space during the fourth millennium BC. This had a broader significance in terms of the assertion of land ownership and territorial rights, which were also affirmed by the building of megalithic tombs within many enclosures. The security concerns that are manifest in the design and landscape setting of these enclosures provides a further insight into the social relations of Neolithic communities in Ireland, their relationship with Mesolithic indigenes and the conflicts that often ensued.

S03-009

Reaching the Pinacle: An Insight into Jersey's Most (Un)famous Stone-Walled Enclosure

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A few dozen kilometers off the French coast, the Channel Islands consist of several islands and archipelagos that were separated from the mainland at the late or final Mesolithic (Conneller et al. 2016). Despite its insularity, Neolithic communities quickly recognised and invested Jersey, the largest of the islands within the Bailiwicks. This situation is shared with several other islands within the English Channel and the Atlantic (Pailler et al., 2008). Between the Early Neolithic and Middle Neolithic I, around 4800–4250 BCE, a spectacular yet challenging-to-access location has been identified primarily as a production site for Type P dolerite axes (Patton 1991). This site, known as The Pinacle, derives its name from an enormous granite rock facing the sea, visible from miles around, making it a unique location along the island's wild coastline.

Excavated between 1930 and 1936, and then again in the 1980s, the site has revealed numerous late Neolithic artifacts, yet publications have focused almost exclusively on certain aspects of the occupation layers (Godfray and Burdo 1949 and 1950). The large quantity of ceramics discovered even lent its name to the "Pinnacle/Fouaillages group," associated with the eponymous site in the Bailiwick of Guernsey. After a hiatus in the 4th millennium BCE, the site saw renewed activity during the Late Neolithic and Chalcolithic, marked by two architectural embankments. These structures have so far attracted little attention, as authors previously interpreted them as defensive in nature. However, comparing the Pinacle to other sites along the western European coastline now suggests a different interpretation (Guyodo, Mens, 2013).

This paper aims to revisit the excavation results, especially the architectural data and stratigraphy, proposing a new reading of the stone-walled enclosures. Additionally, a broader contextual analysis will explore the potential presence of similar sites within the Channel Islands, reconsidering the islands' role on a larger scale and as part of a broader phenomenon.

S03-010

NEWW - Neolithic Stone-Walled Enclosures in Western Europe: new project and first results from western France (4th-3rd mill. cal BC)

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Starting in the middle of the 4th mill. cal BC, new forms of human settlement appeared in the north-west of France. These stone-walled enclosures were first observed on the Atlantic coast and islands, but now they have been documented on the English Channel shores as well.
On high promontory, these sites are bordered or surrounded by embankments and stone architectures. The architectural techniques used in these monumental constructions are varied: vertical slabs, dry-stone walls, etc. The development of these stone-walled enclosures is closely related to the increase in mobility and exchanges. They fulfill a need for a new human environmental interaction and changes in worldview. Visible from afar from the ocean, these sites play an essential part in seafaring for the surveillance and/or control of maritime territory.
Their location is highly specific and closely associated with the seascape, as they are barred spurs facing the ocean or the sea, estuary bottom enclosures or pseudo tor. This last category of site is characterised by a short and straight bank between two natural rocky eminences surrounding a small area facing the sea. In terms of shape and construction, this type of site could be similar to the tor enclosures in southwestern England for example. The Atlantic coastline, the English Channel and possibly beyond may have other parallels. In western France, a program of collective research has recently started compiling data on stone-walled enclosures. The discovery of sites of this type has been increasing in France over the past twenty years. Today, it is necessary to process these data as their appearance and destruction vary depending on natural or human erosion.
The aim is to draw up an initial assessment of the available data in a regional and super-regional scale. The program integrates detection, recording and documentation of architectures. These researches incorporate also datation methods, paleoenvironnement and paleogeography studies.
These stone-walled architectures are not exclusive to western France and now we need to look at them from a different geographical perspective. We hope to set up in 2025, the NEWW project. It aims to bring together research into Neolithic stone enclosures on a European scale in order to highlight the impact of the emergence of new Neolithic social behaviour patterns and dynamics.

S03-011

Implementation of a recording method on several Neolithic enclosures in western France (4th mill. BC)

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This communication presents an interdisciplinary approach developed to facilitate the recording of Neolithic enclosures located in western France (Brittany, 4th millennium BC). In this area, the Neolithic enclosures excavated over the last

twenty years have revealed a variety of architectural solutions, including the use of megalithic blocks or earthen and dry-stone structures. However, excavations of these archaeological sites are still rare and cover only limited areas.
The survey method developed below aims to provide an alternative approach to excavation for collecting data on these sites, which are often threatened by severe natural and anthropogenic erosion. Firstly, this approach offers the possibility of studying the morphology and outline of the architectures by carrying out and exploiting regular topographic profile surveys (with GPS and tachymeters) and digital surveys (LiDAR, photogrammetry). Combined with cartographic tools, this provides information on the general topography of the sites or on the block modules and construction techniques used for these stone architectures.
This approach makes it possible to provide the most complete descriptions possible in the context of a non-invasive intervention. This protocol, which is currently being tested in the west of France, will enable researchers to obtain a homogeneous survey of these architectures throughout Brittany, thus facilitating comparisons at different scales. This presentation will be illustrated by unpublished case studies, such as the enclosure of the site of Pen Liouse (Île d'Arz, Morbihan). The development will also be based on preliminary feedback from survey campaigns at other sites in Brittany.

S03-012

Estuarine stone-walled enclosures in western France, signs of transformation in population dynamics (4th millennium BC)

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In many European regions, the increase in enclosures and fortifications during the fourth millennium BC reflects an important social change.
In western France, among the stone-walled enclosures, those built at the bottom of the estuary are the largest in surface area, and are the result of a consequently construction effort. Environmental conditions, topographical settings, and social constraints influenced the shape and structural designs of these fortifications. Construction requires many builders and significant investment, given the ancient walls that have been preserved. Within these permanently inhabited fortified enclosures, large areas not occupied by buildings may be used for assemblies, fencing domestic animals, specialized activities, and, in some cases, the deposition of human bone.

This paper presents the results of recent surveys and excavations of some sites in western France, as Neolithic enclosures of the Carnac region and on coastal marshlands. The specific location reveals the changes in the perception of waterscape and wetland spaces with the installation of relay sites at the interface of two worlds, between the tidal limit and inland waters. These enclosures are the necessary link between maritime resources and territories and inland agricultural and pastoral landscapes.
The diversity of material culture and products coming from these land/sea traffic axes reveals an extended external relation. The increase in the volume of objects reflects the travel opportunities facilitated by the waterways.
It's a sign of important social, environmental, and cultural transformations as well as the formation of new maritime group identities.

S 04: Obsolete Models, Concepts, and Narratives in Archaeology

S04-013

Tackling a vicious circle: Stereotypes and obsolete narratives in archaeology at the intersection of academia, museums and societies

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Stereotypes are a significant part of obsolete thinking and narratives in archaeology. Based on insights from psychology, sociology, anthropology, archaeology and history, this talk addresses why and how stereotypes – and, through them, obsolete narratives – are formed, fade and/or persist within groups and societies throughout time. In addition, it discusses the ways these constructs enter and shape the discourses of disciplines, and then return to societies within various forms of research outputs with different degrees of impact. The talk takes archaeological museum exhibitions as a starting point for this exploration, as these are the mental, physical and social spaces where academia and society as well as the present times and the archaeological past intersect. Archaeological exhibitions are also the places where we encounter many of the concepts (e.g., archaeological cultures) and stereotypes (e.g., gender stereotypes) that are at the roots of narratives related to, e.g., ethnogenesis, social structures, organization and phenomena in past societies. These narratives are regarded as (increasingly) obsolete in some archaeological traditions today, especially across the Western world, while in others they are still part of archaeological analysis and interpretation. Within the framework of archaeological museums, this talk especially focuses on narratives that currently exist in the representation of gender in archaeological exhibitions across Europe. It reflects on whether and how recent archaeological knowledge is incorporated in these narratives. Furthermore, it argues that there is a communication gap between academia and museums, which contributes to the persistence of stereotypes and, consequently, of obsolete narratives in researching and interpreting the archaeological past, as well as in presenting and communicating it. Finally, the talk explores the impact and consequences of such narratives on archaeological research and contemporary societies, and presents examples of actions that challenge the status quo and offer alternatives to it.

S04-014

Use it or Lose it: Unraveling Cultural Loss and Memory in Archaeological Models, a Quest for Fire

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In many archaeological models, the concept of a “cultural continuum” is often assumed, suggesting that once a society acquires a key skill or technology, such as ceramics or fire, it will not lose it. This assumption overlooks the possibility of cultural loss of useful practices that have no functional equivalents, especially in the aftershocks of stress, disasters and catastrophes and increased variavility. Some models do focus extensively on societal collapse, however, this research often miss intermediate stages of cultural loss, where specific key traits might be lost and have cascading effects on society well-being and long-term sustainability. To address this lack of research we model cultural loss in the context of one intriguing archeological observation, the discontinuation of use of fire in several Neanderthal settelments in a cold phase of the Pleistocene. We modeled forgetting and loss to explain the lack of traces of fire use (as well as other instances of documented technological loss in modern humans). To model this loss, we focus in four factors: number of experts, frequency of use, variability in use and forgetting time. Both variability and forgetting are seldom considered into modeling and understanding of the archeological record, however, we show that these are essential mechanisms which shape the retention or loss of essential cultural characteristics which determine how we interpret our past. Increased variability and memory loss often lead to discontinuation of cultural traces. If we want to seek, identify and interpret cultural discontinuations, we need a proper understanding of cultural loss. By understanding the basic mechanisms of cultural loss and retention, we provide a new vision on how to understand the past and shed light into the future.

S04-015

From Hunting to Hierarchy? Rethinking the Simple-Complex Dichotomy in Hunter-Gatherer Societies

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This paper critically examines the persistent duality in characterizing hunter-gatherer societies as either “simple” or “complex,” a dichotomy that has shaped archaeological and anthropological research for decades. This framework has led

to a proliferation of terms to describe variations within forager groups—such as "non-segmental storing societies," "proto-agriculturalists," "trans-egalitarian foragers," and "complex hunter-gatherers"—which remain undefined and inconsistent, especially when compared to farming communities where complexity is assumed. This binary oversimplifies the diversity of foraging groups, positioning those with hierarchical structures or leadership roles as exceptions or precursors to agrarian societies. Furthermore, archaeologists and anthropologists often impose evolutionary models that place hunter-gatherers on a linear path toward agricultural complexity, reinforcing a progressivist narrative that views farming as foundational to all social dynamics, including inequality and warfare.
Recent evidence, such as eight-thousand-year-old fortified hunter-gatherer settlements in Siberia, calls for a reevaluation of these rigid classifications. These communities, exhibiting characteristics such as sedentism, wealth accumulation, and territoriality, challenge the entrenched assumption that conflict and complexity—often equated with socio-political inequality—only arise with agricultural societies. These findings highlight the need to move beyond the dualistic framework of "simple" versus "complex" and recognize the diverse political, social, and economic arrangements present in hunter-gatherer groups.

S04-016

Neolithic and Neolithic Cultures of Ukraine: Wanted But not Quite Found

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The traditional view suggests an early Neolithization of Ukraine in the end the of the 7th mill BC, marked by the introduction of ceramics, animal husbandry, and agriculture. Recent research indicates a lack of strong evidence for Neolithic economic innovations or significant changes in the population's anthropological composition prior to the introduction of early metalworking. While ceramics were indeed present, their use had long been established among Late Mesolithic foraging groups throughout Europe.
The isolation of Ukrainian Mesolithic forager groups is reflected in the variability of material culture among genetically related populations. In archaeological research, these differences are often interpreted as distinct cultural types - or even as separate Neolithic archaeological cultures. Researchers frequently attribute variations between groups to external influences, such as migration, assimilation, or infiltration. It is important to recognize, however, that the conditional isolation of any group over several generations inevitably leads to certain changes, which will naturally appear distinct when compared to those of a geographically separate group. Ethnographic data indicate that forager groups, despite their seemingly well-planned economic strategies, often encountered food scarcity and hunger crises. Under such conditions, pooling resources to stockpile food becomes advantageous; however, the size of the consolidated community must remain small. This situation significantly limits social interactions with neighboring forager groups, as the potential for mutual assistance during times of need is substantially reduced. Ceramics, specific tools, types of raw material, ornaments etc. are not always suitable as cultural markers, as they are dependent on the natural and geographic, individual needs, personal preferences of small population groups. In contrast, economic structure, spiritual culture, and genetic relatedness are more stable unifying indicators.
We try to prove that the term Neolithic is inaccurate for describing the population that inhabited the territory of Ukraine from the end of the 7th mill to the mid-5th mill BC. Contacts with neighboring early agricultural societies were limited and exerted minimal influence on the economic practices of local foragers. The Neolithic cultures identified in the last century largely represent artificially constructed artifact assemblages and thus warrant a fundamental reassessment.

S04-017

Yamna Culture: People or the "First World Religion"?

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The identification of archaeological cultures is usually based on the uniqueness of their material complexes. The most expressive element in this regard is pottery, particularly its shape and ornamentation. Some prehistoric cultures have been named after specific features of their ceramics: Linear Pottery, Funnel Beaker, Globular Amphora, Corded Ware cultures, and so on.
However, when considering the Yamna culture (cultural and historical community), the primary focus shifts to the burial ritual and its standardization across a vast area (Merpert 1974). The burial ritual conveys significant ideological, worldview, and social meanings (Saxe 1970, et al.). The accompanying grave goods, among other aspects, often serve as cultural (or ethno-cultural) identifiers. In the case of the Yamna culture, a discrepancy emerges: the main criterion for attributing sites to this culture is the burial ritual itself. Yet, when examining the artifacts, whether from burials or the rare domestic context, a complex and ambiguous picture arises. The material culture in different regions within the Yamna cultura and historical community shows clear differences. In various areas, different types of pottery dominate, with distinctions in ornamentation and manufacturing techniques. The assortment and typology of metal objects, weapons, and ornaments also vary widely.
In different regions, the Yamna cultural and historical community had diverse cultural foundations, varied economic and

domestic practices, distinct material cultures, different anthropological types, and diverse intercultural connections.
It can be hypothesized that the features researchers used to identify this culture may actually reflect a shared set of myth-religious and ideological beliefs among the diverse societies inhabiting this vast territory. These shared ideas, manifesting archaeologically as a certain unity, such as standardized burial rites, represent a "new ideology" that became the basis for identifying a culture (or cultural community) that was not entirely uniform. These worldview concepts (a sort of "first world religion") began to form and spread during a period of climate change, aridization, and the expansion of the steppe zone. The burial ritual, reflecting this "new religion", united populations from diverse cultural traditions, different origins, and varied historical destinies

S04-018

Why are old narratives coming back through genetics?

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Ancient DNA is transforming European prehistory, reviving old narratives such as the invasion by 'steppe folks' of 3rd millennium BC Europe as a source for Indo-European languages. However, concerns arise that prehistory is being hastily rewritten as a deep history of mass migrations, with 'pots' and 'people' inextricably linked together, like in the heydays of culture-historical archaeology.

This seminar will briefly explore the historical roots of current debates on prehistoric migrations and examine the reasons behind the resurgence of old interpretations of the past through the latest revolution in science. It will highlight how the use of untested, potentially obsolete culture-historical groupings for statistical modelling of genomic variation, perpetuates simple migration replacement scenarios.

S04-019

How to Train Your Dragon: Weakening of the Concept and Widening the Ontology of Archaeological Culture with Actor-Network Theory

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Archaeological cultures have been around for a long time — at least since the beginning of the 1900s. Therefore, it has been almost a century of recognizing it as a problematic concept, unable to reveal the archaeological complexity and dynamics. Yet, it remains in use and is so engraved in how we construct our narratives that it is unlikely we will ever get rid of the hundreds of cultures in study. This ambivalence teases theorists to return to the concept of archaeological culture, testing different ways of shaping and structuring it to "make things work."
Recent discussions around the idea of archaeological culture acknowledge that the time has come to reconsider it, pointing to the strengths and limitations of applying it practically. While focusing on practicalities, they make little effort to align the concept with the advances in archaeological theory and significant changes in how we theorize archaeology in 2025. With this contribution, we endeavor to discuss the idea of archaeological culture from a theoretical standpoint and search for a way of refreshing it to better fit today's requirements.
A closer look at the rigidity and lower dynamics of archaeological cultures shows the links between these parameters and the intrinsic strength of the concept, its inability to change even despite the changes in our knowledge of archaeological materials related to it. Therefore, increasing the flexibility and, thus, the applicability of archaeological cultures is closely connected to the weakening of the concept — for the idea of a strong theory echoes well the issues one experiences talking about archaeological cultures. In contrast, weak theories are assumed to avoid these issues.
We will examine the structure of archaeological knowledge more closely to identify the source of archaeological cultures' conceptual strength. Once identified, we will search for theoretical ways to weaken its concept and widen the research optics able to access all ontological elements (human and non-human actors) of its network; this approach involves epistemological and ontological sides of the archaeological culture and adds to the advancement of archaeological theory. Our main instrument for this is the actor-network theory, which establishes how archaeological assemblages affect and change the structure of archaeological culture.

S04-020

Back to the past: rethinking the place and nature of radiocarbon dates in archaeology

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It is commonly believed that radiocarbon dating brought about a "revolution" in archaeology. For periods undocumented by written history, this technique provides an ingenious solution to obtain independent calendar dates from organic remains. Despite this independence, radiocarbon applications in archaeology continue to be subordinated to predetermined typological paradigms that conflate the speed and quality of human temporality with the duration of constructed material typologies. This conflation exhausts eventfulness at the junction of material types that are "fixed" in time, reducing radiocarbon dates to mere attributes of archaeological materials and losing focus on the organic temporalities that sustained and reproduced material practices. The overlap between material and temporal units is especially problematic when dealing with assemblages that show extreme synchronic heterogeneity or extreme diachronic homogeneity. Paired with the intrinsic limitations of radiocarbon calibration, this reaches an impasse that limits our ability to capture human eventfulness beyond material taxonomy. In this presentation, I revisit the place and nature of radiocarbon dates in light of the latest revolution enabled by high-resolution Bayesian chronological modeling. I advocate for a reconceptualization of radiocarbon dates as temporal entities of their own. I claim that, by bringing focus to the repeating events that constitute such temporalities, we may gain insights into pervasive forms of temporal eventfulness regardless of visible typological change. This approach conceptualizes the archaeological record as an encounter between organic and inorganic temporalities, opening opportunities for appreciating how past communities actively acted upon their own past and present and incorporating the notion of anachronism into our views of the material record. I will discuss these themes by looking at the Kura-Araxes culture, a conservative yet diverse material horizon that defines the Early Bronze Age (3500-2500 BCE) in the South Caucasus

S04-021

Gustaf Kossina and the Funnelbeaker Culture

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The terms "Funnel Rim Beaker" and "Funnel Neck Beaker," collectively termed "Funnelbeakers," were introduced by G. Kossinna (1911; 1920). His interpretation of their distribution as the core area of a "Germanic culture" exemplifies the misuse of the culture concept in archaeology. Until the 1930s, the TRB (Funnelbeaker Culture) was also called the "Megalithic Grave Culture," referencing its monumental burial structures. K. Jażdżewski is credited with dividing the TRB into North, West, East, and South groups, along with the Elbe-Weser Culture (Altmärkische Tiefstichkeramik), a classification still widely used (Jażdżewski 1936).
Less acknowledged is that Kossinna already proposed a group model anticipating Jażdżewski's scheme. Both Kossinna and later scholars like Jażdżewski and E. Sprockhoff advocated a north-to-south cultural diffusion originating in Scandinavia, countering the Ex Oriente Lux hypothesis. Kossinna linked this diffusion to the "Germans," defending this view in 1920 (Kossinna 1920).
The TRB group model, emphasizing the Northern group, was expanded by Jażdżewski and Sprockhoff and remains influential today. However, recent critiques, such as M. Furholt's (2014), challenge its assumptions of uniformity. These studies highlight regional diversity, questioning the idea of a monolithic TRB culture.
This paper traces the development of TRB classifications, uncovering ideological biases from Kossinna's initial proposals to modern interpretations. It calls for a reassessment of the TRB model, incorporating new data and theories to better reflect its cultural complexity.

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S04-022

Reviewing the concept of resilience in archaeology

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What is resilience? How do we identify resilient societies and practices in the archaeological record? And what can we do with it? This study aims at finding a consensus between various theoretical models (e.g. Redman & Kinzig 2003; Lorenz 2013; Callo-Concha & Ewert 2014) and research frameworks (e.g. Lancelotti et al. 2016; Riris & de Souza 2021) about resilience that were developed over the past decades, critically reviewing their applicability. Resilience theory and related concepts including socio-ecological systems, vulnerability and adaptability, sustainability and coping mechanisms will be elucidated, as resilience is often discussed in relation to these. Deviating definitions, varying integration of related concepts, the reliance on qualitative criteria and subjective choices of scale strongly impact the analytical results and interpretations, limiting comparability between cases. This presentation demonstrates, however, that despite these challenges, resilience has not become an obsolete concept in archaeological research. By studying resilience in the past, especially through the longue durée perspective, valuable insights on past socio-environmental systems can be gained that may ultimately inform current policy-making with the aim of increasing sustainability and resilience towards the effects of global warming.

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S04-023

Against the Exotic: Examining the Incorporation of the "Hellenistic Phalera" from burial 20, Noyon Uul, Mongolia into the Funerary Assemblage Utilising a Sensorial Perspective.

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This paper examines the so-called "Hellenistic Phalera" from burial 20 in Xiongnu-period (100 BCE - 30 CE) Noyon Uul, Mongolia utilising sensorial perspectives. This phalera, by virtue of the iconographic depiction of what is perceived to be a Hellenistic scene shown on the obverse, is considered to be derived from Hellenistic colonies of the Black Sea. It has been re-utilised as the chest piece for a horse-harness, and subsequently buried as part of the funerary assemblage of tomb 20 in Noyon Uul, a large burial site for the Xiongnu period population of Mongolia. The phalera has been interpreted in varying ways, but in all cases, its exotic nature as an item procured over long-distance trade routes has been placed central as the reason this object was incorporated in the funerary assemblage. The discourse has settled on the idea the phalera was used to show how well-connected and "global" the buried was, increasing their prestige. This strong focus on status and prestige reduces the phalera to a representation of exoticism.

Instead, this paper will focus on the materiality and the sensorial affect of the phalera. This phalera has rarely been considered in context, and a re-examination of other funerary items used as horse-harness adornments show that it may not have been the 'exotic' nature of the phalera that led to its incorporation at all, but rather its extremely high quality silver material and its connection to an already existing tradition of burying the dead with similar kinds of material. Placing the sensorial affect of this phalera central may bring us closer to an emic understanding of its significance, and highlights the stark contrast between the archaeological perception of the phalera and the lived experience of those using it in funerary rituals.

S04-024

Thinking Outside the "State": Theoretical Approaches to the Spectrum of Polities

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Archaeologists often define a "state" as a polity concerning a certain scale of society, characterized by a specialized division of labour, stratification into classes, and centralization of authority in a singular ruler, whether pharaoh, tzar, king, president—–a "head of state". Such portrayals, typified by Elman Service's model in anthropology and later nuanced by Marshall Sahlins, remain entrenched in the band-tribe-chiefdom-state evolutionary model of societal development. Similarly, archaeological treatments, such as Renfrew and Bahn, modify these typologies only slightly, mainly changing terms, substituting "segmentary societies" for "tribes", for instance. Still, the four-stage model of societal evolution remains, largely a trajectory from decentralized foragers to centralized, bureaucratic political structures.

Yet, it is clear that these concepts of the "state" need refinement to encompass other polities that concern other expressions archaeologically and historically. Pierre Clastres described the state as involving a political subset of society, one that was opposed to society itself, with active resistance by others to such formations. James Scott detailed *zomia* as non-state zones, while Graeber and Wengrow highlighted the variability and fluidity of numerous non-state to state forms.

Here, I discuss cultural cases of societies that defy notions of the classic "State", but do not match characterizations of non-state societies either. This includes archaeological cases, historical cases, as well as contemporary cases within the Northwest Coast of North America, where Indigenous peoples continue to defy the imposition of "State" control over their traditional territories in Canada. Such examples include the Líĺwat or Gitanyow, who present alternate forms of decentralized and centralized management of their societies and territories in response to colonial states. Viewed in such ways, the defence of territory is not just needed to protect from other states, but also from other centralized entities, such as corporations seeking to extract resources from their territories. These contemporary examples, I will present, provide fodder for thinking through archaeological cases in the past, and a reworking of the concept and typologies of state-scale polities.

S04-025

Armies, States and Kingdoms – Do we need these Narratives in prehistoric Bronze Age?

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In recent years, the use of concepts to characterize Bronze Age societies in some parts of Europe has been characterized by a rhetorical increase in terminology. Previously, if at all, terms such as chiefdoms, tribes or similar were used to describe social entities in the prehistoric Bronze Age. Now, primarily in popular representations, increasingly far-reaching concepts with developed steep hierarchies such as states, dynasties or kingdoms based on armies are used, without the state of archaeological research having changed significantly. This raises the question of the extent to which research benefits from the use of such narratives or whether, on the contrary, this contributes to the obfuscation of the situation through an imbalanced interpretation of the archaeological record and the creation of a certain arbitrariness in the use of terms.
By analysing various approaches to describing prehistoric social structures, this paper discusses methods for examining the archaeological evidence and the limits of interpretation. This is done in particular with regard to the description of social groups with the help of analogies, using examples from the Bronze Age in various regions of Europe. The focus is on the identification of meaningful parameters, basic resources and the spectrum of target-oriented interpretation approaches.

S04-026

Rethinking Bronze Age Role Allocations

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The definition of the Bronze Age power distribution is mostly seen from a masculine and patriarchal perspective. The narrative of the warrior, for example, is a concept that continues to be built upon, although there is much evidence that challenges its meaning and calls for a more nuanced definition of Bronze Age warriors and role allocations in general.
The discrepancy between archaeological interpretations of finds and osteological results has long been a problem in archaeology. However, the burial of women with weapons is often ignored or explained away with male-dominated arguments that defy basic logic.
In such explanatory models, whose authors obviously try to find a justification that excludes the attribution of a position of authority to the female gender, the role of women remains limited to traditional roles.
Essentially, there is a lack of attempts to redefine the term 'power', on which the warrior figure seems to have been based on, to include concepts that are not exclusively focused on Western perspectives. Such an approach would allow for new thinking and ensure the applicability of concepts regardless of gender.
The aim of this contribution is twofold: firstly, to address the issues raised above, and secondly, to introduce new, reliable narratives into the discourse. It is not our intention to impose traditional male roles on women, but rather to rethink Bronze Age society with an open mind.
To advance our narratives on an interdisciplinary basis, we use a range of scientific analyses, including osteology, absolute dating, Sr isotopes and detailed grave analyses.

S04-027

Anthropological and Archaeological Theories of Value from a Philosophical Point of View

Vesa Arponen

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The question of value remains elusive in anthropoligical and archaeological theory. What is valuable? How are values reflected in, or responsible for, what people do and the material traces they leave? The question about such "driving" values of human kind is of contemporary significance because discoveries about past value orientations can and often do inform present actions and attitudes.

This talk philosophically explores the different available value orientations in the past-present perspective. The basic categories were laid down by Malinowski and others contrasting between *economic* and *cultural* concepts of value.
The question is how much these categories still continue to animate our interpretative imaginations, or is there a third way? Early (naive) Marxism put forward a *historical materialist* concept of value, which in archaeology was expanded among others by the concept of *prestige* and *ritual economy* as developed in the 70s by Kristiansen, but how different is the concept of material wealth from immaterial prestige? Sahlins suggested that pre-modern societies may have been

affluent in a way that modern societies could not because of the underlying value propositions, but can more be said about "original affluence" than that it was a kind of anti-economic asceticism? Graeber argued that value was expressed in culturally determined activities, but is there more to this than that value is inexplicable culturally relative? Kopytoff and Appadurai were interested in value as object histories distinguishing the commodified and general from the unique object, but is this also just another expression of the inexplicability of cultural relativism of value? In social theory, Bourdieu distinguished between cultural, symbolic, and economic capital, thereby perhaps giving names to different dimensions of value, but did he also resolve tensions between them? Widlok suggested that alongside the usual economic and cultural categories of value, there is also the category of the *intrinsically* valuable, but how to make sense of this radical third category?

In this talk, an explication of value types will be attempted from the perspective of the philosopher Amartya Sen's Capability Approach, in particular the distinction between *havings* and *doings and beings* based concepts of value as charting a conceptual path between material-economic and culturally relativist concepts of value.

S04-028

Archaeological *Zeitgeists*

Artur Ribeiro

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It is very easy to critique and claim that certain ideas are obsolete when they belong to the past and have already been replaced. Hierarchies, metanarratives, individualism, colonialism, and similar concepts, all belong to old modernity, a period that ended sometime during the second half of the twentieth century. All of these concepts have become obsolete because the world has changed since World War II: corporate structures have stopped being hierarchical, individualism has been suppressed by social media, colonizer-colonized relations have been replaced by global economics, and metanarratives have been replaced by network metaphors.

This *Zeitgeist* of the new modernity is very different - it is one that perceives everything as fluid and flexible, breaking down all boundaries that separate things. In the world we live in there has been an intentional collapse of boundaries to facilitate the movement of capital, people, and things across the world, making the economy truly global. This has subconsciously affected archaeology, leading us to reject all borders, whether it is borders between cultures, between time-periods, and between past agents.

The aim of this talk is to explain that more than concepts becoming obsolete, what we truly have is a situation where we have transitioned from an old modern *Zeitgeist* to a new modern *Zeitgeist*; that we have simply replaced one reality for another, one that coheres with the times we live in.

S 05: Identities, Personhood and Social Relations in Transformation processes

S05-029

Transforming kinship

Chris Fowler

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This presentation will explore kinship in intersection with gender and personhood, focussing on the transformation of kinship in two ways. First, I will discuss ways that archaeologists are currently attempting to transform our understanding of kinship as a field of enquiry by developing new methods for assessing kinship in the distant past and by evaluating different anthropological approaches to kinship. Second, I will explore how Neolithic communities may have transformed kinship through the construction and use of chambered tombs. I will emphasise the potential of contextual analyses including the results of osteological analyses, isotopic analyses and high-coverage aDNA sampling alongside an appreciation of monumental architecture and depositional practice to detect not only patterns in past kinship practices but also transformations in those practices within short periods of time. Here, kinship will be set alongside gender, age categories and personhood. Finally, the presentation will highlight some significant challenges that have to be faced when we attempt to move from interpreting kinship, gender and age categories in such specific contexts to drawing wider inferences about social organization in Neolithic communities.

S05-030

Relational biographies and collective action among the living and dead

John Robb, Jess Thompson

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Archaeologists often think of biographies (including osteobiographies and molecular biographies) as a way of understanding individuals, but people are defined relationally, and biographies are intrinsic to how collectivities are constituted. This paper uses intertwined biographies of multiple individuals to explore how the relationalities constituting society in prehistoric Italy changed between 6000 BC and 1500 BC. This includes relations between living individuals, between the living and the dead, and between people mediating between life and death. The result reflects the changing constitution of political power over the longue duree of prehistory.

S05-031

Sharing food with ancestors – a new approach to pottery in megalithic burials of the Funnel Beaker west groups (3500 - 3000 BCE)

Sarah Bockmeyer

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The Funnel Beaker west groups are known for the plethora of pottery found inside the megalithic and at times in the contemporaneous earthen burials. In the two neighbouring megalithic burials of Kleinenkneten 1 and 2 near Oldenburg in Lower-Saxony, the pottery not only revealed a sequence of when and where interments happened, but depositions outside the kerbed monuments also showed how people still remembered the ones buried there when the chambered tombs themselves were out of use.

This leads to the implication that pottery in burials might not have been grave goods per se or food and drink provided for an afterlife but rather a way to (re-) negotiate kinship in the Funnel Beaker groups using the two megalithic burials described above.

As ethnographic studies have shown, death in non-western societies is not necessarily understood as an end to life but rather as a transformation of the deceased person into an ancestor or spiritual being that remained part of everyday life. Megalithic burials have often been interpreted as family burials and aDNA analysis often seem to confirm close genetic relations between the persons buried in specific chambers.
Kinship studies as a part of relational personhood can then be used to further our understanding of objects found in the burials, exemplified here for the use of pottery vessels and their contents.

S05-032

What fragments can tell… Fragmentation as a means of creating relations

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Grave goods play an important role in reconstructing mortuary rituals, concepts of the afterlife and social relations. Most often they are interpreted as the material expression of the social status or biographical aspects of the deceased, especially in terms of hierarchies, rulership, wealth and power. Rarely is there a focus on how the objects were handled. This is all the more remarkable as the manipulation of objects found in graves can be regularly detected.
One of these forms of manipulation is fragmentation, understood as the deliberate dissolution of completeness. Fragmentation in this sense means ›making fragments‹. The concept of fragmentation from an explicitly archaeological perspective goes back to John Chapman (2000; Chapman and Gaydarska 2007; most recently Sörman and others 2024; cf. Brittain and Harris 2010). It is argued that objects (and also human remains) are intentionally ›destroyed‹ (or more neutral, dismembered or broken) and the individual parts are spatially separated, so that selected fragments then can be used in social exchange to connect objects with people and places.
Fragmentation as a social practice is difficult to prove in archaeological findings, strictly speaking only if one knows where the other fragments are. In my contribution I would like to present some of the few rare examples for fragment fittings especially in burial contexts and discuss fragmentation as a means of creating (relational) identities.

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S05-033

Mound genealogies, ancestral identities and social organization in the Nordic Middle Bronze Age

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In recent years, aspects of genealogy and kinship organization have been revealed by novel DNA and isotope analyses. However, only a small proportion of the archaeological burial record is subject to bioarcheological analyses. How, then, do we integrate aspects of genealogy and kinship into the interpretation of this majority of burials? This paper presents theoretical reflections of how genealogy, kinship and ancestry provide influence on the formation of social identities. These “archaeological” identities are inferred by us based on the information available for interpretation from the record. Implementation of genealogical aspects advances our understanding by adding an extra layer of information. The vast burial record of the Nordic Middle Bronze Age from Denmark is the onset for this investigation. These burials are often richly furnished in metal gear and interred in monumental constructions of mounds. Individuals from these burials have been the center of attention over the long and strong research tradition into the Nordic Bronze Age. In combination, this era provides a well-representative platform for inquiring into these aspects of genealogy. The presentation is based on results from my Ph.D. thesis which aims to integrate the theory of genealogy and kinship into reflections of social organization in the Bronze Age Society of Southern Scandinavia.

S05-034

Between collective identities and elite positions

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Materialisations of the elite often recur in studies of social organization and political structure. The distribution of various indicators of elite positions and central functions certainly identify areas where elite networks are spatially rooted. While such investigations provide opportunities for identifying connections within wider landscapes, they provide one-dimensional understandings of the political dimensions of prehistoric societies, delimited by conventional notions which social identities were of political significance and how power was constituted in the past (Lund et al. 2022).
In this paper I will shift scale from a wider political landscape and delve into detailed trajectories of selected cemeteries from different regions in present Norway that were used and reused for centuries within the first Millennium CE. Comprising numerous burials, these sites are not connected with individual farms or settlements but seem to have become central in materializing social relations within local communities. At these cemeteries, social connections and relations are visible on different spatial and temporal scales: within the cemetery as a whole or within individual monuments, as more

or less temporary funerary events and as parts of enduring traditions of material practices.
The interplay between mortuary practices and self-definition afflicts both living and dead, and in accordance with posthumanist notions of emerging ontologies (Crellin and Harris 2021), identites unfold in close interaction with their material and social surroundings. In this sense, the selected burials and cemeteries enable investigations of intersecting strands of identity as they simultaneously stress collective identites within the cemeteries and personal social identities, generally associated with the elite. Particularly, this opens for discussions of developments in the dynamic between individual and the social collectives they were part of, and in the intersections of communal and hierarchical structures within past societies.

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S05-035

Alternative Concepts of Power, Personhood and Identity and their Impact on Archaeological Narratives

Martin Furholt

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At the core of the dominant view of prehistoric society in Europe and beyond are very often specific, modern Western concepts of power, agency and social identity, which overemphasize the role of individuality, competition and coercion. In addition they largely essentialize modern Western forms of rationality and cosmology in the reconstruction of past personhood and social relations and perpetuate the skewed gender images which have come to characterize our own cosmological legacy. The result are archaeological narratives that present a rather stereotypical and biased account of the past, which however often struggles take into account the current state of knowledge of the archaeological record. The aim of this contribution is to conceptually discuss the problems with our current concepts and explore alternative approaches to those concepts in the light of new archaeological evidence. Especially in the case of the European Neolithic and Bronze Age transition in the 3rd millennium BCE, I will argue, there is urgent need for alternative models and narratives. This contribution will attempt to sketch out some of those.

S05-036

Personhood, Power, and Social Complexity, or how different types of being(s) and power(s) constituted Bronze Age societies

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This presentation seeks to examine the relationship between prehistoric notions of personhood, the types of power that would have coexisted with them, and the overall dynamics of social complexity in these societies.
Using the Argaric Bronze Age society in the Southeast of Spain as a case study (2200-1550BC), it will analyse how different funerary practices and grave goods played a role constituting persons, materialising types of power and, overall, contributing to wider social dynamics. Furthermore, it will argue that the dichotomy between persons and things ought to be monitored, as it disrupts prehistoric ontologies, in which a multitude of non-human entities would have been conceptualised as beings with power.
The analysis will focus on three particular notions of personhood, namely individuality, relationality, and non-human personhood, to then explore their relationship with power in an anarchist sense. Finally, the effect of these relationships between personhood and power will be examined in relation to the tensions between fragmentation and resistance that characterised societies against the state, sensu Clastres.

S05-037

Translocal communities in Bronze Age Siberia: A new look at Seima-Turbino, the “Flowerpot Complex” and the expansion of Uralic languages

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The transcultural phenomenon of Sejma-Turbino (ST) is a complex of bronze prestige objects that spread from the Altai region to the Baltic Sea around 2000 BC. For a long time, archaeologists explained the processes behind this extensive transregional phenomenon through elite groups of warrior-craftsmen migrating from the east. Alternative hypotheses regard processes of cultural transmission between neighbouring communities as more likely reasons for the expansion of the ST-type bronzes, which became the first tin bronzes to reach Europe. In the last years, an intensified scientific dialogue

between archaeology, molecular biology/aDNA and linguistics sheds new light on the complex social relations within and between Bronze Age communities at the forest-steppe interface in western Siberia, opening up new scenarios for the interpretation of the ST phenomenon and its role within the history of Bronze Age Eurasia.
A promising gateway to understanding the socio-cultural mechanisms behind ST and other related patterns in material culture is Martin Furholt's model of translocal communities (1) as it provides an alternative to simplified notions of "archaeological cultures" and migration as universal explanation for population dynamics. Based on this model, this study reviews archaeological evidence from the core area in western Siberia where early ST bronzes and their moulds are found in order to re-assess groupings in the material culture that might indicate communication networks and social relations. The findings are interpreted in connection with new insights from aDNA studies and linguistic evidence on Uralic and Indo-European Proto-languages.
Our results suggest that an intercultural communication space had formed on the southern edge of the taiga of western Siberia in the forest steppe and southern forest zone in the late 3rd mill. BC, involving both, individuals of local decent and people from much further away. This interaction sphere is archaeologically evident in ceramics of the newly defined "Flowerpot complex", and it is also where the production and trans-regional distribution of Sejma-Turbino bronzes had a starting point. This area might also have seen the emergence and first diversification of the Uralic language family, and an early Common Uralic could have served as a lingua franca in the communication network of the translocal communities of the „Flowerpot Complex".

S05-038

Life stock: animals making and changing societies of the European Bronze Age

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Animals were fundamental in Bronze Age societies. Beyond being multivalent sustenance, labour, and symbol, they were socially and physically meaningful members of their communities. Multispecies archaeologies work to decentre humans as the singular causal actors that shape social life. Alongside appreciating animals' greater capacity to act, some have argued that animals were, or could be, "animal persons". Whilst this may be the case in particular cultural and historical contexts, attributing personhood to animals can serve to diminish their autonomy as individuals and herds, and fade their contributions in interacting with people on their own terms. In this paper, we ride a different track to explore multiple scales of animal-human relationships at settlements across northwest Europe. We examine the deadstock (the animal depositions, faunal assemblages, architectures, and iconography) as evidence of the spatially embedded social relationships of animals and humans to envision the living stock (the animal presence we can estimate from the deadstock). We then discuss the difference animals made as life stock—how they structured daily life, labours, and seasonal rhythms—to ultimately interrogate their roles in constituting social relations and the transformations of the 2nd millennium BC.

S05-039

Searching for Social Relations in the Viking Age. (How) Can Studies of Social Identities, Personhood and Social Organisation be linked?

Julie Lund

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In the last decade, studies of social identities and of personhood have been a central focus in Viking Age archaeology. However, these studies have often been conducted without much attention to social organisation. This paper aims to explore the potential of linking grave finds and hoards not only to social identities and personhood, but also to various aspects of social dynamics. By analysing two seemingly standardised graves and two hoards from the Viking Age, this paper will examine the challenges and potential for integrating social organisation with studies of social identities and personhood. Further, it will explore how the choices and selection of source material can affect the interpretations of social dynamics in the past.

S05-040

Early Steppe Connotations of Eneolithic Societies in Central Europe

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The migration waves of steppe communities, as well as the ideological and technological innovations associated with them, have long been the subject of prehistoric studies. The so-called first wave (late 5th millennium BC) has so far been documented primarily in the northern Balkan zone and the Carpathian Basin. Its elements include specific items found in graves, including characteristic flint forms. A new look at the materials of the Lublin-Volhynia culture (western Ukraine – southeastern Poland) also allows us to demonstrate the significant culture-forming role of steppe communities in the creation of a new ideological system in the Middle Eneolithic north of the Carpathians. An indication is the emergence of a specific flint production centre based mainly on Volhynian flint deposits. The blade techniques and the types of retouching show similarities to the Skelya culture's industry (steppe Eneolithic). The production of flint daggers plays a special role, gaining an important ideological position in the funeral rituals. Transfers of new technology and ideology created conditions for the emergence of a new community focused on connections with Eastern European territories. The innovations indicated here were based on various types of relations. Incidental contacts between communities of similar religious and socio-political value were sufficient to transfer the dagger idea. The acquisition of new technology (flint techniques) associated with transferring knowledge required long-term contact between communities. In this case, the decisive role was played by the proximity of the Lublin-Volhynia and Trypillia communities.

S05-041

Uncovering Deviant Mortuary Practices in Balkan Chalcolithic: A Multidisciplinary Analysis of a case from Gumelnița cemetery (Romania)

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Recent excavations at the Gumelnița cemetery (Romania) have revealed two distinct burial features that offer valuable insights into Chalcolithic mortuary customs in Southeastern Europe. These atypical pits contained a diverse array of archaeological materials, including both articulated and disarticulated human remains, animal bones from diverse species, charred seeds, pottery fragments, and stone artifacts, all indicative of burial practices that diverge from typical customs of the period.

This paper aims to provide an in-depth analysis of the structural and material composition of each feature across various stratigraphic layers. Pottery typology and radiocarbon dating will establish the features' relative and absolute chronology. Further interpretation of the dietary practices, mobility, and implications of funerary rites will integrate findings from multi-isotopic investigations ($d^{13}C$, d15N, $d^{18}O$, $^{87}Sr/^{86}Sr$, ^{14}C) alongside archaeological, zooarchaeological, anthropological, archaeobotanical, and proteomic analysis.

Our study's key conclusion is significant, suggesting that these deviant burials likely represent a distinct social or ritual practice within the Chalcolithic community. This may indicate a differential treatment of specific individuals within the society. This interpretation not only enhances our understanding of funerary diversity during the targeted period but also highlights the particular lifestyle (diet, mobility, health status) of these individuals who settled at the Gumelnița site around 6500 years ago. Overall, this indicates a complex agrarian society and intricate beliefs among those people who, in some cases, were born far from the Gumelnița site where they were buried.

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S05-042

New Concepts, Ancient Cases; A Model for Identities of Iranian Central Plateau in the Late Fourth Millennium B.C.

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The Late Chalcolithic of the Near East is often studied concerning the emergence of states and the rise and collapse of intra-region relations. The presence of what appear to be intrusive populations in ancient Near Eastern societies often prompts us to speak in terms of Colonies and Diasporas. But our most nuanced models rely on group focus without much ability to see down to the level of the choices and experiences of specific people. Change in the region has been explained through mechanisms that have been *known in* other areas of archaeological inquiry. For example, evolution, diffusion, and migration were seen as the main drivers in the late 19th and early 20th centuries; whereas the 1970s and 80s saw greater emphasis on internal dynamics that could be explained through social scientific analysis. Regarding the time and place,

this region and period are simultaneously rich in evidence and problematic for interpretation regarding the movement of people. This paper will explore how different scholarly and social trends of the past years have helped to interpret the Livings of foreigners in the Late Fourth Millennium B.C. of the Iranian Central Plateau and situate them in the context of new political Concepts, Migration, and Mobility.

S05-043

Scythian individuals with physical disabilities

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With their specific way of life and economy, Scythian cultural groups were the rulers of the Eurasian steppe belt in the 1st millennium B.C. The graves of these groups are an important source for archaeological research, as they provide insight into the burial rituals of these societies.

Within the archaeological material from graves, cases of illness-related or physical limitations of individuals come to light, which will be presented. One example is known from Ak-Alakha (Ukok Plateau, Russia). The grave of a male individual (grave 1, Ak-Alakha 3, burial mound 1, Pazyryk culture) was discovered in 1993 and was not - as was typical - located in the vicinity of other burial mounds. In addition to the man, grave 1 also contained another individual (juvenile) and was located above grave 2, which contained the burial of a young woman who had died at an early age. The male individual has shown pathological symptoms indicating physical limitations (Chikisheva et al. 2015). During his lifetime, these must have been visible to the community and characterised the man's everyday life.

Another example is connected to the cemetery of Aymyrlyg in the Ulug-Khemski region (Autonomous Republic of Tuva, Russia). The site also dates to the Scythian period (3rd-2nd century B.C.) and was researched between 1968 and 1984. Selected individuals were identified to have physical features that neither led to exclusion from the community nor to killing. These members of society were treated similarly to those without physical limitations. They reached adulthood and show that the community supported them and they were able to survive.

S 06: The contact between Danes and Slavs in the 7 th –12 th centuries AD

S06-044

Danish-Slavic Contacts in the Early Middle Ages – Archaeological and Historical Aspects

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In the early Middle Ages, the Baltic Sea was not so much a dividing as a connecting element, and so it is not surprising that we can recognize early contacts between the northwest Slavic region and Scandinavia, especially Denmark. As early as the Vendel period or the early Slavic era, there is evidence of Slavic-Scandinavian contacts, the centers of which were the maritime trading centers (emporia) that had been established since the 8th century. Even after their decline in the 10th century, the contacts continued, which were particularly evident in trade - in the north, for example, Slavic ceramics were very popular, in the south Scandinavian elite culture and weapons. From the late 10th to early 12th centuries in particular, the last pagan northwest Slavic groups, who had regained their independence and their old faith in the great Lutician revolt of 983, increasingly oriented themselves towards their counterparts in the north. In addition to the migration of Slavs to Denmark and of Danes to Slavic lands, intensive cultural contacts and trade links, there are also visible warlike contacts, such as mutual raids and piracy; in the second half of the 12th century, Denmark was even able to temporarily establish its rule over the areas in the south of the Baltic Sea. Written and archaeological sources provide information about this era. Archaeological materials in particular are becoming more and more numerous thanks to new excavations and metal detector prospections. This allows us to draw an increasingly complex picture of these culturally and historically important processes.

S06-045

Arkona. The stronghold in the middle of the western Baltic Sea

Fred Ruchhöft

Natur-Museum Goldberg, Stadt Goldberg, Goldberg, Germany

The well-known Arkona stronghold on Rügen with its famous sanctuary is located on a chalk cliff high above the Baltic Sea - 65 km from the Danish island of Moen and 90 km from the Swedish south coast. We look back on 500 years of use in the Middle Ages and 500 years of research history with all its ups and downs. Although central parts of the stronghold were lost due to the coastal collapse, excavations in recent years have yielded numerous findings and finds that testify to numerous interactions between Slavs and Scandinavians. The special nature of the place is reflected in all facets of archeology. There is an exceptionally large influence from the north. Outstanding finds underline the importance of the place within the Slavonic settlement area.
Only one question remains: How do you identify a Slavonic sanctuary using archeology?
In this lecture we will not only give an overview of the Middle Ages, but also how a living myth was formed from the historical place, right up to the merchandising of the present time.

S06-046

Changing connectivity: ships and fortifications

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The relationship between Danes and Slavs is particularly interesting because the expansion of the Western Slavs, whatever its nature, reduced the distance between the two groups until the 8th century. There is thus a natural gradual intensification of interaction, which brings with it an increase in the potential for conflict and opportunities for co-operation.
This paper examines the role of ships and fortifications in shaping the relationships of Danes and Slavs. We explore how the development of Slavic shipbuilding was influenced by regional dynamics and how ships served as essential tools for communication and trade. Additionally, we analyze fortifications as both defensive structures and mechanisms for regulating interactions. A particular focus is on the Reesholm section of the Danewerk, a fortified complex constructed in the 8th century.
By investigating these maritime and defensive aspects, we aim to shed light on the complex and multifaceted nature of Danish-Slavic relations during this pivotal period.

S06-047

Danes and Slavs in Lübeck

Dirk Rieger

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Since the early 9th CE the fortified stronghold of a place later called Old Lübeck became more and more prominent within the course of the following centuries. Starting as a potential outpost of a down-the-line system connecting the Baltic hinterland trading routes towards Saxony Old Lübeck developed a Royal residence with strong maritime trading ambitions towards Scandinavia. Henry the Christian King of the West-Slavs and son to his Royal Danish Mother Sigrid (daughter of King Sven Estridsson) patronized and expanded Old Lübeck to become a well-known emporium alongside the Baltic Sea. Contemporaneously another settlement emerged at the banks of the river Trave. This area later became the Lübeck we know today. It had its beginnings around 1100 AD and can be seen as a meeting point for Saxons, Scandinavians and Slavs. Maybe it was here, the Danish King Canute Lavard dedicated a church to Lübeck, which was potentially the nearby standing church of St Clemens - benefitting all their Christian ambitions. It was yet this area that later attracted Danish king Waldemar II. to make Lübeck his boomtown and biggest city of his realm.

S06-048

The slavonic rampart Starigard/Oldenburg as a maritime place between the scandinavien emporia Rerik and Hedeby

Ralf Bleile

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Adam von Bremen described the central Slavic town of Starigard (located in Oldenburg i.H.) as a civitas maritima. There or in Schleswig (Haithabu) one had to board a ship if one wanted to reach Wollin (mouth of the Oder) by sea. Can this Slavic castle therefore be placed alongside the Danish/Scandinavian maritime trading centers of Rerik and Haithabu, in contrast to their usual structure, and is there evidence of the character of a trading center at or in Starigard? Epigenetic analyses of the skeletal material from the princely burial ground of Starigard/Oldenburg, together with the chariot burials observed there, reinforce the impression of Scandinavian contacts. Against this background, can the archaeologically documented princely court at Starigard be understood against the background of an adaptation of Carolingian palatinate plant?

S06-049

Tracing Ancestry Across the Baltic: Investigating Scandinavian Influence in the Elite Burials of Starigard Oldenburg

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The ancient DNA analysis of elite burials from Starigard Oldenburg, a key site in early medieval Slavic society, reveals significant insights into the genetic composition and social dynamics of the Baltic region. Using ancient DNA (aDNA) approaches, this research identifies genetic connections between the individuals buried at Starigard Oldenburg and Viking Age populations in Scandinavia, specifically in Denmark and Sweden. This genetic evidence, combined with the archaeological context, highlights Starigard Oldenburg as a hub of cultural and biological exchange, with Scandinavian influences likely integrated through migration, intermarriage, and possibly political alliances.

Analysis of genetic patterns positions the individuals from Starigard Oldenburg in close relation to populations from Denmark and early medieval Germany, emphasizing connections to regions north of the Baltic Sea. Further examination reveals shared genetic elements with Scandinavian Viking groups, alongside a distinct Slavic heritage, highlighting a complex ancestral background.

This presentation will explore the multifaceted nature of the genetic landscape in the Baltic region, using Starigard Oldenburg as a case study to examine the mechanisms of identity formation through biological and cultural exchange. We will address how Scandinavian genetic and cultural markers might have been selectively adopted by local elites, reflecting a strategic amalgamation of foreign and local influences that supported social and political prestige.

Our findings contribute to a broader understanding of the role of migration, trade, and kinship in early medieval societies across the Baltic. This interdisciplinary research integrates genetic, archaeological, and historical data to offer a nuanced perspective on cross-cultural connectivity and its role in the transformation of early Slavic societies under Scandinavian influence.

S 07: Individual agents in artifacts, assemblages, and landscapes

S07-050

Seeing is not Understanding: Micro, Meso, and Macro-level Behavioral Signals in Taphonomic Contexts.

Charles Perreault

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Paleolithic archaeologist Geoff Bailey once observed that "archaeology . . . is reduced to an appendix, at best entertaining, at worst dispensable, of ecology, sociology, or whichever study of contemporary behavior happens to be in current fashion.". Although harsh, his comment is still accurate more than 35 years later. Archaeologists aspire to make valuable contributions to evolutionary theory and our general understanding of human behavior. Archaeologists: for various historical reasons, archaeologists have come to view themselves as prehistoric ethnographers whose goal is to interpret the macroscale archaeological record in terms of microscale processes borrowed from other disciplines. In doing so, they have produced a flow of information about the past that is impressive in quantity but, for the most part, unverifiable. If archaeologists are to contribute to our understanding of human behavior and culture in a meaningful way. In that case, they need to do like paleontologists and recalibrate their research program to the quality of the archaeological record. This recalibrated agenda entails a different set of research questions than the ones archaeologists are trained to ask. Here, I outline the kinds of research questions and the research strategies the macroarchaeology program entails.

S07-051

Sharing places or trading spaces? Stone artifacts, niche partitioning, and nonhuman primate models

William Daniel Snyder

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Today, the hominin lineage is represented by one species, modern humans, the last of a once diverse cohort. Since the divergence from the chimpanzee lineage, usually multiple hominin species have existed at any one time. Whereas it was once thought that the first toolmakers were from the genus *Homo*, growing evidence suggests that other taxa may have also knapped the earliest stone artifacts (e.g. Plummer et al. 2023).

Due to the nature of the archaeological record and our current state of knowledge, it is difficult to say which individuals were responsible for any one artifact or assemblage. Not only this, but we also lack an understanding of the potential cognitive and cultural differences between toolmaking species and how these interspecific differences might have played out in stone. These differences may indeed be an important factor for how we interpret the meaning of artifact variability in prehistory (e.g. Snyder et al., 2022).

Though there will always be limitations to what we can learn about interspecific differences between early toolmaking hominins – as we cannot observe them and compare them directly – there may yet be theoretical and empirical approaches that can tease out at least some relevant data. For one, we may be the last hominins alive today, but we are, in fact, not the only species capable of flaking stone (e.g. Proffitt et al. 2023).

In this talk, I will present some thoughts on how ecological theory might inform our strategies for identifying species-level behavioral differences. I will also introduce preliminary findings from ongoing research on stone tool behaviors of different nonhuman primate species. Finally, I will shortly outline a future program of research that might enable us to garner new insights into how species-specific biology and cognition of toolmaking agents influenced the outcomes that they left behind. Ultimately, this talk is a call-to-action for archaeologists to look more closely at how different variables related to the toolmaking agents are related to artifact and assemblage traits.

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S07-052

A bifacial paradise.The site of Ochtmissen (Lower Saxony) and its lithic assemblage in the context of the last glacial (MIS 4) in the north Central European region

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The site of Ochtmissen (Lower Saxony) gained relevance right after its discovery due to the composition of its lithic assemblage: a number of bifaces in relation to the overall lithic complex that was judged exceptionally high by its discoverers.
Based on the lithic typo-technology, the site was initially assigned to the Saalian (Thieme 1994, 2003). Since then, its chronological position has come under debate and doubts regarding the proposed chronological attribution have progressively grown within the scientific community. The risks of the use of lithic typo-technology for dating purposes are, in fact, well-known in the literature (e.g., Di Maida 2022, Di Maida et al. 2018) and this site constitutes no exception. Ochtmissen, if correctly dated, could constitute an important addition to the discussions relative to the presence and population dynamics of Neanderthals in the northern central European area, both in a synchronic and diachronic perspective. Additionally, it could also offer new elements to the discussions over the relevance of bifaces as cultural markers during the Middle Palaeolithic, including their role in the definition of the so-called Keilmessergruppe.

Based on the material from the excavation campaign held in the archive of the State Office, a detailed analysis of the following aspects has been performed: the technological and typological aspects of the lithic assemblage; its spatial distribution; the reconstruction of the camp site working areas.
A series of unpublished numerical dates of Ochtmissen's sediments, and an overview of their geological setting, will complete the contextualisation of the site.

Following the presentation of these analyses, we will attempt to link the resulting data to the individuals' and group's agency on single artefact and the artefacts' collection (micro- and meso-levels), as well as to their habitus at the site in relation to coeval groups in the study region and neighbouring areas (macro-level).

S07-053

Set in stone: Lithic technology and production sequences – a traceable marker for individuals in late middle palaeolithic societies?

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The greater the chronological depth of archaeological material, the less clear the traces that reflect individuals and personalities become. This study examines the extent to which lithic artefacts, and, above all, their underlying production sequence and technology can be used as indicators of single individuals or, at least for certain groups or timeframes.
As part of the project "Handaxes - tools for reconstructing Middle Palaeolithic behaviour and social structures?" (DFG project 513984209), the Charbonnières site (France) and the handaxes found there are being analysed primarily regarding technological concepts and the resulting indicators of the social structure of later Neanderthals. Charbonnières has been known since the middle of the 19th century for the large number of MTA-type handaxes that were found on the fields there. The excavations by Floss and Boysen led to the identification of an intact stratigraphy, that was dated by OSL to 63.1(31) kya (Boysen et al., 2022). In 4 excavation seasons (2021-2024), more than 12.000 single artefacts were documented on a surface of 8m², representing every step of blank and tool production. In addition to the high proportion of blanks (flakes, blades), opportunistic cores and bifaces are found in the archaeological layers, as well their corresponding debitage. Further, the large amount of microdebitage and several refits allow insights into a Palaeolithic workshop. With the help of the recovered material, especially the handaxes, it was possible to establish a connection between the objects found on the surfaces and the artefacts excavated *in situ*. Using various methods of analysis, the production concept of the handaxes is examined to determine the extent to which this reflects a planned, 'economic' surplus production for the export of the tools. Work-step analysis plays an important role here, according to which the sequence of the individual removals on the respective pieces is reconstructed. Therefore, overlaps and differences between the handaxes and their technological concept can be identified and compared. Ultimately, this allows conclusions regarding specific 'workers' or standardisation within a group.

Boysen, D., Lamercerie, G., Arnaud, J.-J., & Floss, H. (2022). Charbonnières - a center of biface production in southern Burgundy. In H. Floss (Ed.), *Hommes, terroir et territoires - Le Paléolithique en Bourgogne méridionale* (pp. 329-341). VML.

S07-054

Through a Handaxe, Darkly: Searching for Individuals in the Dickett's Field Assemblage

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Lithic artefacts as a whole suffer from what appears to be a paradox. While every manufactured scar on the surface of an artefact demonstrates evidence of a singular action of a hominin individual, the individuality of knappers beyond this basic assertion is more difficult to evaluate. Dickett's Field (Holybourne Down, near Alton, Hampshire, United Kingdom) was first identified during field-walking in the 1920s by George Willis and associates. The site is on an exposed plateau of clay-with-flints deposits, capping the chalk downlands of the area. Over a century of study that has included extensive field-walking surveys and more recent excavations in the 1990s-2000s, a substantial assemblage has been recovered. This assemblage is almost entirely field-walked from the surface, with only a small fraction of the material excavated. No absolute dates have been possible so far, and for a long time the assemblage had been thought to comprise a time-averaged mix of Lower and Middle Palalaeolithic artefacts. However, a long-running reassessment of the Dickett's Field material has now concluded that it is typologically coherent as a Mousterian assemblage, with limited to no multi-period mixing (Cuthbertson, in review). In particular, the handaxes all fit within typological, technological, and morphological variation for the Mousterian Tradition of Acheulean (MTA) as known from France in MIS3. The current presentation will focus on new research analysing the Dickett's Field handaxes using Work Step Analysis (WSA), which allows the reconstruction of the sequence of reduction for each artefact on its own terms. We will consider to what extent the reduction sequences can be compared, and determine whether the results can shed any light on the presence of recognisable individuals within the Dickett's Field assemblage.

S07-055

Social Stones: uncovering information exchange in the Middle Palaeolithic through computational archaeology.

Alexandra Barroso

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The story of Homo neanderthalensis took place at a distant point in time, and has left little durable evidence, besides lithics, through which we can understand it. This human species has often been portrayed as isolated, seclusive and unsocial, but what if this interpretation of aloofness is not entirely correct?

Over the years, research on Neanderthal cultural behaviours has steadily accumulated data confirming their creation and use of symbolic material culture, with some scholars even suggesting that lithic tool morphologies may be regionally distinct and culturally significant. My own research exploring the phenomenon of lithic regionalism in North-Western Europe has produced encouraging results which corroborate this claim and suggest that morphological patterns appear to be present at varying scales of observation. This may reflect some form of stratified mechanism in place for object meaning, expressed through prescribed sets of characteristics. This phenomenon is known from ethnographic contexts (e.g. Wiessner 1983) and may represent responses to selective pressures, resource management and scarcity.

My current work now seeks to expand upon this. Using a larger, improved dataset and enhanced Geometric Morphometric analyses, it investigates the role of regionalised handaxe morphologies in the communication of socio-cultural information across the sparsely-populated Late Middle Palaeolithic landscape. These symbolic objects could have acted as agents in the dissemination of information about Neanderthal groups, which may have facilitated the monitoring/maintenance of population dynamics, movements, or survival strategies.

This talk will introduce these ideas and my supporting data, and it will discuss the theory behind these interpretations.

S07-056

The Hamburger behind the projectile point. Tracing the signatures of individual flintknappers in the Late Upper Palaeolithic Hamburgian

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The behaviour and role of individual actors in shaping the archaeological record have before been stressed in the archaeological literature, especially so during the 1980's and 90's when the concept of agency was introduced and discussed. Yet, this new analytical framework never achieved any lasting effect on archaeological research practice. Today, the ambition to discover the "Indian behind the artefact" appears to have diminished in favour of new grand narratives. With this waning interest, studies that focus on the prehistoric individual are few and far between. Especially in Palaeolithic archaeology, the focus often rests with long-term processes and the role of the individuals who actively manipulated and shaped the archaeological record is rarely accounted for. Focusing on the Upper Palaeolithic in Europe, specifically the Hamburgian phenomenon, this study seeks to identify individual agents on three different scales of resolution. At a micro-scale, by recognising craft signatures in lithic projectile points. At a meso-scale, by tracking these individuals across different sites. And at a macro-scale, by arguing that a regional dispersal process was driven by the decision making of these individual agents. By employing a mixed-method approach, combining quantitative geometric morphometrics with qualitative technological analyses the study suggests that aspects of the Hamburgian archaeological record indicate a learning environment restricted to a small group of people. This shift in perspective significantly

alters how we understand this cultural phenomenon. If the distinctive projectile points reflect the stylistic preferences of individual flintknappers, it challenges the idea of viewing the Hamburgian as a long-term culture divided into successive epochal phases. Although conclusively identifying individual flintknappers from the distant past is difficult, considering the Hamburgian projectile points as the products of only few individuals has important implications for our understanding of this cultural phenomenon, its chronology and dispersal dynamics.

S07-057

Analysing Upper Palaeolithic palm prints – a dactyloscopic approach

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In Upper Palaeolithic cave and rock art, depictions of hands (positives, negatives, palm prints) are a very widespread phenomenon. In our opinion, these traces are amongst the most personal things an individual can leave intentionally. One of us proposed at a certain point that understanding palaeolithic hand depictions might be essential for understanding palaeolithic art in general (Floss & Ostheider 2013). Yet, their potential meaning is under debate, as is the authorship of these traces.

When manufacturing hand or palm prints, it is possible that impressions of the friction ridges of the skin are preserved. These structures, found on the inner surfaces of the hands and on the foot soles, form in the fetus around the fourth month. They are well suited as a means of identification of individuals because of their uniqueness and inalterability during lifetime. This means that no two people in the world, not even identical twins, do exhibit the same friction ridge patterns, and that they basically do not change from birth to death. A so-called dactyloscopic analysis of such structures, most of the time friction ridge impressions from crime scenes, is conducted by experts working for law enforcement authorities.

It is already extremely difficult to identify a certain group of people in the prehistoric archaeological record, not to mention single individuals. But when it comes to studying palaeolithic art, common research questions to get further knowledge about ancient societies and their possible structuring are: Who made this? Was it a single person? Was it a group event?

We are addressing these questions, conducting a dactyloscopic comparative analysis of around 50 Upper Palaeolithic palm prints from the Grotte aux Points, a site situated in the Ardèche valley in southeastern France close to the Grotte Chauvet. These prints are extremely well preserved and exhibit friction ridge impressions on surfaces of up to 14,5 cm^2, a very rare circumstance from a prehistoric context (Achtelik et al. 2019).

Achtelik, M., Floss, H., Nagel, M. & Monney, J., 2019. Analyse chiroscopique des points-paumes de la grotte aux Points (Aiguèze, Gard). Karstologia 73, 32–40.

Floss, H. & Ostheider, M., 2013. Die Farbe Rot in der paläolithischen Kunst. In: Meller, H., Wunderlich, C.-H. & Knolle, F. (Hrsg.), Rot – Die Archäologie bekennt Farbe: 5. Mitteldeutscher Archäologentag vom 04. bis 06. Oktober 2012 in Halle (Saale). Tagungen des Landesmuseums für Vorgeschichte Halle 10, 89–98.

S 08: AI in Archaeology

S08-058

The risks and potentials of AI for archaeology

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Artificial Intelligence has risen as a powerful tool in various domains, including increasingly in highly scientific areas. AI has also already been used to identify potential archaeological sites, compare and cluster finds, monitor deterioration and much more. At its heart, AI is however essentially a highly adaptive statistical tool. As such it stands and falls with the availability of 'informative' data, i.e. data that carries enough commonalities and dissimilarities to be statistically meaningful. This means not only that there needs to be a sufficient amount of data, but also that this data has unequivocal, quantifiable characteristics that follows deterministic trends. Non-determinism, variability, experimentation and - in short - creativity are however intrinsic to human nature. This is not new for archaeologists, but AI tools give the impression that they can overcome these concerns and are able to predict and classify human behvaiour. In this presentation we delve deeper into the capabilities and limitations of AI - why it seems to be able to predict human behaviour and in which cases this actually fails.

S08-059

An Overview of Machine Learning Applications in Archaeological Research

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Machine learning applications in archaeology have a long history, arguably dating back to the 1970s (Kowalski, Schatzki and Stross 1972), but in recent years, new advances in such methods (especially in neural network-based architectures) could have an important impact in the field. There exist already some reviews on applications of machine learning in archaeology, but these are generally limited in scope to specific subfields or case studies (e.g. Argyrou and Agapiou 2022). A small number of reviews are more comprehensive of the entire field (e.g. Cacciari and Pocobelli 2022; Calder et al. 2022), but only provide their findings in prose, and without applying any quantitative analysis.

We thus present here a summary of the results of a systematic literature review on machine learning applications in archaeology across 134 journal articles published up to the end of 2022 found through two independent search methods. We divided the articles based on three main features: the applicable subfields of archaeology, the broad architecture families of the methods used, and the type of task the articles aimed to solve. We additionally qualitatively evaluate the quality of the methodology applied, tabulated along with the reported results of the application (e.g. success, failure), and the type and number of input data. A quantitative analysis of the articles suggests an explosion of applications since 2018 throughout the field, with a majority of these using artificial neural networks or ensemble learning methods (e.g. random forest).

We conclude by providing a short discussion on best practices for the application of machine learning based on the type of task, as well as the available data, and the scope of the archaeological question to address.

References:

Argyrou, A and Agapiou, A. 2022 A Review of Artificial Intelligence and Remote Sensing for Archaeological Research. *Remote Sensing* 14(23).
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Calder, J, Coil, R, Melton, JA, Olver, PJ, Tostevin, G and Yezzi-Woodley, K. 2022 Use and Misuse of Machine Learning in Anthropology. *IEEE BITS the Information Theory Magazine* 1–13.
Kowalski, BR, Schatzki, TF and Stross, FH. 1972 Classification of archaeological artifacts by applying pattern recognition to trace element data. *Analytical Chemistry* 44(13): 2176–2180.

S08-060

Unearthing Social Echelons of the past through AI-assisted data collection

Mikkel Nørtoft

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Manually collecting detailed data from printed catalogues and reorganising it into a streamlined data structure is painstaking work prone to human error, limiting sample size of studies using all the detailed data available and, consequently, limiting answers to larger questions about social structure in the past. Therefore, building large, detailed datasets by automating parts of the data collection has become increasingly attractive in archaeology.
In this talk, I focus on the Gen-AI-assisted (i.e. LLMs) data collection process from archaeological grave catalogues in my new postdoc project, "Unearthing Social Echelons", in which I analyse these data to explore burial wealth display, resource networks, and inequality. I will discuss preliminary results of my experiments with automated data collection, including the hurdles, pitfalls, and successes I have encountered with the aim of inspiring others and fostering discussion on best practices.
Most of the data comes from scanned grave catalogues, for which I use ABBYY Fine Reader's OCR and table extraction functions. However, such tables are usually not exhaustive if available at all, so the most detailed raw data is often given in text format. To extract all the detailed data from the (still relatively structured) text and convert it into table data for analysis, I use LLMs to iteratively write code that parses the text into JSON entries which can then be converted into a spreadsheet format.
However, catalogue structures often differ, so a universal workflow for all catalogues is not available. Nevertheless, a general approach seems fruitful by first extracting the text in JSON format split into its highest-level entries (e.g. sites) and then compartmentalising these JSON entries hierachically into increasing levels of detail. From this structure, specific types and levels of information can be reliably extracted and converted into table data with IDs for later data joining and analysis.
All of this data is published with my studies so others can use them freely, aiming to collaboratively build a vast, standardised body of detailed and standardised burial data from many different sources.
LLMs can also help in developing online apps for easy archaeological data analysis and visualisation. I will present one such app for, focused on wealth and inequality, which I will also briefly present. This also encourages data accumulation and sharing for an ever-growing spatiotemporal landscape of wealth and inequality.

S08-061

Autarch - An automated workflow for the extraction and analysis of archaeological illustrations

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The transition from Neolithic to Bronze Age societies in Europe is characterized by an enormous amount of archaeological material, including tens (potentially hundreds) of thousands of graves. The primary challenge in analyzing and classifying these assemblages using statistical methods lies in the lack of easily accessible, machine-readable input data. There are two potential data sources in publications: written descriptions and illustrations. Working with content from numerous publications is difficult, due to differences in the meanings of written descriptions and the absence of standardized recording systems. Manually processing large amounts of drawings to extract information such as size or orientation of graves is a time-consuming, repetitive and error-prone task.
To facilitate the processing of large amounts of data, we developed a two step workflow, which is implemented in a software called AutArch (Klein et al. 2023): The first step is completely automated and utilizes AI such as neural networks for object detection and classification, image processing algorithms and OCR (Optical Character Recognition). The second step consists of an interactive user interface allowing for manual adjustments, but also offers a toolset for data analysis.
This toolset can analyze various elements contained within graves, such as ceramic, lithics, and metal objects. By using shape, size, material indicators, and typological patterns, AutArch can generate a structured classification not only of grave orientations, shape, body position, but also of grave inventories, helping archaeologists to uncover cultural patterns and potential markers of identity.
Klein, K. et al. (2023), 'An AI-assisted workflow for object detection and automated recording in archaeological catalogues'. ArXiv: 2311.17978

S08-062

HoloBond Scholar: A Comprehensive AI Tool for Dynamic Literature Analysis and Hypothesis Generation in Holocene Research

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The HoloBond Scholar (HBS) project, developed through a partnership between the University of Bucharest and Microsoft (Romania), proposes a sophisticated AI-driven chatbot designed to analyze academic literature related to Holocene Bond events, enhancing scholarly understanding through multiple avenues. This innovative tool will integrate dynamic bibliographic resources, allowing real-time access to platforms like Google Scholar, ResearchGate, Publons, and premium academic databases (e.g., Science Direct, Springer, etc.). This feature ensures researchers stay up-to-date with the latest scientific findings and data, significantly broadening HBS's research capabilities.

Beyond traditional literature analysis, HBS leverages machine learning to generate hypotheses by identifying correlations between Bond events and environmental or anthropological factors, such as climate shifts and human migration patterns during the targeted period. For instance, it could reveal insights into how climate changes influenced migration trends by synthesizing climate and social patterns. Additionally, HBS intend to evaluate research methodologies within the existing literature, offering critiques and suggesting improvements, such as the adoption of advanced DNA analysis techniques or climate reconstruction models to bridge data from paleoecology and paleogenetics, thereby refining the study of climate'sclimate's impact on Holocene populations.

The interactive interface of HBS enables users to simulate scenarios by adjusting factors like climate fluctuations, population movement, and cultural practices, deepening the exploration of socio-cultural impacts from Bond events. It also provides topic-specific syntheses, detailing localized effects on regions while organizing findings by methodology, outcomes, and theory. AI is designed to recommend future research directions by identifying knowledge gaps, notably where regional climate impact data are lacking. Data visualization modules like climate graphs and migration maps facilitate clear data interpretation. Additionally, HBS aids grant proposal development by auto-generating literature reviews and hypothesis sections, streamlining funding efforts for Holocene climate research. With a networked approach, HBS fosters interdisciplinary collaboration across genetics, archaeology, and climatology, establishing itself as a central tool in Holocene studies and connecting users to a broader academic community.

S08-063

Heterogeneous Information Networks in early raw material exchange

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The Big Exchange Project (Kerig et al, 2023) aims to identify structural patterns inside the networks of raw materials with a distinct origin. With basic network analytical approaches we were able to uncover exchange dynamics in the Linear Pottery Culture and the transition between Late Neolithic and Early Bronze Age societies.

As our research contains heterogeneous data - such as finds, materials, spatial and temporal information - a suitable data structure is needed to accurately represent all information, mostly coming from the material-specific datasets and semantic enrichment through expert knowledge. We use heterogeneous information networks (HINs) (Sun et al., 2011), i.e., graph structures containing multiple types of objects and relationships. They allow to represent rich semantic contextual information, helping to overcome spatial and temporal boundaries set by the traditional concept of "archaeological cultures".

Network motif discovery in HINs (Rossi et al., 2020), particularly within the context of archaeological material networks, is becoming a relevant analytical approach for identifying recurring structural patterns that reveal insights into underlying relationships and data characteristics. Discovering network motifs enables the identification of (in)frequent, meaningful substructures. These substructures may be used to represent indications of cultural, social or economic connections and help archaeologists to omit hypotheses.

This study investigates techniques of network motif search or discovery adapted and applied to archaeological data of the Big Exchange Project, aiming to uncover previously undetected patterns in material exchange networks.

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Kerig, Tim, Johanna Hilpert, Steffen Strohm, Daniel Berger, Solène Denis, Estelle Gauthier, Juan F. Gibaja, et al. "Interlinking Research: The Big Exchange Project." Antiquity 97, no. 394 (2023): e22. https://doi.org/10.15184/aqy.2023.78.

S08-064

Inside the Box: Using Oriented Bounding Boxes in object detection for prehistoric Scandinavian rock art

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Prehistoric rock carvings are visually impressive representations of past ideas and experiences, which range from simple figure outlines to intricate scenes. From the 5th millennium BC to ca. 500 BC carving motifs in rock surfaces peaked in Europe, generating tens of thousands of individual images, with many rock art panels being carved and motifs superimposed over centuries. These long chronologies in conjunction with the local geology, depth of the carvings, intricacies of human creativity, and interpreter biases can make detection and identification of rock art difficult. To reduce the impact of local geology and carving depth on detectability, we developed a tool to generate enhanced 2D visualisations from 3D models, highlighting carved areas of a rock surface. Initial approaches using this 2D documentation demonstrated that deep learning has the potential to improve rock art recording workflows with expert review of the results [1]. Yet, these tests also highlighted the need to keep humans in the loop and the impact orientation can have on the results and useability of predictions. To address the impact of motif orientation and representation, we have generated a more balanced dataset of visualisations of approximately 400 3D meshes for fine-tuning YOLOv11 OBB [2] object detection models. Labelled visualisations are often >8000 pixels in at least one dimension, so training data is tiled with additional processing to reduce small crops of objects along borders. Images are resized to 1024x1024 for training. Preliminarily, we have fine-tuned a YOLO11m-obb model on this dataset (split into train/val/test) for both binary and multi-class tasks. The best performing models have a mAP@50 of 0.64 for binary tasks (carving vs. background) and perform well on boat and human classes. We will present the results of these models in a Swedish context and beyond as well as an initial open-source user-friendly tool to automatically detect rock art in 2D visualisations.

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S08-065

Enhancing archaeological artifact classification through multiple artifact images

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Accurate classification of archaeological findings across different periods is crucial for establishing reliable chronologies, which in turn helps archaeologists understand migration patterns, cultural changes, and anthropological questions. Recent studies show deep learning is a powerful tool for analyzing large archaeological datasets [1-2], such as the Israel Antiquities Authority (IAA) artifact image collection [3], and discovering new patterns. In [1], a Convolutional Neural Network (CNN) with pre-trained weights was trained on thousands of artifact images from the Lower Paleolithic to the Late Islamic period, achieving accuracy comparable to that of archaeologists. Study [2] further explored CNN architectures and loss functions for age estimation across 16 periods, reporting a top-5 accuracy above 90%.

This study diverges from previous research by utilizing multiple images of the same artifact. A multi-input CNN architecture inspired by [4] is investigated with various pre-trained neural networks. Additionally, different loss functions from [1-2] are applied for thorough comparison. The IAA artifact collection has been updated with more online available images and improved background removal techniques based on a foundation model [5]. Experimental results indicate that using features extracted from multiple images significantly enhances classification performance compared to methods relying on a single image.

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S08-066

The Human Factor in Machine Learning Models for Archaeological Predictive Modelling

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Archaeological pre- or postdictive modelling is concerned with calculating probabilities for the discovery of locations of hitherto unknown past human activities in defined spatial areas. In order to achieve this objective, a diverse range of statistical, machine learning and deep learning techniques can and have been employed to construct probability maps based on known sites and mostly comparatively easy to compile environmental variables (slope, aspect, soil, etc.). However, from the outset, this inductive approach to modelling was subject to criticism for its failure to incorporate human agency and cognition. While some approaches have been made to incorporate cultural variables (e.g., Verhagen/Nuninger et al. 2013), there still are quite recent calls (Verhagen/Whitley 2020) to include human action into the workflow of predictive models. As a basis to partly answering this call, significant linear infrastructure developments, surveys and research projects that in the past decades took place in north-eastern Germany produced a usable dataset of Late Neolithic to Early Bronze Age (ca. 2800-1500 BCE) sites. These were employed in an attempt to construct socio-environmental (e.g. total viewshed) and socio-cultural (e.g. distance to pathways and distance in material culture) variables in a format suitable for utilisation in statistical and machine learning models. Their importance and influence for different predictive models in a region characterised by a flat settlement hierarchy and sparse information on permanently occupied sites will be presented and discussed.

Verhagen/Nuninger et al. 2013: P. Verhagen/L. Nuninger/F.-P. Tourneux/F. Bertoncello/K. Jeneson, Introducing the Human Factor in Predictive Modelling: a Work in Progress. In: G. Earl/T. J. T. Sly/A. Chrysanthi/P. A. Murrieta-Flores/C. Papadopoulos/I. Romanowska/D. Wheatley (Hrsg.), Archaeology in the Digital Era. Papers from the 40th Annual Conference of Computer Applications and Quantitative Methods in Archaeology (CAA), Southampton, 26-29 March 2012 (2013), 379–388.
Verhagen/Whitley 2020: P. Verhagen/T. G. Whitley, Predictive Spatial Modelling. In: M. Gillings/P. Hacıgüzeller/G. R. Lock (Hrsg.), Archaeological Spatial Analysis. A Methodological Guide (2020), 231–246.

S08-067

Reframing Digital Archaeology: Bridging Methodological Innovation and Theoretical Perspectives

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Digital archaeology has evolved rapidly from a set of practical tools to an essential pillar of archaeological research, deeply influencing both methodological approaches and theoretical frameworks. This paper, drawn from my habilitation thesis, examines the trajectory of digital archaeology, tracing its development from early computational applications to its current role as a foundational element across all phases of archaeological investigation. While digital methods have greatly expanded research capabilities — enabling large scale spatial, temporal, and quantitative analyses (e.g. macroarchaeology) — their increasing prominence also introduces specific challenges, particularly in maintaining methodological continuity and ensuring cohesive integration into the broader discourses and central themes of the discipline.

The study reflects on the implications of digital methodologies, particularly as they reshape research questions and shift the focus within archaeological inquiry. As workflows evolve to incorporate new technologies, maintaining a balance between innovation and interpretative depth is essential to prevent an over-reliance on computational ease at the expense of qualitative insights. The rapid integration of machine learning techniques and digital documentation methods further underscores the need for sustainable, transparent practices that preserve data integrity and accessibility for future researchers. Equally, as digital tools become integral to archaeological education, it is increasingly important to ensure that this training is both robust and grounded in theory, equipping students with the critical skills needed to apply these tools with insight and not only efficient, but also effective.

This paper advocates for a reflective approach to digital archaeology, one that critically assesses the relationship between digital tools and archaeological theory. Such an approach not only supports responsible adaptation to digital advancements but also ensures that the field remains theoretically grounded. By fostering an adaptable, holistic framework, digital archaeology can better address the complexities of knowledge production and interpretation, ensuring that digital methodologies are meaningfully embedded within the wider intellectual landscape of archaeology.

S 09: Visualising multispecies encounters

S09-068

Multispecies Engagements, Cosmo-Politics and Art: a Perspective from the Southern Andes

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In this talk, we will explore a multispecies perspective to understand human-camelid engagements in north-central Chile between 1000 and 1450 C.E. To achieve this, we adopt a theoretical framework that recognizes the historical dimensions of these multispecies interactions, which emerge from the specific ways in which humans and other-than-humans have co-inhabited over time. Drawing on ideas from Stengers (2015), this perspective involves recognizing a historical *cosmo-politics*—a framework that understands the social and political field as co-constituted by humans and other-than-humans, where power, agency, and affective properties are historically distributed across the field.
Building on these ideas, this work examines how camelids and humans were intertwined in a complex web of historical correspondences and affectivities during the Late Prehistory of north-central Chile. These historical relationships affected modes of co-dwelling, the production of art, the shaping of landscapes, and the social reproduction of these communities. Specifically, we propose that camelids were essential participants in the historical *cosmo-politics* of the Diaguita culture, shaping human practices and experiences while contributing to the collective identity of these groups.

S09-069

The possibility of imaging multispecies encounters

Andrew Meirion Jones

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In this introductory paper I will discuss the theoretical and philosophical frameworks for how we might image multispecies encounters in a host of cognate fields from archaeology, anthropology, geography and Science Studies. The paper engages with the work of anthropologist Alfred Gell and his notion of artworks as cognitive traps and reconsiders how this might be re-cast for multispecies studies, with the concept of images in motion discussed by the geographer Jamie Lorimer in his study of human-elephant interactions, and with Carla Hustak and Natasha Myers' concept of 'involutionary momentum' in their study of plant-human interactions. Finally, the notion of *imaging encounters* is derived from Ing-Marie Back Danielsson and Andrew Meirion Jones' adoption of Karen Barad's notion of 'mattering' for visual media. The paper charts a course from a human-centred focus on aesthetics in anthropology and archaeology to a more-than-human focus on affect in geography and Science Studies and argues that this provides a robust framework for imaging multispecies encounters.

S09-070

Deep-Time Animal Imagery: A Radical Critique

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This paper offers a critical intervention within the study of Palaeolithic animal-rendering art. Noting a fundamental lack of multispecies perspectives, I argue that adopting an "animal lens" and taking up emerging scholarly attention to the ontology of images, the alterity and world-making significance of visual practices, as well as the call for more "ecological" understandings of past visual worlds leads to a radical critique of the dominant assumptions and interpretive paradigms in Palaeolithic visual studies. I suggest that there are three conceptual assertions underpinning most traditional Palaeolithic research on animal-encompassing art: i) the art is above all about *representation* and the "aboutness", "symbolism", and "mimetic" dimension of the art must thus be the primary target of analysis; ii) the identification of animal species is central, and such identification relies on a correspondence of depicted animal "wholes" and living animals – which I call the *(zoo)morphology*-centred view; and iii) the images are *passive* in that they register human-exclusive output and meaning. The latter contention involves at least two components: an overly cognitivist understanding of art-making as mere externalization of internal states without paying attention to genealogy, legacy, and process, as well as other-than-human behaviour and materiality; and that, relatedly, animal-referencing Palaeolithic art needs to be apprehended either as an ecosystem or cultural memory *reproduction* (animals are either present in the mind or in the world). I challenge all of these (implicit or explicit) research propositions and draw together empirical observations and new arguments questioning this way of looking at and making sense of Palaeolithic animal-depicting art.

S09-071

The man and the kangaroo: an appraisal of multispecies dwellings in the Indigenous rock art of the Kimberley, Australia

Ana Paula Motta

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Indigenous Australian folklore is populated by recounts of a common origin for both humans and animals. Many of these stories have as a central theme the creation of the Land, people and animals during the Dreamtime or at the beginning of time by the Ancestors and spirits. These shared histories between the landscape, humans and animals still persist today and can be perceived in the many contemporary Indigenous art forms, but these are also engrained in the landscape in the form of rock art images found all across Australia and created up to 20,000 years ago. Indigenous rock art traditions are rich in iconographic depictions showing humans, animals, material culture, plants and supernatural beings engaged in multiple ways, across time. Interactions between humans and other-than-humans cannot be interpreted as a menu of available resources, but rather as a *long duree* of multispecies encounter and dwelling landscapes. Living with and among animals in the Kimberley requires blurring the line that separates humans and nonhumans, by moving beyond an extractivist and functional approach to animal lives, to embrace multispecies becomings. Here, I present the main results from my PhD research in Indigenous rock art from the Kimberley, while recovering histories of co-becoming and animal histories.

S09-072

Re-emergence and Resilience: Rock Art as a Reflection of Cultural Adaptation in Arnhem Land

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The introduction of new animals into hunter-gatherer societies prompts diverse cultural responses, particularly evident in the rock art of western Arnhem Land, Australia. This presentation examines the 're-emergence' of Timorese water buffalo (Bubalus bubalis) within Aboriginal cultural life during the nineteenth century, highlighting how rock art served as a crucial medium for navigating social changes instigated by colonial contact. By integrating archaeological analysis, ethnographic accounts, and new rock art recordings, we reveal how these artworks became tools for maintaining cultural order amidst upheaval.

Contrary to viewing water buffalo as mere newcomers, local Indigenous perspectives regard them as integral to the Dreaming—an eternal and evolving foundation of existence. This conceptualization allowed Aboriginal communities to assimilate these animals into existing belief systems, demonstrating a dynamic interplay between tradition and change. Our findings underscore that the artistic practices surrounding the buffalo are not mere reflections of external influences but represent a sophisticated response to colonial disruptions.

This study emphasizes the need to view rock art not just as historical records but as active tools for communication, education, and cultural resilience during times of upheaval. The implications of our findings reach far beyond Arnhem Land, shedding light on how Indigenous communities globally have historically engaged with newly introduced species. Ultimately, this research invites a reevaluation of rock art's role in capturing and responding to cultural transformations, enhancing our understanding of complex human-animal relationships in diverse contexts.

S09-073

Reframing Human-Crocodile Relations: Cultural Representations of Saltwater Crocodiles in the Northern Territory

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Saltwater crocodiles (Crocodylus porosus) hold iconic status in the Northern Territory, yet their cultural representations remain largely unexplored. As apex predators, their relationship with humans reflects a complex interplay of coexistence and conflict, particularly following the species' near extinction due to hunting in the late 19th century and subsequent recovery post-1971 protection. This presentation critiques the prevailing narratives that depict crocodiles as human-eaters and non-Indigenous hunters as heroes, rooted in a colonial frontier paradigm that marginalises Indigenous perspectives. Ecofeminist Val Plumwood's seminal work, *Being Prey* reveals how her attack by a crocodile in Kakadu challenges Western binaries of nature/culture and human mastery over animals. Her analysis exposes sensationalised media portrayals that distort the animal's true role in local ecosystems. Likewise, Luke Taylor's research has highlighted Aboriginal representations of crocodiles in Arnhem Land, where they are viewed as spiritual guardians rather than mere aggressors, symbolising creative potential and ancestral power. This presentation will examine diverse cultural depictions of saltwater crocodiles—ranging from architecture and photography to Aboriginal rock art—emphasizing their significance

across different worldviews. By critiquing these socially constructed narratives, I aim to foster a more inclusive historical account that honours Aboriginal voices and experiences, ultimately redefining the cultural identity surrounding this formidable species in the Northern Territory.

S09-074

Trails to an Interconnected World: Rock Art, Landscapes, and Cosmologies in the Gobi-Altai Mountains, Mongolia

Cecilia Dal Zovo

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In Mongolia, the study of Bronze and Iron Age rock art has often been hindered by a dissociation between archaeological knowledge and the cosmologies of the local mobile populations. In my current project, TRAILS, I aim to bridge this gap by analysing the visual landscapes and cosmovisions embedded in the rock art of the Gobi-Altai Mountains from a long-term, integrated perspective. This involves considering both the physical environment and material culture of the mobile groups who created this rock art, as well as their conceptualisation of and relationship with the major forces governing the universe. These likely included a variety of non-human beings—animals, water, mountains, and ancestral spirits—that encompass the local traditional worldviews yet were sparingly considered in the exploration of the multispecies repertoire identified as 'animal style' rock art of Mongolia and neighbouring regions. In this sense, rock art may arguably be investigated also in light of the variety of correspondences between human and non-human or hybrid beings, between micro- and macrocosm, and between materiality and symbolic knowledge. This can provide a deeper comprehension not only of the motifs engraved on the stone but also of their persistent significance, particularly in present-day Mongolia. Today, rock art indeed resonates not only with the local communities of mobile herders but also with contemporary artists, who often incorporate ancient motifs into their work. Within this framework, I explore the potential of a combined analysis to generate unique data and an expanded understanding of rock art that can be meaningful for both archaeological inquiry and local stakeholders.

S09-075

If water dies, all living beings in the Pacha will die too: Indigenous philosophies of mutual inter-breeding in water management in the NW Argentine Andes

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In recent years, Indigenous perspectives have gained recognition in academia and spaces like the Conference of the Parties for Climate Change. Indigenous leaders are increasingly publishing works and using social media to elevate Indigenous knowledge as a form of valid knowledge alongside science.Around the world, Indigenous communities are at the frontline of the climate crisis, actively engaging in activism. Central to this agenda is the defense of forests, water, animals, and resources in response to the global surge in extractive activities. Inspired by Haraway (2016), we argue that embracing plural ontologies can be a powerful tool in creating inclusive futures and a more comprehensive approach to biodiversity loss and climate justice.

In Argentina, where our work is based, mining projects tied to the Energy Transition are expanding, sparking a contested narrative on resources. Here, Indigenous water and soil management techniques—such as terrace farming and llama herding—are maintained by herders who manage fragile resources under severe conditions. The Andean concept of *Uyway/Uywaña* or mutual inter-breeding reflects a perspective that contrasts with the Western dichotomy of nature versus culture. In this worldview, humans do not dominate nature; instead, there is a network of reciprocity among humans, animals, plants, and natural entities like mountains (Apu) and Mother Earth (Pachamama). *Uywaña*, extends to all life forms, where people and other beings engage in uywanakuy, or "mutual upbringing."

The creation and management of wetlands, deeply tied to *Uywaña*, are referred to as "breeding wetlands," highlighting these reciprocal relationships in Andean ontology. Local families actively manage and maintain these wetlands, many of which have been sustained for centuries .Water (Yaku in Quechua) is the vital force connecting the Andean worlds: Qanaq Pacha (above), Kay Pacha (here), and Uku Pacha (below), embodying the Andean worldview's axis.

Guided by these concepts, we worked collaboratively with communities in Cusi Cusi, located in the arid High Andean plateau of northwest Argentina, where a complex agricultural system evolved between 3,800 and 4,300 meters.In this context, we aim to explore how Indigenous perspectives can inform interpretations of both present and ancient water management practices, connecting these with broader issues of water and the climate crisis.

S09-077

Percieving and Portraying - Relationships between Red Deer and Humans as depicted in the Rock Art of Mesolithic Norway

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Animals are the most frequently depicted motif in Stone Age rock art in Norway. Traditionally, these representations have been tied to perceptions of animals as resources, but recently the *animal turn* in archaeology has provided new theoretical tools for interpreting relationships with animals through the lens of animistic worldviews. While we cannot know the thoughts of the artists producing rock art, we can know how they chose to depict the things they had seen. I bridge the gap between the observation of animals and the depiction of the same animals by assessing the significance of an animal's behaviour and how it is evident in the rock art depictions. Drawing on ethology - the study of animal behaviour - I argue that these depictions reflect not only symbolic interpretations but also detailed observations of animal actions. Using the Late Mesolithic rock art site at Vingen in Western Norway, dominated by red deer motifs (*Cervus elaphus*), I examine how prehistoric people perceived red deer behaviour and how these perceptions were translated into rock art. This sheds light upon the complex relationships between humans and red deer in the Late Mesolithic of Western Norway, demonstrating how ethology can inform our understanding of prehistoric animal depictions.

Keywords: rock art, animal turn, relational ontology, red deer, ethology, Norway, Late Mesolithic

S09-078

Upright members of societies – megalithic burial architecture and other-than-human persons in the Funnel Beaker west groups (3500-3000 BCE).

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Split stones in the burial architecture of megalithic tombs have often been noticed, especially in north-western Germany - this has been interpreted as a lack of adequate building material being available to Funnel Beaker groups. However, it has been shown in studies of megalithic burials in Britain that architectural elements such as the stones were important and well-selected (Fowler 2022; Cummings & Richards 2021; Cummings 2009).

In an attempt to reconstruct possible modes of relational personhood in the Funnel Beaker West group between 3500 and 3000 BCE, the materials that were used play a crucial role in northwest Germany because organic materials, including bones, are largely missing from the record due to lack of preservation.

This paper argues that at least some of the split stones from the megalithic burials of northwest Germany were or became other-than-human persons and played specific roles in the transformation processes happening inside the burial chambers. By using the megalithic burials of Ostenwalde (Spr. Nr. 835) and Groß Berßen 7 (Spr Nr. 861) as an example, the implications resulting from this interpretation for Funnel Beaker ontologies will be elaborated and discussed.

References:

Cummings 2009
V. Cummings, *A View From the West: The Neolithic of the Irish Sea Zone*. Oxford: Oxbow 2009.
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V. Cummings; C. Richards, *Monuments in the Making. Raising the great dolmens in early Neolithic northern Europe*. Oxford: Windgather Press 2021.
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Ch. Fowler, *Social arrangements. Kinship, descent and affinity in the mortuary architecture of Early Neolithic Britain and Ireland.* Archaeological Dialogues 29, 2022, 67-88.

S 10: Approaches to Coupling Earth and Human System Data

S10-079

Coupling the Earth and Human systems of the past. Is it really so challenging?

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The collaboration between archaeology and earth system sciences has a long standing history. Especially after founding of the IPCC in 1988 with the global awakening due to the upcoming climate changes, the need of knowing how people interacted with climate in the deep past became apparent. Archaeology has a big advantage of shared time scale with palaeoecology. This is valid especially for the Holocene, for which both of the disciplines have rich datasets which can be analysed on national, continental or even global level.
The key advancements of the future lie in the nature of archaeological data and what we do with it. We need to exploit fully the richness of not only the most straightforward lines of evidence (e.g., eDNA, lipids, environmental archaeology, radiocarbon dates), but crucial is also the rich cultural data, into which archaeologists put vast amounts of energy during the last 120 years. This paper will revise the current approaches of coupling the Earth sciences with archaeology, offer successful case studies from Central Europe and discuss the future directions of interdisciplinary research, from both theoretical and methodological perspectives.

S10-080

Streamlining Model Creation within the HESCOR Database

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Processing data to create Earth and/or Human system models is incredibly time consuming. While this is due in some part to the data itself (which may contain errors, inconsistencies, etc.), much of the processing time is related to interdisciplinary dialogue since many datasets require specialized knowledge to be utilized. The Human and Earth System Coupling Research (HESCOR) project at the University of Cologne has tried to streamline interdisciplinary research by promoting methods that lower barriers and encourage interdisciplinary discourse and data sharing. Within HESCOR, methods, such as clearly defined workflows and protocols, and a 3-tiered database are the keys to the interdisciplinary process. Standard workflows and protocols help structure conversations and set expectations so that the HESCOR researchers are encouraged to continue interdisciplinary dialogue throughout data processing. By organizing HESCOR data in well-defined tiers (Tier I – metadata, Tier II – reorganized data within HESCOR ontology, and Tier III – interpreted data), the HESCOR Database reflects the research stages of data analysis – processing data for modelling along the way. This structure allows HESCOR members to better communicate data interpretations across academic fields and formulate models that can help reconstruct causal links between the Human and Earth Systems. This presentation will provide an overview of the methods and workflow currently used by HESCOR to better organize data for large, interdisciplinary research. We hope to expand this project to provide open data and code related to the coupling of the Earth and Human Systems to a broader and more diverse scientific community globally.

S10-081

Analysing distribution, typology, and chronology of the ramparts east of Cologne, Germany, based on geographical data

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This study presents the analysis of 37 enclosures with ramparts and ditches that are located in a low mountain range east of the city of Cologne, Germany. At the start of our project in 2016, little reliable evidence was known about the dating and internal structure of these sites. This issue was addressed by analysing LIDAR data, systematic prospections, and small-scale excavations. The investigations have yielded dates ranging from the Late Bronze Age to the Napoleonic campaigns. This is the data base for the analysis using Geographical Information Systems (GIS) with the aim of finding attributes typical for a given period, thus allowing the prediction of the dates of sites that have not yet been archaeologically investigated. Two different sets of methods were applied: The first set analyses the general structure of the enclosed area, attempting to identify a classification of the construction principles. This approach is an alternative to the typology used by the British Hillfort Atlas team, which is based on description rather than measurement. Attributes considered include size and shape parameters such as circularity and the position of the highest interior point in relation to the site boundary.

The second set of methods analyses regional environmental and cultural relationships for sites of a given period. Factors considered include prominence, distance from the nearest navigable river, medieval church, or pre-industrial trade route. Moreover, viewshed analyses have been undertaken for Iron Age sites to analyse intervisibility and visual control of the nearest navigable river. The low number of enclosures for each period, edge effects, non-random sampling, landscape change, site reuse or continuity, and varying resolution of the geographic data are just some of the issues encountered in the analysis. For the periods considered, a high variability of the parameters studied was observed. It was therefore not possible to identify any typical features for a given period, suggesting that the sites had different functions.

Reference:
G. Lock/I. Ralston (eds.), 2019. Hillforts: Britain, Ireland and the Nearer Continent. Papers from the Atlas of Hillforts of Britain and Ireland Conference, June 2017. Archaeopress. https://doi.org/10.2307/j.ctvnb7r0b

S10-082

Human-environmental interaction during Chalcolithic to Roman Age times deduced from a palaeolagoonal sedimentary sequence in southern Iberia: A biomarker perspective

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The semi-arid climate in southern Iberia is a major challenge to modern society – and so it was during prehistoric times. Despite the general arid climate and superimposed aridity events such as the 4.2 ka BP event prehistoric societies in some parts of southern Iberia flourished. At the same time societies in other south Iberian regions struggled and eventually collapsed. The details of these developments, however, are still quite underexplored. How and why did societies in different but adjacent regions in southern Iberia took so different developments? How have these societies been affected by and adapted to climate change?
We aim to answer these questions by high-resolution multi-proxy analyses on a palaeolagoonal sedimentary record of high chronological resolution. A dense sampling strategy for radiocarbon dating ensures a high chronological precision as well. The chosen lagoon was situated at the river mouth of the Guadalquivir draining the Sierra Morena and western Sierra Nevada mountain ranges. In addition, the lagoon was densely inhabited during prehistoric times as documented by the Chalcolithic mega-site of Valencina de la Concepción and various Roman settlements such as Italica. This talk focuses on the preliminary results of biomarker analysis, which are used to reconstruct precipitation variability with regard to amount and source as well as human impact and herding strategies deduced from faecal biomarkers. These results are accomplished by X-ray fluorescence data, sedimentary aDNA data and pollen counts. The comparison with palynological data is of particular importance as it allows the discussion of a human or climatic driver of vegetation change. The details of the palynological study will be presented in another session, however.

S10-083

High-Resolution Reconstruction of Middle-Upper Paleolithic Population Transition on the Iberian Peninsula

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The Iberian Peninsula is of particular interest to the Middle to Upper Paleolithic Population Transition (MUPPT) from the Neanderthals (NEAs) to anatomically modern humans (AMHs). Numerous seminal archaeological studies on the subject exist, but our understanding of the MUPPT remains fragmented. Here, we use the Our Way Constrained Agend-Based Model (OW-CABM) to provide a high-resolution reconstruction of the MUPPT. The Human Existence Potential (HEP) model, a part of the OW-CABM, combines climate model data and archaeological site data through logistic regression to compute the HEP, a key value acting as a driver for the population dynamics. The OW-CABM is then used to reconstruct the distribution and dispersal of the NEA and AMH populations, as well as the admixed population of the two species. Several core questions regarding the MUPPT are studied in detail. We first point out that the MUPPT can either be in a successive or a weakly-interactive mode. In the successive mode, the NEAs were already extinct at the time when the AMHs arrived in northern Iberia, and no interactions occurred between the two human species. We show that the Glacial Stadial and Heinrich Event (GS9/HE4) climate shift dramatically reduced the NEA population size, but did not wipe out the NEAs entirely. The last refugia of the NEAs existed in the Cantabrian, Portuguese, southern-tip, and Mediterranean coastal areas. In the weakly-interactive mode, the NEAs survived the earlier cold climate phases and still lived when the AMHs arrived in northern Iberia. Before the Heinrich Event 4, in an expansion wave, the AMHs settled in northern Spain and coexisted with the NEAs. The Cantabrian is the most likely region of NEA and AMH interbreeding. The model suggests further dispersal of the AMH into the Ebro Valley in the east and in the interior of Iberia from western Cantabrian along river valleys as migration corridors. Within 5,000 years both inland and coastal routes converge in southern Iberia. Neither climate change nor the expansion of the AMH are solely responsible for the extinction of the NEAs. The model

results imply that the changing environmental conditions destabilized the population networks and reproduction of NEAs, resulting in reduced population sizes and eventually the extinction of the NEAs and the further expansion of AMHs.

Hominin dispersal in environmental systems: Linking processes of environmental changes and hominin dispersal in Eurasia during the Early Pleistocene

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Early hominin dispersals from Africa and into Eurasia continue to be discussed and to raise several questions regarding routes, timing, causes and limiting factors of dispersal movements. One aspect that has received a lot of attention by researchers are the climatic and ecological conditions by which hominin populations were influenced and under which they lived. It is hypothesised how climate and environment functioned as a barrier for hominin survival, if hominin groups had ecological niche preferences, followed subsistence resources, or developed physiological or cultural adaptational features. However, only looking at the archaeological sites and material gives us a local insight into the environmental conditions of hominin presence. Our goal in the Lateurope project, is to get a better understanding of how the environment influenced global-scaled early hominin dispersals, from local-scale influences.

The work presented here aims to study the interplay between environmental factors and global dispersal patterns of Early Pleistocene populations. Computational modelling methods and simulations offer a possibility to investigate the relationships between hominin behaviour and Earth systems. We use climatic data, predictive emulators, and ecological reconstructions, to identify the types of environments in which the hominins have lived and made behavioural decisions. By combining the available climatic data and emulator Paleo-PGEM with the land-surface model ORCHIDEE, we present a dynamic paleoenvironmental reconstruction for Eurasia during the Early Pleistocene, spanning from 2 to 0.5 Ma. This provides a map of dynamic environments changing through time, which we will use to create niche models for hominin populations. The niche modelling is a crucial step in connecting the relations between hominin behaviour and the environment on a local scale with large-scale dispersal patterns.

A reconstruction of this extend, when integrated in a simulation, will allow us to observe the timing and routing of the first hominin populations' movements out of Africa and into the Eurasian continent. The climate and ecological elements provide an arena for simulating environmental parameters' influence on population dispersal, and the possibility to observe, if they correlate with the spatiotemporal distribution of pinpoint-occupations evidenced in the archaeological record.

S10-084

Coupling Human Mobility and Environmental Change: Agent-based modeling of Cultural Diffusion in Ancient Societies

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Mobility was a key driver of cultural and technological exchange in prehistoric times, influencing the spread of innovations and shaping societal development. Unlike modern mobility patterns, human mobility in ancient times was driven mainly by environmental influences, such as resource scarcity, environment suitability and climate change. To explore this process, we have developed a mathematical model that can help exploring how these factors shaped human movement and additionally, influenced the diffusion of cultural and technological innovations. We introduced a mathematical agent-based model (ABM) to simulate the movements of individuals across landscapes in response to environmental factors, providing insights into the dynamics of ancient human mobility and its role in cultural evolution [Nataša Djurdjevac Conrad, Luzie Helfmann, Johannes Zonker, Stefanie Winkelmann and Christof Schütte, 2018. Human mobility and innovation spreading in ancient times: a stochastic agent-based simulation approach. EPJ Data Science, 7(24)]. We applied our model on empirical data from Central Africa spanning 120 000 years and explored the role of environmentally driven changes in the population dynamics of hunter–gatherer communities on the development, transmission and accumulation of complex culture. Finally, in this talk we will address key challenges arising in this emerging interdisciplinary field, such as limited and sparse data [Johannes Zonker, Cecilia Padilla-Iglesias and Nataša Djurdjevac Conrad, 2023. Insights into drivers of mobility and cultural dynamics of African hunter–gatherers over the past 120 000 years. Royal Society Open Science, 10(11)].

S10-085

Exploring landscape connectiveness through past vegetation modelling

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Collaborations between archaeologists and palaeodata specialists with climate modellers are still rare, despite a growing awareness of the potential high impact of such collaborations (e.g. Timmermann et al. 2022). In this contribution, we present some examples and challenges of our ongoing, completely digital collaboration between climate modellers, archaeologists and palaeoecologists over the last eight years. We found the potential of such joint projects particularly effective in the realm of vegetation modelling. On the one hand, these can be used to answer explicit hypothesis asked by archaeologists or palaeoecologists by modelling the past biome composition and distribution and exploring which are the main drivers (e.g. CO_2 levels, fire, climate parameters) that could create a vegetation composition as reconstructed from the palaeoecological record (Ecker et al. 2020). On the other hand, palaeoecological data, such as from pollen cores for example, can be used to improve model by bias-correcting bioclimatic output, a method we have recently developed and tested (Kelley et al. 2024). To achieve this, we fused palynological and vegetation modelling from a Dynamic Vegetation Model (DVM) driven by an ensemble of paleoclimate climate model simulations to pollen-based proxies of Last Glacial Maximum vegetation types. The results were analysed to establish how "connected" the landscape was. This has important implications for animal as well as human dispersals. Our newest project is building this experience and is modelling potential migration corridors for late Pleistocene human dispersals within Africa. We discuss our experiences in communicating across disciplines as well as the challenge in translating qualitative and quantitate archaeological data into useful parameters for global Earth System Models.

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S10-224

Dispersal of Homo sapiens to East Asia

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The dispersal of Homo sapiens from Africa to East Asia is a fundamental aspect of human evolutionary history, yet many questions remain regarding the mechanisms, routes, and timings of this migration. Climate may play a crucial role in early human dispersal:

1. Glacial-Interglacial Cycles create the migration corridor such as Bering Land Bridge.
2.Temperature and Precipitation Changes, affecting the distribution of habitats and available resources.
3.Seasonal changes in climate, such as monsoon patterns in certain regions, influenced the availability of water, vegetation, and animal resources.
4.Abrupt climatic events, such as Heinrich events and Dansgaard-Oeschger events, caused rapid and dramatic changes in temperature, precipitation, and atmospheric circulation patterns.

This research aims to explore the dispersal routes of Homo sapiens to East Asia and investigate the related impact of climate change based on the Human Dispersal Model (HDM).

S20-256

Molluscs and Ostracods as Bioindicators in Holocene Floodplain Sediments of the Rivers Echaz and Eger (Southern Germany)

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The development of overbank silt-clay deposits from the Middle Ages to early Modern times in central European floodplains is still poorly understood. In the rivers Echaz (3rd order tributary of the Rhine) and Eger (3rd order tributary of

the Danube) in southern Germany, these deposits are typically up to one meter thick. Both floodplains are characterized by calcareous sediments, as their springs derive from the limestones of the Swabian Jura, and they are therefore promising study sites for micropalaeontological investigations.
In fluvial systems ostracods are especially useful to document changes between fluvial activity and standing water, and to reconstruct the spatial distribution of water bodies. Oxygen or heavy metal sensitive species allow recognizing organic and heavy metal pollution levels. Anthropogenic usage of water bodies can be assessed and the provenance of sediments can be identified. The frequency of aquatic and terrestrial gastropods, bivalves, and macrobotanical remains provide further information about the floodplain development, the palaeoenvironment, and the past land use.
As part of the SPP2361-subproject "Local pathways to the Fluvial Anthroposphere at Echaz (Rhine) and Eger (Danube)", we study indicator species, ecological tolerances, palaeoecological assemblage analysis and taphonomy in sediment cores and profiles from the floodplain sediments. In a next step we plan to compare the subfossil ostracod faunas with recent faunas in the floodplains today. Thereby information on not only the overbank silt-clay deposits development, but also e.g., historical fishponds, channel engineering and hydro-energy installations, floodplain land use and irrigation systems, craft and waste disposal and pollution will be obtained. In this contribution, we present a project overview and first results.

P01-297

Estimating human existence potential using deep learning neural networks

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The Human Existence Potential (HEP), as proposed in [1-2], has been successfully applied to the reconstruction of human dispersal on the pan-European scale [3]. This method verifies locations with archaeological records and offers insights into human dispersal routes. Previously, HEP was obtained in two steps: first, using logistic regression (LR) with second-degree polynomials on presence and absence records for suitable climatic predictors derived from simulated bioclimate variables, such as temperature and precipitation; second, refining HEP by considering accessibility factors such as topography, glaciers, water bodies, and vegetation.
In this study, all driving parameters—including bioclimate predictors, presence and absence records, and accessibility conditions—are used as multi-input images for a deep learning neural network (NN), with the output being the accessible HEP. Two modern NN architectures, namely the pre-trained convolutional neural network (CNN) and the Transformer with multi-head attention, are investigated to achieve a one-step HEP estimation. The final performance of these architectures will be comprehensively compared with the LR approach under different environmental conditions during exemplary cultures.

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S 12: Neolithic Seascapes

S12-086

Navigating the Mediterranean during the Neolithic Expansion

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Direct evidence of boats and navigation in prehistory is limited. One of the world's most well-preserved archaeological sites, yielding up to five dugout canoes, is the Neolithic settlement of La Marmotta in Italy. Submerged beneath the waters of Lake Bracciano, near Rome, the site is preserved under a 3-meter layer of mud, which has safeguarded wooden artifacts, including the canoes, as well as objects potentially linked to navigation, such as paddles and rudders. These dugout canoes, crafted from single tree trunks, vary in size and display notable morphological differences. Although initially discovered between 1998 and 2003, a recent collaborative project involving the Spanish National Research Council (CSIC), the Museo delle Civiltà in Rome, and the University of Pisa has enabled further investigations into aspects such as the tree species used and their chronological framework.
The Neolithic community that inhabited this site represents one of the earliest agricultural and pastoral societies to settle in the Italian Peninsula, migrating from regions of the eastern Mediterranean. They occupied this area for approximately 400 years, between 5600 and 5200 cal BC. Following a rise in the lake's water level—likely due to a catastrophic event—the settlement was abandoned.
Over subsequent centuries, some Neolithic populations continued to expand into new territories, reaching southern France and the Iberian Peninsula. This presentation delves into the Neolithic expansion, highlighting the crucial role of navigation and the exceptional canoes and nautical artifacts preserved at the La Marmotta site.

S12-087

The Dawn of Warriors – Violent conflict and the sea in the Nordic Neolithic

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For a long time, the Scandinavian Neolithic was viewed as the domain of peaceful farmers, some of whom eventually reverted to a hunter-fisher-gatherer lifestyle, from which the Corded Ware Cultures eventually emerged. This perspective made the Neolithic appear as a "foreign land" compared to the martial Nordic Bronze Age, with its weaponry, warrior burials, and rock art depicting combat. Three decades ago, Lawrence Keeley challenged the notion of the "peaceful savage" and, through his polemic, opened the study of prehistoric violence, conflict, and warfare. The aDNA revolution of the past 15 years has revealed that different groups operated with distinct socio-economic and cultural frameworks. In recent decades, significant discoveries and studies have been made, including evidence of violence, burnt-down fortifications, population declines, and more. These indicators of conflict, along with the socio-economic and cultural patchwork of differing interests during the Neolithic, make the southern Scandinavian peninsula and neighboring regions to the south and west an intriguing laboratory for studying violent conflict. Against this backdrop, our contribution will discuss Neolithic specialized weapons and expressions of individual warrior identity. We will argue that organized violence, raiding, and an expressed warrior identity were not inventions of the Bronze Age but emerged in the two millennia prior, with violent conflict already having a distinct maritime component.

S12-088

The Missing Boats - Rock Art and the Maritime Technology of Neolithic Hunter-Gatherers

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The Scandinavian Neolithic is unusual in the sense that some of the inhabitants of its northern parts never abandoned a Mesolithic style of life, and that hunting and gathering become the major component again with the immigrating Pitted Ware Culture (3500-2300 BC; PWC). Whereas in the north the main hunting game were elk, the southern contemporaries specialised in sealing and fishing. The scarcity of physical remains of boats, apart from occasional logboats, within the archaeological record frustrates our understanding of maritime technology of these groups, especially of the seaworthy boats they would have to rely on not only for hunting, but also for journeys to Gotland and other islands. In this paper, we focus on the study of Neolithic rock art which can serve as a proxy for the investigation of vessel types that were used for long-distance travel and trade as well as hunting and fishing on open seas.

Rock art areas such as Alta in Norway, Nämforsen in Sweden, and Vyg in Russia contain hundreds of carvings depicting boats including technical details such as elk headed stems. These vessels were incorporated into scenes of hunting and fishing which makes it likely that the images show the vessels hunter gatherer groups needed to perform their maritime activities. The investigation of details such as ratios, crew counts, and activities including the consideration of ethnographic vessels from Greenland and North America, i.e. the umiak, can inform us about which types of vessels were likely depicted. By considering archaeological information about the maritime activities of the PWC groups, we suggest that they had a similar maritime technology relying among other vessels on seaworthy seal skin canoes, which enabled not only fishing and seal hunting, but also long-distance journeys across the Baltic for trading and other purposes.

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S12-089

Ritual Exchange in the Baltic Sea during the Middle Neolithic: Ceramic Sourcing of Figurines from the Pitted Ware Culture site of Tråsättra

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The Pitted Ware Culture (PWC) of the Middle Neolithic (3500 to 2300 BCE) are known to have been able seafarers who traded goods across considerable distances of open water. How this trade was organized is poorly understood and remains an important research question for our understanding of Neolithic political and economic organization. This paper presents the results of the clay provenance determination of 39 ceramic figurines and 19 potsherds from the PWC site of Tråsättra using Inductively Coupled Plasma (ICP) analysis. Tråsättra is located northeast of modern-day Stockholm and was a PWC community occupied between 2650 and 2470 BCE. Through ICP-analysis, 10 out of the 39 figurines were shown to have been made using non-local clays. Clays used in the non-local figurines were matched to sources ranging from Åland to Gotland, indicating that Tråsättra was involved in a 400-kilometer-wide exchange network that spanned much of the Baltic Sea. Furthermore, statistical clustering of the ICP results coupled with the stylistic analysis of the figurines suggest the possibility of 3 to 4 levels of interaction within this overarching trade network, indicated a complex web of trade relationships. Based on these results, we suggest that the PWC people of Tråsättra may have been involved in a ritual exchange system comparable to similar networks documented among ethnographically known maritime societies around the world. We argue that these results show that the political economy of the PWC was more complex than expected under a simple “down the line” exchange system and point towards exciting possibilities for future research.

S12-090

The cradle of the Atlantic Bell Beaker network

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The Atlantic network is of significant importance in the context of Western, Central and Northern European Bell Beaker (BB) using societies. It is well established in the research that there are close links between Atlantic BB groups, for example in Brittany and Galicia, or Great Britain, the Netherlands and Denmark. Even the most distant regions exhibit certain shared attributes. The proximity to the Atlantic/North Sea appears to be a crucial factor in the circulation of artefacts, knowledge, and people. As such, the BB period is often portrayed as marking the advent of super-regional communication in general and the Atlantic exchange system in particular.
However, this paper will present evidence indicating that a close connectivity in this Atlantic network may be of an even older origin. Among other, the distribution of double axes in France and Galicia, the parallels of Breton lateral entrance graves to Dutch and north German contexts, or the eye motif which appears in contexts on the Iberian Peninsula and in Denmark, allow for the reconstruction of similarities in regions with access to the Atlantic in the earliest third millennium BC. Based on this, it is possible to reconstruct a similar network along the Atlantic façade, which via a few knots connects regions as far away as southern Spain and Denmark. However, it will be shown that the network in its beginning was lower in intensity and probably structured differently.

S12-091

What can metapopulation models say about maritime connectivity in ancient times?

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Connectivity mediated by the sea is constantly changing in space and time. This simple fact is known to impact profoundly demographic and evolutionary trajectories, with a large corpus of theoretical and empirical studies developed around the concept of metapopulation – that is a population composed by many subpopulations that share a level of connectivity (Levins 1969, Hanski 1999). However, the same does not hold in archaeology. For instance, evolutionary approaches have focused on the role of population size on cultural transmission, but have rarely addressed the effects of population structure and dispersal.
By analogy with ecology and evolutionary biology, we argue that spatial patterns of cultural expression can be explored by treating human populations living by the sea like a metapopulation. This simple idea also allows us to apply and adopt several tools from ecological and evolutionary sciences. In this perspective, we have developed an agent-based framework called MetaPypulation, which allows us to explore the interplay between population structure (metapopulation) and its range of parameters with various mechanisms of cultural transmission. This paper will explore some of our preliminary results with a particular focus on population structures that can occur in a seascape, and if such modelled outputs are only useful for general theory-building or can be directly compared to specific archaeological case-studies.

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S12-092

The Neolithization of the Northern Black Sea: The Summary of the Discussion

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The question of the Neolithization of the steppe and forest-steppe zone of Ukraine showed a combination of the different impulses of the Neolithization, which were coming from the West and East directions in different periods.
In studies from the Soviet period to the time of Ukraine's independence, several main theories took place in the scientific discussion. The eastern impulse of mobility caused by aridity during the 7th millennium BC, developed by V.N. Danylenko (Даныленко, 1969; Kotova, 2003, pp. 10–12), which was continued in the works of the number of the archaeologists from the East Europe (Shnirelman, Krizhevskaya). The next theory, established by D.Ya. Telehin states that the local population on the Northern Black Sea developed together with the west impulse, which brought agriculture. The latest results of the neolithization research bring to light a broader view of the ways of migration to Europe through pollen analysis of the vegetation to examine two ways to the Northern Black Sea: from the Near East over Greece and the Balkans or other Maritime routes from the Mediterranean (Ganz et al., 2022, Ganz et al., 2024, Kotova, Demchenko and Kiosak, 2021, pp. 1529–1530,). Also, it is in the discussion of the possibility of Early Neolithization near 7500 Cal BC of the local population in the Northern Azov region and their further contacts with the culture of Rakushechnyy Yar population in the Low Don region, which was originally with the migration from the Northern Caucasus (Kotova, 2009, p. 172). D.L. Haskevych researched the influence of the Printed-Cardium Pottery on the Northern Black Sea region, and the only possibility of contact was done by migration through the Danube region and interaction with the Hamangia community in Romania and Bulgaria. D.L. Haskevych connected the neolithization of the Mediterranean with migrations from North Africa to the Middle East and through the Maritime ways speeded to the Mediterranean and Bosporus to the Black Sea (Гаскевич, 2010, pp. 246–248).
Long-term discussion on the Neolithization of Ukraine and the Northern Black Sea region is highly interesting and relevant in the context of the spread of agriculture and husbandry to Europe. Together with the collected C14 database and GIS visualisation, we can summarize the existing theories and bring them to the global European context.

S12-093

The Age of the Dugout: Simulating Waterways and Social Networks between Ancestral Villages in the Central Salish Sea, Pacific Northwest Coast

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The Salish Sea is a flagship region of the Northwest Coast of North America, and its archaeological record has supported multiple interpretations of the history of Salish peoples. Dugout canoes played a central role in almost all dimensions of Coast Salish peoples' social and economic life. Dugouts were the cornerstone of the exchange system between people and communities, which has been interpreted as a way of managing spatial and temporal variation and fluctuation in the availability of resources (Suttles 1960). However, as pointed out by Ames (2002), there remains a need for theorizing

boats and maritime mobility to better characterize how watercraft technology shaped precontact and historic social dynamics along the Northwest Coast. How did advanced dugout technology support the spatially-extensive social interaction networks documented in the Salish Sea in the historic period? Did the recurrent use of specific seaways and maritime routes influence patterns of social connectivity across the region? Could histories have unfolded differently if other types of watercraft or settlement strategies were used? To explore these questions, we have developed an Agent-based model (ABM). The HUGASEA model is an ABM that simulates the movement of agents paddling a canoe across a simulated seascape. The objective of the model is to identify the most recurrent maritime routes between one or multiple source(s) and destination(s), evaluating the degree of connectivity between given locations in terms of navigation time and/or risk. In this paper, the design and mechanics of the ABM are presented. Results, scenarios and parameters drawn from ethnographic data and the archaeological record are explored. Finally, the applicability of the model to other rugged seascapes and maritime societies, like the Neolithic societies of Europe, are discussed.

S 14: Function and Material Properties of Ceramic's

S14-094

Functional properties analysis of ancient cooking pots and other type of vessels

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If we define cooking as 'the softening of foodstuffs using boiling water', then to decide if a pot is suitable for this purpose we need to evaluate its water permeability and thermal shock resistance. Thermal shock can cause structural damage to a ceramic material. Microscopic cracks can occur and mechanical properties can deteriorate. There are a number of methods (e.g. flexural strength testing) which can determine the degree to which a material has been damaged by thermal shock. Most of the methods used in the analysis of contemporary ceramics cannot be used for analysing ancient pottery due to the size of the sample required and to the high sensitivity of these methods.
This paper highlights the difference between assessing functional properties of ancient vessels by measuring changes in the velocity of propagation of longitudinal ultrasonic waves before and after thermal shock as opposed to assessing them based on the changes in a vessel's water permeability.
The results of functional properties analysis as well as the correlation between raw material and function will be presented using pottery dating from the 6th millennium bc to the Roman period found at sites in present-day Syria, Iraq, Turkey, Sudan, Bulgaria, Germany and Austria.

S14-095

Crafted for Survival: The Functional and Cultural Role of Ceramics in Northern Nigeria's Past

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One of the important roles of Ceramic typology is that it enables an understanding and explanation of possible movement of groups of people, trade, mutual borrowings and adoption of cultural traits. Hence, the primary concern in the study of ceramics must transcend mere reconstruction to understanding the *raison d'etre* of certain ceramics so reconstructed. In parts of northern Nigeria where source of water poses a great challenge ethnoarchaeological study on ceramics revealed the most interesting branch of the industry is the making of vessels for carrying water often to a mile or more. The vessel (tulu) itself is a small-mouthed spherical holding about 3-1 gallons and is a conivenient load for an adult woman with various shapes made for little girls, in order that all available labour in a household may be utilised. The manufacture the (tulu) vessel also requires the most water-retained clay because it requires skillful trimming of its walls by continuous moisture of the clay during manufacture. This is not the case for cooking vessel where clay is collected in lumps from dried surfaces and there is no thorough mix with water before it is collected. A clay mould of which the base is fixed in the earth with the upper face inclined slightly towards the manufacturer is used. This upper face has a hollow in the centre, which fits roughly the outside curve of a finished pot. The result of the process is to produce a very true shape of great strength, and with the greatest possible economy of material. Smoothness of surface is obtained by the friction between the clay and the mould as the pot is turned over and over, with the wood ashes between the two surfaces. At this stage the pot is set on its side to dry. In the case of *Kumbu*, a large vessel for storing drinking water, or baking of local bread known as *Gurasa,* the even surface from its rim to its bottom provide for easy spread of heat for baking through a little hole at the bottom. The rim diameter of Kumbu vessel is 0.6m (or 60cm) in most cases, 1.07m (or 107cm) high, and 0.3m (or 3cm) wall thickness. The main thrust of this presentation therefore is until the cultural contexts of ceramic vessels are properly understood the relationship between the artefact and the social system that produced it will remain underappreciated.

S14-096

An Early Neolithic 'cracking technology': Assessing the thermal shock behaviour of Starčevo-Körös-Criș organic-tempered ceramics

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During the Early Neolithic, *Starčevo-Körös-Criș* pottery became a widespread and long-lived phenomenon in the central Balkans, which was characteristically and consistently tempered with organic agricultural by-products. Explanations for this consistency abound, but most are unrelated to how these vessels performed mechanically in different activities. Given the centrality of cooking activities in Early Neolithic societies, a deeper understanding of the thermal shock behaviour of these ceramics is warranted. In this paper, I identify the effects of organic temper in the thermal shock

behaviour of low-fired pottery. With the novel use of a thermal cycler, disc-shaped replicas of *Starčevo-Körös-Criș* pottery bases were submitted to multiple moderate heating and cooling cycles to emulate past thermal shock conditions. With this apparatus, thermally induced cracks were generated, and thermal shock resistance was estimated by measuring the cracks' growth and path tortuosity. In addition, three-point-bend tests were conducted independently. Our results indicate that, regardless of manufacturing method, fibres from organic temper toughen the ceramic material through energy dissipating mechanisms, such as crack deflection, bridging and micro-cracking, attaining stable crack growth and increasing the material's thermal shock resistance. Furthermore, results from three-point-bend tests indicate that, while values of organic- and untempered discs did not differ, there was a notable reduction in the variation of flexural strength in organic-tempered specimens, which would have made these ceramics a more 'predictable' material. In this way, these organic tempered pots constituted a 'cracking technology' that not only maintained their structural integrity, but also enabled an entire repertoire of actions.

S14-097

UFO: Unidentified Functional Objects? An Archaeometrical Investigation of Uncommon Chalcolithic Small-Sized Biconical Closed Pots from the Archaeological Sites of Gumelnița and Măriuța-La Movilă

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The eponymous site of the Chalcolithic Gumelnița culture is located on the left bank of the Danube, in Southeastern Romania, Călărași County. Within the same administrative region, 50 km northwest, lies the Măriuța-La Movilă site, on the right bank of the Mostiștea River. These communities were part of a larger techno-cultural complex, known as Kodjadermen-Gumelnița-Karanovo VI, that inhabited the Balkans during the second half of the 5th millennium BC.
This study will discuss the preliminary results of an archaeometrical investigation performed on an unusual category of small, biconical closed pottery with flat bases and small upper holes. These pots have been enigmatic in archaeology, but their purpose has long eluded researchers and encouraged various functional explanations, including their use as containers for powder substances. However, recent studies have shown that some retain lead traces, suggesting their use as crucibles for smelting.
By involving research methods such as X-ray computed tomography (CT), X-ray Fluorescence (XRF), and Scanning Electron Microscopy (SEM) with Energy Dispersive X-ray Analyser (EDX), coupled with the existing literature, this research explores the technological, functional, social and cultural dimensions of this category of pots.
Ultimately, this interdisciplinary approach will contribute to a broader interpretation of pottery and human behaviour during the Chalcolithic in Southeastern Europe.
This work was supported by the Interdisciplinary School of Doctoral Studies of the University of Bucharest (ISDS), Research Institute of the University of Bucharest (ICUB), Museum of the Lower Danube of Călărași, the National Institute for Laser, Plasma and Radiation Physics of Măgurele, and Bucharest Municipality Museum, Romania.

S14-098

The potential of petrographic and chemical analyses based on examples of North German ceramic inventories

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Archaeometric ceramic analyses can make a significant contribution to clarify a wide range of archaeological research questions. In particular, the analysis of the raw materials and technologies used to make the vessels can provide important information that are relevant for the understanding of archaeological sites as well as their social and economic structures. The lecture will focus on some of these questions that will be illustrated by means of examples of individual North German ceramic assemblages from different time periods. The ceramic material was studied using a combination of thin section investigations and chemical analyses, which include portable X-ray fluorescence analysis (XRF spectroscopy) and ICP-AES (Inductively Coupled Plasma – Atomic Emission Spectrometry).
One of the investigated aspects concerns the reconstruction of the transition between chronologically successive cultures, such as the ceramic phase of the Ertebølle Culture and the early Funnel Beaker Culture. The ceramic analyses show that there is a change from the use of coarse-grained clays for the production of Ertebølle Culture pottery to a clear preference for fine-grained clays tempered with granite and grog. These fundamental modifications can be explained by the technological and functional requirements of the new early Neolithic pottery spectrum. Insights into the organisation of the pottery craft are also possible as analyses of ceramics dated to the Roman Iron Age show. There are indications that spindle whorls and loom weights were made separately from the production of the vessels so that a certain degree of specialization within the craft can be assumed. Finally, ceramic studies highly contribute to reconstruct local networks as

well as supra-regional communication structures and exchange connections based on the identification of imported, non-locally produced vessels. This is clearly shown by the analyses of the widespread Early Medieval shell-tempered pottery. It can be proven that the shell-tempered vessels reached the North Frisian coastal region as foreign goods, probably in the course of trading activities.

S14-099

Pottery function and pottery technology – an understudied subject?

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Analyses of pottery function have flourished in the last two decades. Organic residue analyses (ORA) have been carried out on large sample sets from multiple sites covering wide geographical areas (e.g. Evershed et al. 2008; Cramp et al. 2014; Ethier et al. 2017). However, few studies have associated ORA results with pottery technological studies, and it is even rarer to see functional and technological studies on the same groups of ceramics (Spataro et al. 2019; 2021). This has left a gap in our understanding of socio-economic aspects of pottery assemblages, e.g. specialisation and social complexity. Archaeometric studies can also help to address whether pottery used to transport specific types of goods was made in specific geographical areas.
In this presentation, I will try to associate ORA results with technological studies of materials published separately, focusing on early Neolithic ceramics from the Adriatic region, the Balkans, the Baltic region and Russia. These datasets are heterogenous, in terms of research intensity in each discipline, and the level of organic preservation, as well as the subsistence economies concerned. Even so, some correspondence between pottery technology and function is evident, at least in the farming societies. More complex patterns should be expected in less egalitarian and more economically diverse societies, which have yet to receive the same level of scientific attention.

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S14-100

Characterization of clay composition of pottery production indicators from Taranto (TA) through PIXE-PIGE analyses

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The work presents the results of a multidisciplinary study conducted on a group of pottery production indicators, found in the potter's workshop of via Leonida 52, active in Taranto between V and IV century BC. The complex was investigated between 1987-1988, following the detection, during the foundation works for private construction, of pits of pottery materials related to craft activities. In this area it was possible to carry out an extensive excavation, which allowed us to reconstruct the distribution of spaces within the area, with a few structures connected to each other, including a kiln. To assess the nature of the archaeological context and the large number of production indicators found, it was considered appropriate to promote a programme of archaeological analysis. It was aimed to systematically collect information on the characterization of the clay used by the Tarantini artisans to produce the different types of pottery documented in the craft complex.
Among the pottery categories attested in the *atelier* (black glazed, plain and banded vases), Apulian red figure pottery has represented a privileged field of research. Despite significant contributions on the stylistic and iconographic research of these pottery products, the scientific literature still shows clear gaps regarding the technical aspects and production contexts of Apulian pottery.
The application of archaeometric analyses, in particular PIXE (Particle Induced X-ray Emission) - PIGE (Particle Induced Gamma-ray Emission) techniques, on 39 pottery production indicators from via Leonida 52 contributed to the filling of these gaps and to the ascertainment of the production of Apulian red-figured pottery in this complex.
This *atelier* is indeed the first Tarantino context where the manufacture of figurative vases has been confirmed archaeologically and analytically.
In the absence of archaeological data about the ancient clay quarries in the Taranto area, the analysis of firing supports and poorly fired materials found in the kiln and wells of this potter's workshop allows us to know the elemental composition of the clay used by the figuli of the Spartan colony; the possibility of presenting the results of this work in this conference can encourage the dissemination of these analyzes and the identification of other vases attributable to the Taranto workshops; this also allowing us to discriminate the Taranto vases from those of different manufacture.

S14-101

Continuity, discontinuity and diversity of ceramic production in Bronocice

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On the Baski Hill in Bronocice (Pińczów District, Lesser Poland) there is a complex of settlements from the Eneolithic period, studied in the 1970s by a Polish-American expedition led by Janusz Kruk and Sarunas Milisauskas. The new, currently implemented project (since 2020) concerns the oldest phases of settlement, related to the Lublin-Volhynian and the Funnel Beaker cultures (ca. 3900/3800-3500/3400 cal BC). It includes also studies on ceramic production. Technological and raw material features are used, among other things, to present chronological trends in the subsequent phases of the Middle and Late Eneolithic. The issue of the continuation or discontinuation of the studied phenomena was especially interesting, allowing looking at the dynamics of settlement in Bronocice from a different angle. Forty fragments of pottery were selected for detailed studies, for which ceramic cuts were made for microscopic analyses. Then, the structural and textural features of these materials were analysed, including primarily: mineral composition, granulation, the way components were arranged, the degree of preparation of ceramic masses and firing temperature. The aim was to identify raw materials and to distinguish purpose admixtures. Finally, petrographic groups and fabric groups were distinguished. The recognition of the geological characteristics of the samples and their reference to local geological conditions corresponded with these studies. In order to better recognise the specificity of the period under study, samples from later settlement phases were also included in the analyses: TRB-Baden group, Globular Amphorae culture and Corded Ware culture. The obtained results indicate the use of diverse technological traditions in individual phases. At the same time, there are clear indications of technological continuation and use of the same raw material sources throughout the whole Middle Eneolithic period.

S14-102

Lead glazes – production technology and health risk

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Lead glazes became increasingly common in Central Europe from the Middle Ages onwards. They have two functions. Firstly, they seal the vessel and secondly, the vessels can be made more colorful. There are also other glazes that achieve the same effect without lead. The lead glazes can be produced in a very simple way. The production process was intensively studied on several pieces from Erfurt and the results will be presented. Another focus of the lecture will be on the lead emission of the glazes. This was determined both on the original glazes and the lead glazes were produced in the laboratory and the lead release was tested on these. The lead release was tested both with 4 percent acetic acid and with different foods. These data will be used to estimate the health risk of the lead glazes. This data will be supplemented by written sources.

S14-103

Unlocking the secrets of the Danish craftsman Niels Hansen Jacobsen's glazes - interpretations of analyzes made with p-XRF

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Niels Hansen Jacobsen was a Danish sculptor and self-taught ceramicist, working from the end of the 1880s until his death in 1941. Hansen Jacobsen worked a lot with reproduction of the inner conceptions. It can be argued that it was in the creation of fantastic creatures drawn from the world of fantasy, mythology or abstract concepts that he created his most successful works.

NHJ was very experimental, incorporating new materials such as amalgams and possibly the earliest types of plastics into his works. The research project described here revolved around the glazes he used on his ceramics. The NHJ had decided that his recipes should be burned upon his death, and therefore only sparse written material has been preserved.

The glazes vary greatly in both structure, surface character and colour, and the purpose of the project was therefore to try to recreate the glaze compositions that NHJ had made based on chemical analyzes of the many ceramic works of art preserved at the art museum in Vejen, in Jutland.

Since the objects could not be taken out of the museum, the analyzes were done with portable XRF, with the limitations that this entails. However, a reliable calibration could be made by comparing series of analyzes of smaller sherds with analyzes of the same glazes, carried out using µ-XRF.

The analyzes showed that NHJ, as expected, had also been very experimental with its often lead-containing glazes. A long series of coloring substances, such as iron oxide, copper oxide, chromium oxide, cobalt oxide, tin oxide and lead chromate.

Kit-colored paste-like glazes were often made by adding bone ash, and white by tin oxide or calcium antimonate. Some areas which appeared to be glazes must also be assumed to consist of glaze powder mixed with either hardening oil or possibly one of the early types of plastic, namely celluloid, which was used in the period to replace, for example, legs or horns in combs, mirror frames or the like .

S14-104

Crafting Identities: Ceramic Production and Social Change in Middle Bronze Age Wietenberg Culture, Transylvania (2000-1500 BCE)

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In Middle Bronze Age Transylvania (2000-1500 BCE), regional cultures crystallized across the Carpathian microregion as the distribution of metal resources heightened interregional connectivity and fueled the development of social complexity. One such culture is the Wietenberg culture, distinguished by its mortuary practices and ceramic decorations. Due to its status as an important center for mining in Bronze Age Europe, regional archaeologists have previously focused on metal, examining the organization of metal procurement and distribution as an avenue of social, political, and economic transformations. However, community organization is not linked to a single craft or resource – rather, it is constituted by an interconnected web of dynamic social, economic, and ideological dimensions. Therefore, I consider how ceramics were part of the complex suite of social, economic, and ideological activities that characterized the Middle Bronze Age. Though a seemingly banal good, ceramics' use in everyday life make them an essential material culture item for examining how emergent social complexity was experienced daily.

In this presentation, I present preliminary findings of social network analyses of Wietenberg ceramic motifs and consider future research interrogating the extent to which ceramic production played a role in creating and maintaining distinct regional identities in Bronze Age Europe. Rooted in enregisterment theory as borrowed from linguistics, a preliminary examination of motifs demonstrates that the Wietenberg identity was co-created with ceramic motifs during the Formative Wietenberg (2000-1875 BCE), but by the Classical Wietenberg (1875-1500 BCE), ceramic motifs contained significant subregional variation, suggesting ceramics took on additional roles in cocreating smaller-scale social identities. I consider how future work rooted in theories of craft production can augment understandings of how and when ceramics were used to create, or maintain, access to resources, goods, and social networks in Bronze Age Transylvania. In particular, determining whether ceramic production was centralized or decentralized will shed light on potters' potential role in reflecting a cohesive Wietenberg identity versus more regional variations and localized identities. Ultimately, I argue that ceramic insights into the complex social dynamics and cultural interactions within Bronze Age Transylvania, enhancing our understanding of prehistoric European societies.

S 15: Echoes of transformation across the European Pre-Roman Iron Age

S15-105

Urban Rise and Transport Shifts: Uncovering the emergence of urban networks in La Tène Europe (3rd–1st Cent. BCE)

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During the Late Iron Age, continental European societies experienced significant transformations, marked by a surge in economic, political, and technological exchanges with Mediterranean and hinterland communities. Amid this economic and social expansion, an extensive urban network emerged, spanning from the Atlantic to Central Europe. This development is now understood as a long-term process influenced by both internal dynamics and external influences. This presentation aims to explore the connections between the rise of large hinterland agglomerations and the vitality of medium- and long-distance transport networks. A chronological analysis of 855 grouped settlements across ten countries, from France to Slovakia, provides new insights into the wave of urban foundation during the last centuries BCE. Concurrently, transport network modelling using a spatial interaction model estimates the role of economic exchanges in the prosperity of these new agglomerations.
In light of new archaeological data and methodologies derived from Geography and the sciences of Complex Systems, we investigate how innovations in transport and the increase in traffic may have contributed to urban centralisation at the end of Protohistory.

S15-106

Transformations, Change, and Invariance in the Iron Age

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Transformations in cultural systems are often conceptualized as a result of significant change. However, the degree of change necessary to qualify as a transformation remains ambiguous, especially when considering the stability of periods between transformations. While it's often suggested that a transformation occurs when change is irreversible, a clear metric for determining this threshold is elusive.
This paper proposes a shift in perspective, focusing on the concept of invariance. Invariance, a cornerstone of the natural sciences, can also be applied to cultural transformations. By examining the elements that remain constant during periods of change, we can gain a deeper understanding of the conditions that lead to transformations.
This theoretical approach is complemented by case studies from the Iron Age, providing concrete examples of how invariances can be identified and analysed within historical contexts. The case studies focus on settlement patterns without restricting the theoretical concept to it. The analyses of settlement patterns are very undemanding in terms of the data required and are therefore particularly suitable for developing large-scale networks of comparable case studies. In this way, transformations can be placed in a supra-regional context.

S15-107

Celtic Expansion Reloaded: Reassessing Population Trends in the Early La Tène Period

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This paper assesses potential population dynamics during the La Tène period in different case study regions and will attempt to extend the discussion towards specific human mobility scenarios in the early La Tène phase.
Initially, this work focuses on the interplay between settlement patterns and consumption levels in the Paris region (Quatrelivre, 2023). The stability in consumption levels during the 4th century BCE, i.e. La Tène B1, clashes with a notable decrease in the number of identified sites. This raises critical questions about the reliability of site counts as proxies for population estimates. Two hypotheses emerge: the decline in sites may indicate either a reduction in population with increased per capita consumption or a demographic concentration, where individuals are clustered into fewer, larger settlements. Such clustering suggests a significant shift in habitation patterns that may have been overlooked, especially given the often poorly defined structures of early La Tène settlements.
Moreover, this observed stability allows for a reevaluation of the ongoing discourse surrounding Celtic expansion in Europe, particularly the scope of population movements it may have generated. While archaeological evidence points to

cultural exchanges across regions, notably in metalwork, the extent of actual population movements remains debated. Historical texts mention Celtic settlements in Cisalpina, suggesting localized migrations, yet the broader patterns may reflect transient movements rather than large-scale displacements of entire tribes (Lejars, 2006; Dreslerova et al., 2022; Schönfelder, 2024).
In order to refine our understanding of the 4th century BCE as a transformative period for Celtic societies, a new project was formed to carry out innovative analyses in 3 case study areas, from the United Kingdom, Germany, and the Czech Republic. This paper will address methodological issues raised when confronting chronological frameworks and will offer some fresh insights from preliminary analyses.

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S15-108

If this is La Tène, what isn't? If it isn't, what is...?

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the paper will focuse on La Tène type objects in central Italy, mainly Etruria. Italy was a key region for definition La Tène culture itself in the second half of the 19th century when La Tène type objects found in northern Italy and the way of their utilisation were recognised as non-local and linked 1) with the transalpine area and 2) with the historically documented Celtic invasion of Italy. in late 20th and early 21st century study of La Tène culture flourished, again mainly in the parts of northern Italy traditionally associated with Celts.
in this contribution (following in the footsteps of Thierry Lejars' studies in Marche and Umbria) I will specifically focuse on La Tène type objects in Etruria, a region with a very strong 'classical' or mediterranean cultural identity, rarely ever lined with the Celts (if not as invaders) and yet unexpectedly rich in finds of La Tène type objets of the 4th and 3rd centuries BC. as the collection of data is still underway, the time may not be ripe for an authoritative synthesis and interpretation, but it may just about be the case of asking the material and ourselves some basic questions: can we trace some patterns in time and space? what sort of social interaction with the La Tène milieu can they reflect? and could they actually tell us something about our own definition of La Tène?

S15-109

Agricultural transformations: New evidence of Celtic Field formation

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The everyday lives of most people in the pre-Roman Iron Age were for large parts spent on basic production. Therefore, the ways of cultivating the fields must have constituted important parts of culture.
In late Bronze Age and pre-Roman Iron Age, field systems known as Celtic Fields, were established in many landscapes of the northwestern fringes of continental Europe. The remains of these field systems consist of low banks and lynchets enclosing regular or semiregular plots. The largest preserved systems cover >200 hectares.
The Celtic Fields can be very similar across great distances, from the Netherlands to Denmark, and must, to some extent indicate similar agricultural techniques and land tenure strategies. Similarities that show connectedness on the basic level of production and beyond. The cultivation of the Celtic field systems probably entailed new ways of organizing labour, leading to pervasive societal changes over time. Understanding the temporality of dynamics and stasis within the field systems is paramount to understanding the praxes that upheld and changed the systems over time. However, achieving sufficiently detailed chronologies has been a challenge.
During the last two decades archaeological excavations have been carried out in a field system situated north of the city of Aalborg, Denmark, by The Historical Museum of Northern Jutland. The field system was established c. 500 BC and was sealed by drift sand in the late pre-Roman Iron Age. Recently, the chronology of the field system has been re-assessed through a novel temporal and spatial correlation approach combining optically stimulated luminescence (OSL) dating, OSL profiling, radiocarbon, and Bayesian statistics. This yielded new precise evidence on bank formation, as well as temporal dynamics in the layout of the system. Data from the excavations is currently being processed as part of a research project funded by the Danish Ministry of Culture.
This paper presents the research results and discusses the role and implications of the Celtic Field systems in pre-Roman Iron Age society.

S15-110

Pollen Analysis and Landscape Reconstruction: Filling Gaps in Settlement Dynamics in Southwestern Germany from the La Tène to Roman Period

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This research focuses on the use of high-resolution pollen analysis and landscape reconstruction to explore and fill gaps in our understanding of settlement and land-use changes in southwestern Germany during the La Tène period to the Roman era. The primary aim is to reconstruct vegetation dynamics and correlate these findings with archaeological data to identify the socio-economic shifts during the 2nd half of the 1st millennium BCE.

By analysing 32 high-resolution pollen profiles from lake and bog sediments, this project reconstructs key environmental and land-use reoccupation. Temporary peaks in the birch pollen curve and a decline in settlement indicators suggest brief interruptions in land use. This study fills critical gaps by clarifying whether these changes were local events or driven by broader regional migrations, particularly through the correlation of birch-pollen peaks with settlement disruptions.
The research methodology involves improving the chronological accuracy through radiocarbon dating of plant material, enhancing the resolution of pollen profiles, and analysing charred macroparticles to trace fire events and human activity. These detailed palynological investigations are synthesised with archaeological data to bridge gaps in our understanding of settlement dynamics, addressing unresolved questions about who reoccupied the land before Roman colonisation and whether incoming populations from eastern and central Europe drove these phases of reoccupation.

This project provides a more comprehensive picture of the late Iron Age landscape, offering crucial insights into the complex settlement dynamics in a region that has shown both discontinuities and continuities in land use. By focusing on the integration of environmental and archaeological data, this research fills gaps in the historical record, contributing to a broader discussion on population movements, land-use patterns, and the socio-economic transformations that shaped the late Iron Age and early Roman periods in Europe.

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S15-111

Transformations of La Tène settlement patterns in the Váli Valley (Northeast Transdanubia, Hungary) based on non-destructive data

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The research of the Late Iron Age in Hungary in the last century mainly focused on cemeteries, scatter finds, and occasionally oppida. However, in the last 20 years, as topographical investigations gained new momentum, Hungarian archaeologists became more invested in the surroundings of well-excavated settlements, cemeteries, and the rural landscape in general. Nevertheless, with a few exceptions, there is still little information on the settlement patterns of more extensive territories and their changes during the La Tène Period.
To gain more information about the topic, a comprehensive and systematic survey started in the autumn of 2023 in the Váli Valley (Northeast Transdanubia, Hungary), serving as the PhD topic of the first author of this presentation. The topographical research aims to investigate the different types of rural settlements and their patterns during various periods within the Late Iron Age and to track how these patterns changed over time.
For this topographical research, we utilise only non- and semi-destructive research methods, such as artefact collection, metal detector survey, aerial reconnaissance and geophysics. By combining different methods and using Geographical Information Systems (GIS), we are able to get a detailed picture of the sites without their destruction.
The investigation discussed above is still in progress. However, the results of the research so far are promising and give insights regarding different settlement types, the choice of location within the valley and possible relationships between sites.
The presented research project is supported by the National Archaeological Topography Program of the Hungarian National Museum Collection Centre in cooperation with Eötvös Loránd University and King St. Steven Museum.

S15-112

Across the Alps - Encounters in the European Early Iron Age

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During the past years, Iron Age Europe has come into the focus of ancient DNA studies. Some of them suggest a gene flow between individuals from cultures north and south of the Alps as early as in the 7th/6th centuries BCE, when large parts of Europe north of the Alps were characterized by the Early Iron Age Late Hallstatt cultures. However, large-scale movements of people from north of the Alps into Italy would have been expected only later, in course of the so-called Celtic migrations in the 4th/3rd centuries BCE. By applying a multidisciplinary approach, we show that individual contacts between West/Central Europe and Mediterranean cultures of Italy have been intensified much earlier, and that some common narratives about how to identify intercultural contacts in the archaeological record need to be reconsidered.

S15-113

Connectivity, ancestry and mobility during the Iron Age - new evidence from ancient DNA

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ERC-funded project MICROSCOPE, which started in late 2019, has by now generated ancient genomic data from nearly 1000 ancient individuals, mostly dating into the European Iron Age between 800 and 100 BC. In addition, we developed new statistical methods to investigate past human mobility with higher detail and more quantitative insights than was previously possible. Here, I will demonstrate results from several core regions, with the strongest focus on a recent study on late Hallstatt elite burials from Southwestern Germany. I will show how modeling kinship and ancestry through space and time allows for new quantitive insights into past social practices and mobility. Specifically, two of the richest burials from European prehistory, the burials from Eberdingen-Hochdorf and Asperg-Grafenbühl were related as uncle and nephew, based on a new integrative statistical approach combining archaeological, anthropological and genetic data. Beyond kinship, our analyses reveal patterns of long-distance mobility, for example across the Alps, as evidence by multiple individuals from both north and south of the Alps with non-local ancestry, which we can model explicitly in space. I will present preliminary results from ongoing studies in Austria and Southeastern Europe, covering different Zoom-levels, from micro-regional relationships and patterns of integration of foreigners, to large-scale patterns of connectivity between Europe and Western Asia.

P01-290

Ceramics as a Source for Research on Cultural Variability

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The most important source available to archeologists is pottery, the most mass product of prehistorical communities, which has specific local characteristics and, as a result, defines regions and cultural zones.
At the turn of the 3rd and 2nd centuries BC, various civilizational trends intersected in Greater Poland, resulting in a new civilizational model that is visible among the communities of the region. However, the reconstruction of the dynamics of this process and its components encounters a serious barrier, which is the lack of precise possibilities for separating ceramic materials from this phase. In the area of the European Lowlands, covered by the Pleistocene glaciation, the source material is common and easily accessible. Also, in Central Europe, it was observed that country potters used local outcrops and change them as needed. They mix till and clays from different sources to obtain a proper paste.Our study revealed that the chemical diversity of ceramics is smaller than the diversity of the source material and concluded that in postglacial areas, the preparation process might be more influential on the chemical composition than the source material. We observe rather "taskscape" than provenance, but the role of each component is unknown. This shows an entirely unique, hitherto unexplored problem on the border of archaeology and natural sciences.

P01-299

Scripta manent? About Some Early Inscribed Objects in 'Alphabet of Lugano' of the Gallic Sequani Tribe

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A recent doctoral work on the chronology of Gaulish inscriptions in eastern Gaul has enabled us to isolate a small but valuable corpus of inscriptions in the 'Lugano alphabet' from the *Sequani* territory on locally produced objects. Dated to the 6th and 5th centuries BC, they have been known since their respective discoveries (Collet, Briquel 1994; Verger 2001). However, their local attribution is only recent, following new research on the artefacts (e. g. Dubreucq et alii 2018).

The Lugano alphabet has only been attested to date in Switzerland, with the Sequane territory situated close to this area via the Jura mountains. This suggests an attempt to transmit writing beyond the Jura reliefs during the Final Hallstatt and early La Tène periods. However, the available documentation and the rarity of these early written testimonies in Central-Eastern Gaul indicate that this transmission was episodic : no other written mention of a Celtic language was found before the early 1st century BC, when other cultural and economic contacts took place.

The objective of this poster is to present these objects, examine the value of these inscribed messages and put forward hypotheses for the transmission of a written practice in the Jura region, taking into account the circulation routes.

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S15-118

Northern Gaulish sanctuaries and Southern Scandinavian war booty sacrifices: A structural comparison

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For many decades sanctuaries in Northern Gaul – such as Ribemont-sur-Ancre and Gournay-sur-Aronde – have been subject to archaeological research. The discovery of ritually destroyed and sacrificed weapons as well as animal and human bones in sanctuaries built for this purpose gives insights into post-conflict rituals and religious concepts of societies in Pre-Roman Iron Age Europe. The conspicuous similarities to war booty sacrifices in Southern Scandinavia regarding the intentional destruction of weapons have been recognized. However, a detailed comparison of the phenomena has not yet been undertaken, also due to the chronological and spatial hiatus, which is proven to be irrelevant when it comes to studying the Iron Age post-conflict rituals across Northern and Central Europe.

An in-detail comparison of the sites in Northern Gaul and Southern Scandinavia has been the topic of discussion in the authors master thesis. Since some sites have not been excavated in their entirety and metals as well as organic materials are preserved differently in the wetland environment depending on the site, the conducted analysis was not done in a quantitative but a qualitative way, focussing on the presence and absence of different categories of findings. The comparative analysis divides the sites into external (natural environment, chronological context, architecture) and internal structures (material culture, human and animal remains, signs of intentional destruction on weapons, personal items and bones).

It became apparent that both Northern Gaul and Southern Scandinavian sites represent ritual locations used over long periods for weapon depositions and sacrificing. Northern Gaul sanctuaries feature monumental structures, unlike the Scandinavian sites, where natural water settings served as sacred spaces. Both regions exhibit ritual destruction of weapons and the presence of animal bones, suggesting ritual feasting. However, human remains, prevalent in Gaul, are rare in Scandinavia, though both display post-mortem manipulation. The sites highlight a military character with similar weapon types that are used in ritual practices, indicating an ideological link across Iron Age Europe. These results could serve as a base for further research, focussing on the development of post-conflict rituals on a geographical and chronological axis as well as understanding how Iron Age societies across Europe responded to violence and resolved conflicts.

S15-119

Good Times, Bad Times.Archaeological Horizons and Cultural Trajectories in Inner Thrace in Early Hellenistic and Pre-Roman Times (the Late 4th – the 1st centuries BCE)

Julij Emilov

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The presentation aims to provide a regional overview of major cultural changes in the East Balkan region during the timeframe from the Macedonian conquest to Roman expansion during the last three centuries BCE.

The Early Hellenistic horizon of archaeological data reflects the emergence and collapse of several urban centers in the interior of Thrace. A relatively short period of prosperity in the last decades of the 4th and the 3rd centuries BC is followed by a deterioration of urban lifestyles in the Pre-Roman period (the 2nd – the 1st centuries BCE).

Examining the available archaeological evidence and the relevant information in the ancient historiography serves to delineate different trajectories of urban and micro-regional development, marked by the impact of regional conflicts and natural disasters (earthquakes).

Three case studies (Seuthopolis, Sboryanovo and Vratza) illustrate the reflections of Hellenistic/ Roman impulses as well as the local responses to imperial strategies of the Diadochoi and the Roman Republic, highlighting the transformations of the "barbarian centers".

S15-120

Transformations of weighing practices through time and space across Iron Age Europe

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The earliest evidence of weighing practices in Europe can be found in the archaeological record of the Middle Bronze Age. In the context of archaeological studies of the European Late Prehistory, they are frequently employed as proxies for economic activities, playing an instrumental role in trade and monetary transactions. In this model, the adoption of these practices is traditionally regarded as an evolutionary step towards greater complexity and sophistication in social and economic structures, enabling the development of chrematistic transactions and currencies to facilitate them.
The aim of this paper is to present a more nuanced picture of the socio-economic role of weighing and how it evolves through time and space by providing an overview of our knowledge on weights and scales during the Iron Age in different parts of Europe. This overview will include a description of the characteristics, functions and distribution of weights and scales from this period. This study is based on an analysis of archaeological evidence from the British Isles, the Iberian Peninsula and Central Europe throughout the 1st millennium BC. It proposes a non-linear model of the adoption and use of weighing practices in pre-Roman Europe. This situation is contrary to the hypothesis that Late Prehistoric people employed measurements in a progressively normalised and accurate manner, from their initial adoption during the Bronze Age to the Roman era.
This overview will provide a foundation for a comprehensive examination of the socio-economic shifts and transformations that occurred during the Iron Age, with a particular focus on the role of metrological instruments in these processes. In particular, the paper will emphasise the relationship between weighing practices, trade and money, and situate these discussions within the broader context of current research on the subject.

S15-121

From graphitic situlae to pots with thickened club rims? Changing networks and their impacts in the light of Late La Tène Transdanubian ceramic assemblages

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Graphite-tempered situlae are among the most characteristic finds of the Eastern La Tène Culture from the LT B1 phase up to the turbulent historical period of the 1st century BC and sporadically beyond. With its heyday during the LT B–C periods, the vessel type was common in large numbers in the Late Iron Age sites from Lesser Poland to the Northern Balkans, and from the Rhine Valley to Transylvania. The graphite was mostly traded in the form of lumps, mainly quarried in the area of the Bohemian Massif. The widespread distribution and the high degree of form uniformity in their quality and design indicate the existence of an extensive and well-established trade network in the given area where related technological knowledge, practices, and connected meanings also circulated.

It is still not unequivocal why this system underwent major changes during the Late La Tène period: in some regions, the use of graphite almost wore out completely, while in others, it reached the peak of its application. A new type of vessel – the so-called pot with thickened club rim or pseudo-situla – also appeared in this phase, seemingly replacing graphitic situlae. Formed of roughly tempered clay, with vertical and diagonal, wavy or arched combing on their outer surface, these pots have a link with graphitic situlae as their shape, size, and decoration are quite similar. The question arises: was there a direct link between the appearance of the new vessel type and the decline in the number of graphitic situlae? How can we trace the adaptation process of communities in a changed environment linked to these finds? In this presentation, we aim to examine this problem through ceramic assemblages from different sites in Southern Transdanubia, namely Báta–Öreghegy oppidum, Balatonföldvár–Földvár smaller fortified settlement and Zamárdi–Kútvölgyi-dűlő II. open settlement.

S 16: Modelling conflict in archaeology

S16-123

Modeling and evaluating prehistoric conflicts in a broader context

Daniel Kondor, Peter Turchin

Complexity Science Hub, Vienna, Austria

The role of violent conflict in prehistory has been the focus of substantial research and fierce debates. Resolving some of the fundamental questions has been difficult due to not only the scarcity of data, but conceptual challenges concerning the assumed causes and consequences. In well-studied regions, estimates for the general prevalence of conflict are now available, but more detailed analysis of spatiotemporal patterns is still not possible. In this talk, I will review recent evidence for conflicts in prehistory and their interpretations, along with a broader discussion on the importance of the social context of conflicts. I will argue that the importance of conflict goes beyond those who directly participate in it, and that emergent cultural norms related to the possibility of conflict and for the avoidance of conflicts can have a substantial role in shaping prehistoric social interactions. I will also briefly discuss our group's recent work showing how computational models together with data can be used to better understand the wider scope of conflicts, compared to what is possible based on only direct evidence.

S16-124

Empirical models of prehistoric conflict processes

Oliver Nakoinz[1], Sebastian Schultrich[2], Students of Hauptseminar Die Archäologie von Konflikt und Deeskalation 2[1]

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This paper will contribute the results of a seminar at Kiel University in the coming winter semester on conflicts and de-escalation. The purpose of the seminar is to develop descriptive conflict models, based on the ROOTS SC6 methodology, for different case studies and sets of empirical data. Since the seminar has not started yet, not detailed content can be presented with the abstract.

S16-125

Exploring the Link Between Conflict and Demographic Pressure. A case study from Prehistoric Northern Europe

Giacomo Bilotti

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Conflicts are a pervasive aspect of human societies, both past and present. However, understanding the impact of conflict on prehistoric societies remains challenging and often contentious. Research in this area has frequently relied on ethnographic analogies, qualitative data interpretation, and is sometimes influenced by the personal ideologies of scholars interpreting specific cases.

The aim of this paper is to move beyond qualitative approaches by adopting a quantitative framework based on hypothesis testing. Given the broad range of conflicts and the many possible causes, I will focus on a single relation which is frequently assumed in the literature. In particular I will test the following hypothesis: **is conflict correlated with demographic pressure?** Here, I examine armed violence (or its representation) between individuals and groups in southern Scandinavia during the Late Stone Age and Bronze Age.

To proxy violence, I will examine the presence and distribution of weapons over time and across locations, assessing these trends in relation to demographic changes. This region is particularly suitable for such a study due to the large amount of stone and bronze weapons and the availability of extensive archaeological datasets, which enhance the potential to explore the relationship between weapons and human occupation. Furthermore, recent advances in palaeodemography enable a more precise reconstruction of population variations at different scales, allowing for a more structured comparison of the two proxies.

S16-126

Does conflict potential increase with population size?

Søren Wichmann, Andrea Santamaria

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In a previous study, we have presented an “Escalation and De-Escalation Pyramid” which organizes conflict dynamics in five different steps. Each step refers to one escalation and its corresponding de-escalation process. Steps are defined by the presence of different indicators. When an indicator is attested for a given conflict situation, one can infer that the situation reached the corresponding level. At the basis of the pyramid, we detected indicators possibly referring to “conflict potential”, which means that they have a potential to lead to further escalating dynamics.
Here, we expand upon this model by investigating the relationship between one of the potential indicators, namely population growth, and the presence or absence of indicators for conflict escalation and de-escalation. To do this, we correlated data on (a) polities’ population size, (b) features of their military sphere (i.e., presence of weapons, armor, fortifications), and (c) outcomes of their military actions (i.e., levels of violence or evidence of exterminations and ethnocides). Data were extracted from the Equinox dataset, which is a part of Seshat project and pertains to 375 different polities spanning from the Neolithic to the present day.
The correlations show that larger populations are typically associated with massive fortifications and sophisticated armor. Conversely, while increasing population size shows a linear correlation with the hierarchization of armies, this is rarely accompanied by a higher frequency of offensive weaponry. These correlations also allowed us to observe the clustering of the individual variables under scrutiny. This clustering helps to clarify the interpretation of some debated indicators as either escalation or de-escalation proxies. For instance, palisades may potentially be interpreted as either tools for threatening potential enemies or collectively negotiated infrastructures for border regulation and inner-polity organization. Here, the clustering of this variable with items like ramparts and ditches demonstrates that this second interpretation is more likely.
Overall, what emerges is that growing populations are a decisive factor leading to large-scale collaborative efforts resulting in monumental defensive structures and greater technological professionalization of military personnel. Despite this, we have not yet found evidence that such dynamics correlate with an increased threat or with a higher actual usage of violence.

S16-127

Environmentally induced conflict in Mid-Holocene Central European societies?

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In recent years archaeological thinking has increasingly been informed by very large data sets, sometimes encompassing the entire planet. With these, traditional research questions may be readdressed, and often new perspectives and interpretations result out of such data-driven, multiscalar approaches.
For example, whether the rise and decline of Neolithic societies was driven by endogenous (demography; social, encompassing conflict) or exogenous (climate; environment) factors can be re-assessed using large data compilations: Based on empirical case studies in Western Central Europe, and using population and climate proxies, we look at the interplay of endogenous and exogenous factors on various scales of spatial resolution, ranging from local to a lastly global scale. Initial results of this approach show that the explanatory power of factors shift on temporal as well as on spatial scales.
Conflict appears as a constant low-level variable on local scales, with at times considerable outbreaks of atrocities also on regional scales. Moreover, violent conflict appears to have become more regular over time.
While conflicts may have been enforced by unfavourable environmental conditions, the latter are no prerequisite for conflicts to arise. Instead, the simple farming societies of the Neolithic and Bronze Age seem to have been driven by an ‘inherent collapse’ mechanism, inevitably leading to outbreaks of direct and indirect violence.

S16-128

Archaeobotany and conflict: Do they always show up in the archaeological record? Examples from Zeytinli Bahce, Turkey

Tim Mattis Schroedter

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The presented study addresses the tension field between conflicts and the potential variability in resource exploitation and shifts in diet on the background of a site occupied over nearly 4.5 millennia.
At Zeytinli Bahce, Turkey, the occupation from Chalcolithic to Byzantine times must have resulted in heavy human impact on the surrounding landscape and therefore displays an excellent example for the reflectance of conflicts in the human - environmental relations and their archaeological footprint.
Although archaeological structures reflect major changes in architecture and social organization in several time periods, the archaeobotanical and anthracological records seem to draw an opposite picture. From the anthracological and the archaeobotanical perspective, only marginal changes reflect continuity for most of the archaeological periods and thus lead to the question, if changes in the social organisation of communities necessarily find their way into the different aspects of social routines from architecture to resource exploitation. Can conflict be traced in building material and do socio-political changes impact dietary choices or can environmental constraints limit the chances for major shifts in the

economic models and thus cover intense social disruptions? Do social conflicts necessarily lead to the change of basic economical shifts? These questions will be addressed from a dendroarchaeological and archaeobotanical perspective.

S16-129

A quantitative model of conflict, with a case study from Early to Middle Bronze Age Crete

Andrea Santamaria, Søren Wichmann

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In a collaborative effort between archaeologists, historians, and linguists we have developed a model designed to describe different aspects of conflicts and to compare conflicts across time and space. The model takes into account different levels of both escalation and de-escalation, embracing all the possible aspects of a conflict from a mere undeveloped potential over complete annihilation to various countermeasures and stages of resolution. Through ten relatively detailed European case studies spanning the Bronze Age to the 20th century we demonstrate the comparative potential of our model and suggest ways in which it may help to identify typical patterns in conflict situations.
For the purpose of the present paper we have selected one of the case studies for an in-depth demonstration of how our conflict model explains archaeological data from Aegean Pre- and Protohistory. The case study in question concerns the role played by the earliest European writing in de-escalating elite conflicts during the Early to Middle Bronze Age transition on Crete. We suggest that the adoption of Cretan Hieroglyphic within literate administrations can be understood as having an effect of de-escalation, perhaps even a conscious strategy for achieving such an effect. The development occurs immediately after – and partially overlapping with – a period of conflict escalation on the island.
The standardized descriptions of conflicts yielded by our model as applied to the ten case studies are amenable to quantitative analyses aiming at the extraction of typical patterns of conflict. Duly considering the limitations of our data we illustrate how to extract such patterns.

S16-130

From conquest to cohesion: Linguistic data for understanding conflict dynamics in Hittite Anatolia

Eleonora Selvi

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In the Bronze Age Hittite archives, cuneiform tablets were discovered bearing inscriptions not only in Hittite—the Indo-European language spoken by the rulers of Hatti during the 2nd millennium BCE—but also in a diverse array of other languages.
This contribution investigates how linguistic and epigraphic features may serve as indicators for modeling escalating and de-escalating processes among conflict dynamics. Specifically, we examine, from a quantitative perspective, the variation between (1) bilingual and monolingual (Hattic and Hurrian) texts within the Hittite archives between 1600 BCE and 1300 BCE; (2) their typologies—such as war accounts, religious texts, and economic treaties; (3) the prevalence of Hattic and Hurrian names and titles within the Hittite court; and (4) the linguistic and orthographic proficiency of Hittite scribes in these languages.
Our findings indicate that the Hittite relationships with the Hattic and Hurrian populations followed distinctly different trajectories. Hattic influence on contemporary Hittite gradually declined, aligning with archaeological and historical evidence of the political assimilation of Hattic into the Hittite state. However, Hattic cultural influence—manifested in religious texts and bilingual compositions—persisted, suggesting that these texts arose from intercultural and interlinguistic collaborations among scribes from diverse backgrounds, rather than from a unilateral attempt by the Hittites to assimilate the cultural and linguistic heritage of subordinated peoples (Rizza 2002). Conversely, Hurrian influence on contemporary Hittite fluctuated significantly over time, mirroring the shifting political alliances and hostilities between the Hittite Empire and the Hurrian kingdom. This variation is also reflected in the Hittites' fluctuating interest in Hurrian religious and cultural texts (Giusfredi & Pisaniello 2023).

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S16-131

Roman trade models using normalized pottery data - a data analysis review

Katharina Zerzeropulos

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Comparability of models very often depends on the data that is used for the modelling process, which is why the quantification and later normalization needs to be of utmost importance to understand if models can reach the state of being comparable with each other.
Scientific modelling is first and foremost a combination of empirical and theoretical models, aiming at creating a modelled record similar to the one of the empirical model that is used as a base for the archaeological material (Nakoinz - Knitter 2016).
In the case study presented in this paper, pottery data from the Mediterranean coast in a period from 50 BCE to 150 CE will be used to understand the trade mechanisms of the early Roman Empire. It is widely believed that trade and economic frameworks have had a large influence on the development and settling of conflict potentials (Temin 2013; Wichmann et al. forthcoming), which is why a better understanding of the like, may lead to new insights into conflict management in the past.
A focus will be put on the normalization of the empirical data model, as well as the conceptionalzation of a basic layout of the theoretical backdrop. The levels and parameters of the ABM concept for the theoretical models will be elaborated on and various combination scenarios presented.
Possible shortcomings and interfaces for adding new data shall be discussed in light of the extension of the empirical dataset.

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S 18: Living with the water

S18-132

Nature-culture interactions in an extreme landscape: the synanthropic salt marsh

Annet Nieuwhof

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The salt marshes of Wadden Sea were first colonized in the Early pre-Roman Iron Age. Salt marsh habitation was dependent on adaptive strategies that enabled life in this extreme natural environment. As salt marshes are regularly flooded by definition, permanent habitation was only possible when the houses were built on raised areas. In the early stages of terp habitation, this was a gradual process: houses were first built on small platforms, which in the course of time developed into terps. Habitation spread while the salt marshes expanded, a process that continued into the later Middle Ages, even after dike building began.
By adapting to the landscape, people profited from its fertility, its accessibility and its openness. By doing so they influenced the landscape and changed it, but in turn, the landscape also strongly influenced the way of life of its human inhabitants. Nature and culture were engaged in a continuous cycle of action and reaction and thus developed together. This interrelatedness inspired us to the term 'synanthropic salt marsh'.
This paper will discuss this relationship and show examples of the physical remains of human adaptive strategies.

S18-133

New insights into dwelling mounds and beach ridges in Butjadingen

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Since the end of the last glaciation, the North Sea coast has generally experienced a rising sea level. Yet, during the Roman Iron Age the coastal fringe of Butjadingen, Germany, prograded and formed several distinct natural beach ridges. The newly developed landscape attracted settlers, who benefitted from the connection to the Weser as well as the fertile, calcareous clay district. While they initially settled on these beach ridges at ground level, over time these settlers built dwelling mounds (terps) by the stacking of manure and 'Klei' sods made of clayey to silty sediments of the surrounding area in order to raise their settlements from the wet ground. To this day, such dwelling mounds characterise the landscape. Since the Middle Ages, the natural development of the landscape has been stopped by the construction of a closed coastal dike line. However, even then the dwelling mounds remained important as dikes initially provided only limited protection against storm surges. Over the last 90 years, some dwelling mounds have been partly archaeologically excavated in the region, while surface finds are known from several others. Not only do these offer insights into the lives of people in the past, but also allow typochronological dating. Our investigations focus on the area between Langwarden and Roddens in the northern part of Butjadingen and aim to systematically asses the human-environment interaction applying an interdisciplinary methodological approach. Today, many dwelling mounds and beach ridges in this area are well preserved, mostly not built upon and located on agricultural fields. Geoscientific maps, LIDAR-based elevation models, legacy data from drillings and geomagnetic prospections formed the basis for our selection of suitable research locations. Results from our recent drilling campaigns and the excavation at the terp 'Hasenburg' offer new insights into the environmental conditions and the resources available during the formation of the coastal landscape 2000 years ago. Moreover, the numerous finds of pottery, animal bones and mussel shells tell of the everyday life, diet of people and trade contacts of these times. Together with a robust chronology based on typological archaeological finds, radiocarbon (^{14}C) and optically stimulated luminescence (OSL) dating, a picture emerges on how geological preconditions and sediment processes shaped the landscape of Butjadingen and how this influenced settlement patterns and adaptation strategies.

S18-134

Human-wetlands interaction in Adriatic Lagoon environments during the 2nd and 1st millennia BC

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This presentation stems from the project "SHORES - Living on the shore: sustainability and connectivity of the Adriatic lagoon environments: research, preservation, and promotion of pre-protohistoric cultural landscapes", a joint research program between the University of Udine and Sapienza University of Rome.

Through an interdisciplinary approach, our research explores settlement dynamics, adaptation strategies, and land use in the western Adriatic coastal wetlands with a focus on cases studies from the northern (Grado lagoon - Aquileia) and southern (Salso lagoon - Coppa Nevigata) during the 2nd and early 1st millennium BCE. The main goal is to gain new insights into human-wetlands interactions during Late Prehistory. Lagoon environments provided both defensive advantages and access to a wide range of environmental resources, favouring at the same time connectivity through coastal and maritime mobility and exchange.
Although the environments in the two case-studies area exhibit distinct characteristics, both experienced unstable river regimes and fluctuating lagoon conditions. In the Upper Adriatic, instability is visible in the shifting of watercourses and changes in settlement patterns. For example, the settlement of Ca' Baredi-Canale Anfora near Aquileia was abandoned towards the end of the Bronze Age, while Essiccatoio Nord, 2 km further east, was established in the early Iron Age. In the area south of the Gargano, changes in the lagoon led to progressive silting during the 2nd millennium BCE, causing the abandonment of the fortified settlement of Coppa Nevigata in the early 1st millennium BCE.
In our presentation, we will examine how resource exploitation, climate variability, and environmental changes affected the human-wetlands interactions in these regions, through a combination of bioarchaeological, geomorphological and archaeological data. Our study provides insights into diachronic patterns of settlement development, resilience and decline that may broadly contribute to the understanding of the histories and dynamics of other comparable coastal landscapes, such as the European Wadden Sea region.

S18-135

Coastal changes and human occupation in the eastern partof Thessaloniki Bay - a marshland settlement of Gona in the light of geoarchaeological research.

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The marine transgression in the Holocene has significantly changed the prehistoric and historic settlement networks of North-Eastern Mediterranean. In our study we focus on a Bronze Age settlement mound of Gona located in Northern Greece. The tell has witness human occupation since the Late Bronze Age according to previous research. By using multidisciplinary geoarchaeological tools (ERT, vibra-coring, sedimentology, malacology and radiocarbon dating) our study resulted in reconstructing the maximum transgreesion at ca. 3000-2500 BC as well as discovering even earlier stages of habitation. After the maximum transgression the sea coast began to retreat due to increased Anthemous River delta progradataion rate and resulted in formation of extensive marshes. Human habitation in the area was confirmed for each of the landscape formation stages thus suggesting human persistence in a changing coastal environment.

S18-136

Medieval overexploitation as trigger for large-scale drowning and permanent land loss in the Rungholt area, North Frisia (German Wadden Sea)?

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Since 2015, the RUNGHOLT project investigates the natural development and impact of medieval cultivation and major storm surges on the coastal landscape of the North Frisian Wadden Sea region. Between the Nordstrand peninsula and Hallig Südfall, interdisciplinary research based on systematic geophysical prospection, geoarchaeological investigations and archaeological survey gives new insight into the once cultivated landscape, drowned by the 1362 AD "Grote Mandränke" and still preserved beneath recent tidal flat deposits.
Coring and trenching, a subsequent analysis of sedimentary, geochemical and microfaunal palaeoenvironmental parameters and radiocarbon dating show the local stratigraphy to be strongly affected by human impact, especially in medieval times.
Combined with geophysical prospection results on settlement structures and coastal protection as well as archaeological evidence, we found that medieval land reclamation obviously moved from a flood-protected marsh area westward into an extensive fen and bog landscape. Here, peat formation dominated from c. 800 BC to at least 1000 AD but remains are mostly missing in the local stratigraphy. Instead, we found 12th to 14th cent. AD settlement remains directly on top of a pre-800 BC fossil marsh. From this distinct hiatus of c. 2000 years, we conclude that cultivation measures widely included the complete removal of peat to use the underlying marshland for agricultural purposes. This type of cultivation is also

supported by quite typical so-called “Hufen” settlements found all across the study area.
Distinct sedimentary evidence of 15th cent. AD tidal flat deposits directly on top of the cultivated fossil marsh further proves medieval peat extraction to have lowered the ground surface well below mean high water of that time. Despite some exceptional coastal protection measures, cultivation thus clearly increased the study area’s coastal vulnerability and favoured the devastating effects of the 1362 AD “Grote Mandränke” storm surge. For our study area, we therefore consider intense human-environment interactions as decisive trigger for the establishment of the tidal flats that are nowadays part of the UNESCO World Heritage “Wadden Sea”.

S18-137

Temporalities of land reclamation and sedimentation infrastructures in the North Frisian Wadden Sea

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Located in the Wadden Sea, the Halligen are marsh islands that experience annual flooding between two to ten times a year. Flooding is addressed through the building of ‘environmental infrastructure’ (Blok, Nakazora, and Winthereik, 2016) of summer dikes that protect habitation efforts through dike construction. This particular method of land reclamation reflects local and cultural history, as demonstrated by Theodor Storm’s novella, The Rider on the White Horse, where he reflects this through the reading of dike-building literature of the 18th century (Weber, 2016). In the contemporary, the Halligen area and the Wadden Sea need to respond to climate change and increasing sea levels. Using ethnographic research methods, I research a European initiative focused on infrastructure that uses “nature-based solutions” to boost sediment accumulation and combat erosion, helping the Halligen and mudflats adapt to rising sea levels, whereby one infrastructural technique is the “Rohrkoog,” which allows to direct sediment-rich water to the Halligen. My ethnographic study focuses on the relationship between the historical infrastructure of dikes and the experimental or “new,” emphasizing the necessity of the latter evolving from the logic of the former. This approach demonstrates the influence of political elements and emphasizes how historical contexts can restrict some actions while enabling others. This can be identified in the cultural and political unwillingness to move the dike back or even remove it to make the Wadden Sea move inwards with the rising sea level. At the same time, options for heightening the Halligen and even the Wadden Sea seem more feasible. This shows that politics have been inscribed in matter throughout history, modifying the landscape for centuries and now deeply intertwined with political issues (Bijker, 2007). Anand highlights the importance of examining the time-related aspects of infrastructures to fully comprehend their nature, which leads to a comprehensive insight into their characteristics and future consequences. The politics surrounding the dyke enable certain futures but restrict other possibilities (Anand, Gupta, and Appel, 2018, pp. 15–19). This presentation regards this as a ‘chronopolitical experiment’ (Zee, 2017) that connects past and future temporalities.

S18-138

The lost Wadden Sea and how to reconstruct it

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Today, Horns Rev and Blåvandshuk marks the northern border of the Wadden Sea World Heritage Area. However, until the early Modern Period the Wadden Sea stretched much further North. Today this part of the west coast of Jutland is covered in dunes or lost to the sea. The existing Danish part of the Wadden Sea also has seen major changes caused by floods and wind.

Jutland’s former coastline towards the North Sea and how it developed over time can be reconstructed using a range of different sources.

In the paper a church list from the 14th C. listing all churches in the Ribe diocese is combined with studies of the existing Medieval churches to create a complete map of the parish structure and how it was changed over time by the sea and the wind – looking both North and South of Horns Rev and Blåvandshuk.

The second part of the paper demonstrates how local conditions in the coastal areas of the Danish Wadden Sea can be reconstructed in good detail using historical maps, excavations and finds from metal detecting.

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S18-139

What made the tidal river Hunze relocate to the north-west?

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Abstract: The main tidal river *Hunze* that originates on the Pleistocene, higher grounds of the present province Drenthe in the Netherlands, initially discharged into the *Waddenzee* to the north of the town Groningen. The old name of the region *Hunsingo* as well as the present elevation map of the province Groningen still reflect this past situation. During the Carolingian period, the course of this river gradually moved westwards and became the western frontier of *Hunsingo*, discharging into the *Lauwerszee*, an inlet of the *Waddenzee* to the northwest of the town Groningen. This relocation of the estuary of the *Hunze* from North to Northwest had all kinds of effects for the natural watercourses of the sub region *Halfambt*. The main settlement centre of this subregion were the twin *wierden* Baflo-Rasquert that both developed strongly during this period. It seems that this habitation centre had for centuries a seaborne watercourse discharging into the *Hunze*. The presentation will address besides the relocation of the *Hunze*, the altering watercourses in the region *Halfambt*, as far as they can be reconstructed.

The forces of nature that led to the replacement of the estuary of the *Hunze* are fairly well understood. They involve the silting of the northern estuary due to new depositions of marine sediments along the *Waddenzee* coast, as well as the evolution of the *Lauwerszee* outlet. This outlet developed from a small gully into the *Waddenzee* to an ever-wider watercourse probably due to peat forming as well as the quarrying of peat soil. Another reason will have been the occasional storm floods. Both natural and human interference seem to have been decisive for the opening of the *Lauwerszee* estuary. More contested is the dating of human interventions near *Winsum*, the hinge within this history of relocation. The present *Winsumerdiep*, a canal from *Onderdendam*, passing *Winsum* and discharging into to the *Reitdiep*, is a relic of the ancient *Delf*, a large scale, artificial canal. The dating of the *Delf* near *Winsum* is questioned. However, there are indications that its construction emerged around 1000 and not around the 13th/14th century as implied by the present palaeographic maps. The silting of the northern estuary of the *Hunze* during the early Middle Ages will have caused drainage problems for the lower parts and peatbogs of the *Halfambt*. By 1000 it could well have resulted in the early digging of the *Delf* that watered into the *Reitdiep/Lauwerszee*.

S18-140

Unravelling the chronologies of coastal landscape features using OSL profiling and dating

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The medieval North Sea coastal plains were dynamic landscapes, shaped by a complex interplay between natural processes and human interventions. By the first millennium AD, inhabitants of these regions began to exploit and manage these landscapes on an increasingly large scale, through reclamation and water management strategies. What is often lacking however is a precise chronological understanding of the landscape change.

The presented project focused on three case study areas across the North Sea coast: the Middle Coast of Belgium, Hallig Hooge in Germany, and Misthusum in Denmark. These areas, rich in medieval settlement history, present well-preserved traces of both the natural landscape (e.g. silted up tidal channels and salt marsh development) as well as early human strategies for living in and adapting to the dynamic coastal environment (e.g. dwelling mounds and embankments). Landscape features such as these, made up of complex sediment sequences, are notoriously difficult to date. Some of the most commonly used approaches – which include dating artefacts recovered from within the earthworks, dating through associated archaeological features, and direct dating of ecofacts and sediments using radiocarbon or optically stimulated luminescence (OSL) methods – can be problematic. Over the past 20 years, the development of portable OSL equipment has offered a potential solution, as it allows for luminescence-depth profiles to be generated for the entire stratigraphy of a feature in near real time during fieldwork. The insights this provides in its relative chronology inform the subsequent strategy for collecting larger OSL dating samples. Examining the luminescence behaviour of a whole stratigraphic profile also means the dating samples are not isolated and sediment ages can be contextualized, which provides tighter control on the feature's age and a better understanding of its depositional sequence.

By combining the dating evidence with additional information from wider archaeological surveys, historic sources, earth sciences data and computational modelling, it becomes possible to create detailed landscape histories that go beyond the scale of the individual features. In this way, the study helps us better understand the long-term evolution of these coastal plains and how people adapted to life in these dynamic environments, modifying the landscape itself in the process.

S18-141

Ava Ranga Uka A Toroke Hau – A Prehistoric Water Management Site on Rapa Nui (Easter Island, Chile)

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Over a thousand years ago, Polynesian seafarers settled on the island that would later become world-famous as the UNESCO World Heritage site Rapa Nui. One of the greatest challenges for the successful settlement of the island was the extreme scarcity of freshwater. Unlike most volcanic islands in Polynesia, Rapa Nui has no permanent rivers or streams, making accessible drinking water a rare and valuable resource. Toponyms and oral traditions suggest that much like on other islands in Polynesia, some water sources were under taboo and thus controlled by the elites.

The site of Ava Ranga Uka A Toroke Hau is located in the very center of Rapa Nui inside the widening of the only seasonal stream of the island. Twelve years of geo-archaeological research at the site could show a complex system of hydraulic architecture, controlling and guiding the flow of the water. Hydraulic engineering included water-basins with clay caulking, sub-terranean aqueducts, and check dams.

Petroglyphs, offerings, and the architectural connection to the ceremonial platform Ahu Hanuanuamea (Rainbow Ahu) shows the strong ritual component of this water management.

Stratigraphic evidence for extreme flood events shows that water was not only a valued resource but also a destructive force at the site of Ava Ranga Uka A Toroke Hau. Diachronic changes show the adaptation skills and the resilience of the Rapanui before contact with the European world.

S18-142

Understanding the drowned medieval town of Rungholt. Archaeological methodology for a conclusive settlement investigation in the tidal flats of the German Wadden Sea.

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The Rungholt-project has resulted in a large geophysical and geoarchaeological dataset from the tidal flats near the German Wadden Sea island Hallig Südfall, revealing the layout and structure of a drowned medieval coastal settlement. The area is deemed to be the fabled town of Rungholt which was lost in a storm surge in 1362. Archaeological investigations of the remains are difficult due to lack of accessibility, short time windows for fieldwork and other restrictions of the tidal flat environment. Only few and small sections of the archaeological sites are occasionally exposed from their recent sediment cover. To verify and sample the structures revealed through magnetometry, we developed a small-scale excavation frame that allows targeted excavations at a scale suitable for the work environment. In 2024, it was possible to excavate a section of a major church building, preserved in form of a thick foundation of shell debris and slags, that was dug into the peat underground.
Another part of the settlement is recently exposed by a tidal stream, uncovering single settlement elements like ditches and cisterns, as well as find objects. This long-known site was never fully understood due to its small and cut-out like extent. Through a combination of excavation, yearly field survey, metal detecting and sampling, we gained insights into the dating, everyday culture and status of the settlement. Thousands of pottery pieces from local and imported ware, animal and human bones and many metal objects form a large and informative material corpus. The incorporation of these visual archaeological finds into remote sensing data from drone photography and legacy land survey orthophotos, combined with the magnetometry, enables us to map an ‘excavation plan’ of the entire settlement, its structure and workings. The new overview on the find material of this small section of the settlement can be compared with the archived finds of the larger settlement chamber, revealing a thriving coastal community with a strong economy and means to invest heavily into the cultural landscape.

S18-143

Building resilience to environmental threats in history: Insights from three Asian cases

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Throughout history, communities have adapted their living environments to withstand various natural hazards, showcasing the dynamic interplay between cultural practices and environmental resilience. This study investigates how settlement patterns and architectural designs have contributed to coping with specific natural threats such as floods and earthquakes.

The first case study centers on the Achang ethnic group in Yunnan Province, Southwest China, who have historically constructed their homes with elevated wooden structures and stone foundations to mitigate flood impacts. These architectural strategies allow for natural water drainage and minimize damage during high water events, demonstrating a deep cultural understanding of the local environment and highlighting the role of indigenous knowledge in shaping resilient communities. The second case examines stilt houses in the Vietnamese Mekong basin, where seasonal flooding and coastal erosion necessitate housing designs that enable residents to elevate their living spaces above floodwaters. We assessed how the spatial arrangement and structural flexibility of stilt houses contribute to long-term resilience in flood-prone environments with considering community cohesion and the sharing of adaptive practices. The third case addresses architectural practices in Central Asia that have evolved in response to seismic activity. Traditional construction techniques integrated local materials such as timber and adobe, with designs intended to absorb and dissipate the forces generated by earthquakes. This study focuses on flexible wooden frameworks and reinforced mud-brick walls that not only offer physical protection but also reflect the cultural adaptation to recurring natural hazards.

Each case demonstrates how traditional knowledge and architectural practices are not merely passive adaptations to the environment but active strategies for survival that have been honed over generations. This comparative analysis contributes to the broader understanding of how human social relations and cultural practices shape settlement planning in response to environmental threats, offering valuable lessons for resilience planning in diverse geographic and cultural contexts.

S 19: Material culture and visualisation

S19-144

Taxonomy and anti-taxonomy. Some reflections from the rock art of Northwest Australia

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Conceptualising the relationship between style and function is one of the most persistent issues in archaeology. It has spurned many crucial debates within the research history of archaeology and has found different expressions during various periods of the discipline. Comparing, classifying and ordering material expressions into types is one of the most foundational practices of archaeology. A key part of the process of archaeological inference is pattern recognition and quantification. However, how do these respective observations relate to human perceptions and cultural understandings? How do they relate to the causes of human actions? While it is necessary to approach these questions with reference to an explanatory framework or approach, it is also possible refer to recent observations in ethnographic contexts to enhance our understandings of the above-mentioned relationships. In this talk and in this spirit, I want to briefly attempt to situate a range of rock art expressions in the Northwest Kimberley that have been classified into different styles and in chronological sequence, Western Australia, in their contexts of use.
The rock art in this part of Australia has been the focus of public and research attention since the 19th century. A key reason for this interest is the fact that most of the rock art of the Kimberley is deeply integrated into the lifeways of the local Aboriginal Traditional Owners. This situation allows for unique insights into the relationships between Indigenous understandings and formal archaeological and stylistic approaches and interpretations. The respective analyses show a complex picture that is mostly characterised by a disconnect between taxonomic patterns and Indigenous ideas. These differences can possibly be related to variable ontological schemes in the construction of the world. They point to equally complex relationships between material cultural expressions, human practices, perceptions, worldviews, and rationalisations. These insights draw attention to the difficulties of clearly relating human motivations and intentions to the material products of human actions even in ethnographic contexts with favourable access to a diversity of sources and materials. In the case of the Kimberley, these results also have ethical implications as Traditional Owners often feel disempowered and disconnected from their own heritage by modern formal archaeological interpretations.

S19-145

People and their painted kin: A new mid/late-Holocene rock art style from Northeastern Kimberley, Australia

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In this presentation, we argue for the inclusion of a new mid/late-Holocene rock art style to Kimberley's rock art sequence; the Linear Naturalistic Figures (LNF). These figures have been found in the northeastern Kimberley region, across 22 sites. This style is primarily composed of animal motifs (84 percent) with some occasional plant motifs (4 percent) and is characterised by large naturalistic figures presenting a continuous or linear outline. A detailed analysis of their subject matter and superimposition sequence shows that these figures are distinct from the previously described Irregular Infill Animal Period, mostly in terms of a lack of anthropomorphic motifs, lack of highly detailed anatomical features, and the characteristic strong linear outline and no infill. In this presentation, the results of a detailed iconographic analysis of these figures are discussed, along with a chronological revision of the Kimberley rock art sequence. We argue here that the LNF constitute a style on its own right - distinct from other Kimberley styles – and theorise that these figures are most likely mid to late Holocene in age. The analysis on the LNF style suggests people returned to depicting large naturalistic figures, particularly those of macropods. This is consistent with other naturalistic styles found across northern Australia and the Pilbara and Australian deserts. Finally, this return to depicting animal forms – following several millennia of highly decorated human figures – has been interpreted here as a paradigmatic change into how people perceived their landscape and related to art. We argue that this renewed emphasis for animals could be understood as an expression of kinship, where animals and humans share a common origin, which facilitated caring for Country.

S19-146

The cognitive affordances of South Scandinavian Mesolithic ornamentation

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The classification of sign types within prehistoric art research is deeply rooted in archaeological tradition, most notably with the structuralist principles of Leroi-Gourhan (1958). Recent work (Tylén et.al. 2024) can be viewed as a furthering of this work: with the interdisciplinarily founded assumption that "the overt content or structural configuration of symbolic artifacts carries traces of the adaptive pressures constituted by their actual use" (Tylén et.al. 2024:13), a conceptual model is laid out in which temporal changes in motif morphology can be used to infer the originally intended purpose of past ornamentation practices. Centrally, the introduced concept of 'cognitive affordances' acts as a mediating layer between the structure of prehistoric art objects and the proposed function they served. I here apply the model proposed by Tylén et.al. (2024) to the portable art of Mesolithic South Scandinavia. As this corpus is relatively extensive, well-studied, and representing a spatio-temporally delineated tradition of ornamentation, it serves as an ideal case for putting the cognitive affordance-model into practice. Motivated by this theoretical novelty, the synthesised corpus of Mesolithic south Scandinavian portable art is subjected to a set of controlled cognitive experiments to infer the temporal changes in motif 1) Saliency, 2) Intentionality, 3) Memorability, 4) Distinctiveness, and 5) Discriminability. These experiments, resting on the foundation that past and present human visual perception are governed by similar low-level Gestalt principles, allow new inferences regarding potential adaptive pressures on the morphologies of the motifs themselves. This methodology and associated theoretical framework thus bridge the research historical roots and future avenues regarding the search for meaning in prehistoric art; the structuralist foundational work of Leroi-Gourhan (1958), still inherent in contemporary sign classifications, is readdressed through a novel, interdisciplinary method rooted in the cognitive sciences, actively addressing the actual symbolic function which governed prehistoric art practices.

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S19-147

Material minds lab: Experimental results prehistoric pottery

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This paper presents initial findings from eye-tracking experiments conducted in the Material Minds Lab (INCIPIT-CSIC, Santiago de Compostela) as part of the Material Minds (XSCAPE) ERC Synergy project. This interdisciplinary project brings together neuroscience, cognitive science, archaeology, and anthropology to investigate how material forms are shaped by both historical processes and cognitive mechanisms. The experiments presented here focused on prehistoric pottery from diverse European regions, analyzing the eye movements and visual behavior elicited by each object. Through this approach, we assess hypotheses on societies' "internal models" and explore how these artifacts reflect both the rationalities of their beholder, as well as the societies that created them.

S19-148

Material mind lab: experimental results greco-roman ceramic

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The current paper presents the results of a recent eye-tracking experiment conducted in the Material Minds Lab (INCIPIT-CSIC, Santiago de Compostela) as part of the Material Minds (XSCAPE) ERC Synergy project. This interdisciplinary project integrates neuroscience, cognitive science, archaeology, and anthropology to explore how material forms are shaped by both historical processes and cognitive mechanisms. The current experiment focused on Greco-Roman pottery. The experimental selection considered chronology, context and stylistic and typological requirements. In the acquired data, visual attention patterns were analysed in order to investigate the distribution and sequence of attention across different parts and elements of each object. The results address how typology and chrono-stylistic developments influence attention allocation, revealing possible cognitive frameworks and interpretative models used by viewers. By assessing how formal and stylistic elements are looked at, we will discuss how these artifacts reflect both the rationalities of their beholder, as well as the social and cultural contexts of the societies that created them.

S19-149

On the 'novel' development of pottery styles in prehistoric Central Germany

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Stylistic variation has been a central concern in the study of pre- and proto-historic pottery. The variation of these ceramic styles have been usually addressed through a variety of explanations, most commonly of a typo-chronological nature, but also related to evolutionary forces, technological change, shifting social boundaries, among others. Following recent studies using tools from experimental psychology, in this paper we understand stylistic variation from a cognitive perspective, i.e. according to the visual effects that pottery styles elicit on their viewers.
Towards this purpose, in one of the most well-documented regions of Europe, i.e. the Middle Elbe-Saale region of Central Germany, two free-viewing experiments were conducted at the State Museum of Prehistory in Halle (Saxony-Anhalt, Germany) using 41 vessels that span from the year 5500 to 1 BCE. Our results show that the stylistic variation in the Middle Elbe-Saale can be understood as a series of phases of novelty and stagnation, which we suggest correlate with key socio-historical and technological changes in the region. Furthermore, the global trend in the five-thousand-year sequence, suggests an overall decline in innovation in the craft, which was likely linked to the historical push towards increasing specialisation and standardisation of the craft.

S19-150

Between Cultural Biases and Archaeological Knowledge: An Eye-Tracking Case Study on the Visual Analysis of Christian Medieval Nubian Wall Paintings

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With the adoption of Christianity in the 6th century CE, the Kingdom of Nobadia (present-day northern Sudan) became an important centre for the creation of Christian art. One stylistic convention used by Nubian artists in church decoration was the depiction of local authorities in a way that reflects their authentic appearances and ethnic origins, while holy figures were depicted with a white complexion as a key means of distinguishing saints from local authorities (Jakobielski et al. 2017).

The division between white and non-white figures was not only a significant means of expression in medieval Nubia, but may also carry implications for contemporary viewers of these paintings. As psychological literature suggests, when spectators view representatives of different ethnic groups, they tend to focus more on, and remember better, faces that match their ethnic background compared to those of other ethnicities (Meissner and Brigham, 2001).

To investigate the impact of this cultural bias in archaeological analysis, we asked 28 archaeology students from the University of Warsaw (Poland) to view Christian medieval Nubian wall paintings from the Faras Gallery at the National Museum in Warsaw at both the beginning and end of the summer semester in 2023, while their eye movements were recorded. Our goal was to determine whether the archaeological knowledge acquired during the semester would reduce their tendency to focus more on faces congruent with their own ethnicity (i.e., white faces) as compared to non-white faces.

Our results indicate that, after a semester of study, archaeology students focused more on faces that did not match their ethnic background compared to their initial viewing. However, we also observed that students may still be influenced by the cultural bias in question. The results obtained became a starting point for our discussion on the importance of developing data-driven educational programmes to support student learning.

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S 21: Next Generation Archaeology

S21-151

Death, deposition, and divide: Exploring inequality through an examination of social status and health at Kerma, a Bronze Age Nubian capital (1750-1550 BC)

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Archaeology plays a prominent role in scholarly investigations of inequality, tracing its origins and development through both space and time. However, traditional approaches to inequality in this field have long projected modern materialist conceptions of inequality onto the past, often relying on the use of methods that merely identify and quantify material disparities in the archaeological record. While recent years have witnessed a growing body of work that increasingly shifts its focus from hypermaterialist paradigms to experience-centred approaches to inequality, numerous archaeological contexts await reinterpretation. Such is the case for Kerma, the Bronze Age capital city of the state of Kush, Sub-Saharan Africa's earliest state. During the Classic Kerma Period (1750–1550 BCE), Kerman society is thought to have been highly stratified, an observation primarily based on material disparities observed in Classic Kerma's monumental burial mounds. Although much has changed since its initial excavation in the 1910s, our understanding of social organisation at Kerma remains rooted in early scholarship and requires reassessment. This study investigates inequality at Kerma by exploring the relationship between funerary reflections of social status and skeletal embodiments of differential health, a multi-faceted approach that highlights individuals and their lived experiences while considering their attachments to the material world that surrounds them. In this research, osteoarchaeological and funerary analyses are employed on a sample of 133 adult and subadult individuals from Kerma. Health status is explored through an examination of the following dental diseases and conditions: carious lesions, tooth wear, periodontal disease, calculus, periapical lesions, antemortem tooth loss, ablation, and osteoarthritis of the mandibular joint. Integrating insights from these skeletal markers allows us to address differential dietary habits, disease experience, and hygiene-related practices at Kerma, all serving as effective proxies for health inequality. Explorations of social status are based on funerary analysis, considering both material (i.e., tangible) and immaterial (i.e., intangible) aspects of burial practice. This presentation will share the preliminary results of this research, further contributing to a more nuanced and holistic understanding of inequality at Kerma, while demonstrating the value of reinterpreting such noteworthy archaeological contexts.

S21-152

Godsted Bog: Uncovering an Endangered Mesolithic Settlement

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The site of Godsted Bog is a notable area with several Mesolithic settlements on the island of Lolland, Denmark. Godsted Bog is today a dried-out peat bog that has been subject to agricultural cultivation throughout centuries. However, the site was once one of many nested islands in a lake utilised by prehistoric hunter-gatherer groups.

The local museum, Museum Lolland-Falster, possesses a significant collection of flint artefacts gathered by a local, which stands as a testament to the significant Mesolithic activity in the area. Few excavations were conducted in the early 1900's but Godsted Bog was yet to be professionally examined in modern day.

Due to agricultural drainage and climate change the old lakebed is now laid dry, which endangers the preservation of organic material. For that reason, in September 2023, the University of Copenhagen conducted a two-week field school as part of the Prehistoric Archaeology's masters programme in collaboration with Museum Lolland-Falster.

One aim of the project was to examine the state of preservation in the peat bog to determine if the considerable decline of moisture in the soil over time endangered the archaeological remains. Another focus was on researching and recovering organic material, additional flint artefacts or other archaeological finds, which could enrich our knowledge of the socio-environmental dynamics of late Mesolithic hunter-gatherer groups on Lolland.

The excavation uncovered the outskirts of a previously excavated Ertebølle settlement (5500-3900 B.C.) situated by the former lakeshore, and significant amounts of flint artefacts and zooarchaeological material in varying stages of decomposition. These finds highlight a site with primary settlement in the middle of the Ertebølle period and sporadic activity from preceding and subsequent periods. Moreover, the state of the zooarchaeological material declines significantly in the dried out stratigraphic layers of sediment, confirming the hypothesis of the negative effects of drainage in the otherwise well-preserved sites of Danish peat bogs.

Our research thus includes an examination of the plentiful and varying zooarchaeological material and flint artefacts, which points to a seasonally based in-land site, that was inhabited for several millennia by hunter-gatherers. Furthermore, our presentation will shed light on the rapid developing threat to rare Mesolithic sites, such as Godsted Bog, caused by climate change and agriculture.

S21-153

Smashed, defleshed and discarded? Preliminary results of re-examining the Mesolithic human bones from Dyrholmen (DK)

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This contribution is based on my master's thesis. The aim of this research was the inventory and osteological analysis of the human bone finds from Dyrholmen, a Mesolithic site in the eastern part of Jutland in Denmark. This site was discovered 1923, the main excavation was held 1939 by T. Mathiassen in the context of the second kitchen-midden commission (Mathiassen et al. 1942). According to Mathiassen's research, the three phases reconstructed in Dyrholmen also represent the different stages of the Ertebølle Culture. After the publication by Mathiassen, Degerbøl and Troels-Smith these three phases had been reevaluated and updated a few times (Hartz 1999). Different to the chronological aspects there was never a re-examination of the human bone finds (Degerbøl 1942).
The majority of all bones are highly fragmented with different traces of manipulations. The human bones of Dyrholmen are clearly unique and outstanding, not only because of the high number of individual finds, but also because of the different taphonomic changes that could be identified. In total 162 human bone finds had been anatomically identified. Despite the fact that most of the bones are highly fragmented, some osteological analyses were possible. More interesting is the classification of different manipulations. Under the term of 'taphonomic changes' manipulations were divided into organic and inorganic processes, with the aim to differ between potential agents and actions. The intention of this talk is not only to give an overview of the results, but also to demonstrate the importance of re-examining find complexes that have not received any further attention since their discovery or last publication.

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S21-154

Changing Lanscape Relationships in Iberia from the Mesolithic to the Neolithic: a Posthumanist Perspective

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This ongoing undergraduate dissertation examines the transition between the Mesolithic and Neolithic in Eastern Iberia. It aims to investigate how the introduction of domesticates changes the relationship between people and their landscape, focusing on migration and exploitation of the environment. Many of the theoretical frameworks previously used in Iberia are socio-political theories underpinned by Marxism (Lillios, 2019). This dissertation identifies a gap in the literature and seeks to fill it by critically analysing post-humanistic approaches. The concepts of object affect (also known as object agency) and actor-network theory offer a dynamic way to think about the archaeological record (Crellin and Harris, 2021). Much of the research from Iberia offers fragmentary insights into narrow archaeological contexts. Post-humanistic frameworks collate research and reconstruct the nuanced prehistoric socio-environmental interactions that underwent great upheaval as Mesolithic and Neolithic populations came into contact with each other in the Iberian peninsula. By synthesising recent scientific evidence from the peninsular, like aDNA and isotopic evidence with the material record, the data available can be reinterpreted using post-humanistic theories to reconsider how we think about the Mesolitic-Neolithic transition from a holistic perspective.

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S21-155

Common Peripheries - The 'Bug-Dnistr' Tradition of Hunter-Fishers and their Contacts with Early Farming Groups: New Research in Northern Moldova

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The so-called 'Bug-Dnistr Culture', seen from the perspective of local research traditions, represents the first Neolithic phenomenon in the region between the Pruth and Dnistr rivers. Bug-Dnistr communities, while relying on fishing, hunting and foraging for subsistence, produced a distinct kind of pottery from the earliest stages. Currently available radiocarbon dates suggest two peaks of increased activity, one in the early 6th millennium BC and one in the middle of the 5th millennium BC. When early farming groups of the Criş and later the Linear Pottery Culture traditions arrived in the region in the course of the 6th millennium BC, contacts between the local Bug-Dnistr fisher-foragers and incoming agriculturalists may be assumed, as sites from Northern Moldova and West Ukraine, containing artefacts from these groups in the same context, suggest. However, the timing, character and intensity of these contacts at the periphery of the agricultural world is currently not well understood. This talk will present preliminary results of my ongoing master's thesis, in which pottery from selected North Moldovan sites with mixed materials, notably Soroki by the Dnistr river and others, is analysed and statistically evaluated. Furthermore, relevant radiocarbon dates from the literature are systematised and critically rated by reliability. On the basis of this typological assessment and the new, more refined chronology, first conclusions will be drawn about the nature and extent of contacts between the autochthonous foragers and the incoming farmers. An outlook will provide suggestions for further steps to investigate the Bug-Dnistr phenomenon and for measures to better clarify its place within the Early Neolithic of the region.

S21-156

Technological Analysis of Middle Neolithic ceramics on the southern Norwegian coast

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Around 3500 BCE, cord-stamped ware appeared within hunter-gatherer-fisher groups in Southwestern Norway (Vestlandet). Typological classifications have been a large part of research on these pots, where there has been considerable stress on their relationship to other complexes, such as the Pitted Ware and Funnel Beaker complexes. This has been criticised in more recent research, as studies on Southwestern Norwegian Neolithic ceramics have revealed these to be a local, more independent ceramic tradition. There has also been a struggle to break free from the older, more traditional typologies linked to other parts of Scandinavia.

However, there is a gap in research concerning the production methods behind these pots and the nature of the interactions and relations that they represent. Thus, my research involves a non-destructive technological analysis of Middle Neolithic sherds from two localities on the southwestern coast of Norway. Considering social theories of technological choice, technical style and of learning networks, I will determine what choices may or may not have been made throughout the production process. Detecting any choices of specific traits in production methods may help determine the nature of contact and any possible social meaning of these pots. Are cord-stamped pots merely a common decorative trait? Or do they represent a larger learning network?

S21-157

"Looking down without digging up." Testing seismic methods for examining ditches and earthworks.

Niklas Dopp

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The traditional archaeological investigation of ditches and earthworks involves excavation, which is a highly invasive, time-consuming, and expensive method. In the last few decades, besides the examination of aerial pictures, geomagnetic surveys have become a more frequently applied non-invasive method in field research, which provides information about the earthworks. In itself, an efficient method for examining the extends of earthworks but only providing a horizontal map of the features, while precise vertical information is missing. This study aims to present a possible solution to add vertical information to the horizontal geomagnetic data. This could be achieved by combining different geophysical methods, which should be confirmed later by excavations at key locations. Whereas Ground Penetrating Radar and Electrical Resistivity Tomography could add vertical information, these methods often suffer from insufficient penetration. This study thus employs seismic sounding, a geophysical method rarely applied on archaeological prospection, to obtain

vertical information by using shear-wave reflections at subsurface boundaries. To test if obtained data from seismic-sounding is suitable and efficient for examining earthworks, a magnetic survey and reflection-seismics were conducted over the Lengyel rondel (4850-4600 BCE) of Podhájska in southwestern Slovakia. The data obtained with these methods were then compared with excavation results of the largest inner ditch at Podhájska from 2023, to check if it is possible to understand the depth and form of the earthwork without the use of invasive methods. The preliminary results indicate that the combination of geophysical measurements and other noninvasive methods can offer a time- and cost-effective complement to conventional excavations for thoroughly studying ditches. Nevertheless, the presentation takes into account all the advantages and limitations of this geophysical approach.

S21-158

How Comparable is the inequality? A new approach to a known topic

Erik Riese

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Social inequality is a widely discussed topic in our present society, growing more relevant every year. Due to its negative Influence, for example on democracy and the climate crisis (Riddell et al. 2024). Naturally, socially relevant topics are also a part of our scientific discourse. So much so that Graeber and Wengrow already talk about a "veritable boom of thinking about inequality" (GRAEBER/WENGROW, 2022 7) in their recent book Dawn of Everything. However, the archaeological discourse mainly focuses on the sphere of material wealth. In this presentation, some ideas will be proposed to research a wider range of inequalities in archaeology, which has been inspired by the work on different wealth forms (embodied, relational, and material) by Monique Borgerhoff Mulder (and her colleagues) (BORGERHOFF MULDER et al. 2009). Based on the Idea that inequality can appear in different ways. Not only in material possessions. The wealth forms from Borgerhoff Mulder and colleagues act as a framework to research further than the own Ontology and to test which different values or ideas could have been important in different illiterate prehistoric societies. This presentation focuses on the material culture of the Late Neolithic and Early Chalcolithic Vinča communities (culture) in the Balkan region. In this region, a technological change is occurring. For example, evidence of early Copper Metallurgy can be found. This could be related to social change and lead to inequalities. This presentation will be focused on using the framework defined above to test some of the published statements about social inequality in the Vinča communities.

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Riddell et al. 2024: R. Riddell/N. Ahmed/A. Maitland/M. Lawson/A. Taneja, Inequality Inc. How corporate power divides our world and the need for a new era of public action. DOI: https://doi.org/10.21201/2024.000007.

S21-159

The Pottery assemblage of a burned down house in the late neolithic Vinča settlement of Žabalj, Serbia

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The 2023 excavation in Žabalj in northern Serbia was the continuation of the archaeological investigations of the late neolithic settlement, which started with smaller excavations, taking place since the 1960ies. Magnetic surveys in 2019 and 2021 produced a complex plan of the settlement, while the latest campaign revealed a 2,5 m deep stratigraphy and uncovered two burnt houses. One of these houses contained ceramic finds, that classify typologically as Tisza Culture material, whereas the pottery of the other one belongs to the Vinča Culture. Part of this Vinča pottery material were over 20 complete or almost complete vessels, which give opportunity for further technological and functional analyses, while the selection and variety of this assemblage bring insight into the character of the house inventory and its use at the point of its destruction.

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S21-160

The Cradle of Patriarchy? Gender Perspectives in Neolithic Archaeology

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This presentation builds on the speaker's bachelor's thesis on "Gender Perspectives in Prehistoric Research" (University of Leipzig, 2023) and offers an introductory exploration of Gender Archaeology for the European Neolithic, specifically aimed at fellow students. As such, it can only provide a preliminary, surface-level exploration of this fascinating yet complex topic and will not offer any definitive answers. Firstly, an argument will be made for increased attention to gender-archaeological research on the European Neolithic, particularly regarding the possible origins of gender-based inequalities in this period. These origins have long been suggested by scholars from other disciplines, which calls for a more focused archaeological perspective. Key theoretical concepts from gender studies will be introduced, along with a critical examination of their application and reception in prehistoric research. The presentation will then outline various methodological approaches in prehistoric Gender Archaeology, evaluating both their potential and limitations.
After this the talk will provide an overview of two central source categories in prehistoric gender research: graves and anthropomorphic art, within the context of the European Neolithic. Additionally, an innovative approach from Spanish research for statistically assessing gender inequality in the Neolithic Iberian Peninsula will be introduced. Finally, two Neolithic cultures, which seem to exhibit particularly high sex-gender intensity, the LBK and the Cerny culture, will be examined more closely.
The goal of the presentation is to spark a discussion on the potential and challenges of Gender Archaeology in prehistoric contexts and to invite critical engagement and reflection on possible future trajectories of research in this field.

S21-161

Adoption, Adaptation, and Rejection: A Transcultural View of the Minoanisation of the 'Seraglio' on Kos

Kai Rottmann

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The transition from the Middle to the Late Bronze Age Aegean brought significant changes. The beginning of the Neopalatial period on Crete (~1750 to 1450 BC) saw the rise of Knossos to a hegemonic power, even affecting the material culture in the wider Aegean. Minoan-style artefacts spread, bringing with them intricate changes, including social and religious customs (Niemeier 2009).
Scholars often interpret Minoanisation through expansionist models, though some suggest a non-colonial view (Vlachopoulos 2016, 116-117). This work approaches Minoanisation through the lens of transculturality. According to this framework individuals are not constrained to being part of only a single culture but are rather able to hold multiple cultural identities. Since the focus lays not on the material itself but on the processes behind it, transculturality proves to be well suited for studying cultural encounters (Abu-Er-Rub 2019).
To exemplify this the settlement of the Seraglio on Kos will be looked at more closely. Lying on the so-called Eastern String connecting Crete to Anatolia, Kos exhibits intricate interplay between Cretan influences and local traditions. While some elements appear to have been adopted directly, such as the potter's wheel, others show a more complex picture. The Light-on-Dark and Dark-on-Light ware integrated foreign impulses and combined them into known patterns, thus creating a new class of pottery, which quickly became popular in the Aegean.
Utilizing transculturality it is evident that previous explanations of colonisation are insufficient. Instead, the material remains point to a nuanced situation, in which inhabitants of the Seraglio embraced certain impulses, while also rejecting others or selecting only parts.

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S21-162

Sealed Authority: Power Dynamics and Administrative Innovation at MM IIB Phaistos

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The sealings of Phaistos, discovered in 1955 and subsequently published by Doro Levi (Levi 1958), were later studied by Enrica Fiandra (Fiandra 1968, 1975). Despite these studies, many questions remain unanswered.
The sudden appearance of seals being used to impress sealings associated with specific items in MM IIb Phaistos is striking and likely indicates a shift in the administrative system.
While Fiandra has suggested that the over 1500 studied pieces were used to seal only 16 different objects, a thorough case study of 166 casts of the sealings, which were available through the CMS in Heidelberg, reveals that Fiandra's conclusion can by no means be definitive. It seems that the sealings came from a greater variety of objects than previously thought. Furthermore, this extensive use of sealings to seal certain rooms or containers is also very likely to go hand in hand with a new way to express power, as the access to specific goods seems to have been restricted to what is generally referred to as

the elite. Therefore, another aim of this presentation will be to show what the impressions of the seals on the sealings can tell us regarding the sphragistic use of seals and the responsibility of certain seal-bearers. This can be achieved by finding possible patterns in the use of seals, by carrying out a quantitative analysis, using the sample of 166 sealings with their respective seal impressions. This analysis focuses on systematically examining and comparing the seal-motive, seal-shape and seal-size in connection with the type of sealing these seals appear on.
This work will shed more light on the beginnings of the Minoan administrative system during the end of the Protopalatial period and the social as well as cultural changes that came with it and paved the way for the following Neopalatial period.

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S21-163

Construction and Testing of a Nordic Bronze Age Boat

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The goal of the presented project was to reconstruct a boat from the Nordic Bronze Age. To achieve this, a possible appearance and construction plan for such a ship were determined based on all available sources, and a boat was then built based on this plan. The completed ship was subsequently tested during a two-week trial voyage on the Rhine.
The aim was to explore not only the construction techniques but also the ship's maneuverability, load capacity, and seaworthiness.
The primary sources for the ships of the Nordic Bronze Age are depictions found on Scandinavian rock carvings, as well as illustrations on razors and other bronze objects, and Bronze Age ship settings in Scandinavia. Current research assumes that these images represent real ships that served as models for the depictions (Kristiansen 2004, 111). These ships may have represented a connecting element for the eastern and northern seas, facilitating the hypothesized networks of Bronze Age Europe (Earle/Kristiansen 2010, 19). Furthermore, these ships were likely one of the key elements driving the transition from late Neolithic to Bronze Age societies. They may have been an element that integrated a purely agricultural society into a network of long-distance trade. The ship itself, serving both as a unifying cultural symbol and, on a smaller scale, as a practical social organizational unit (boat crew, captain, etc.), would have been integrated into the societal reception. However, the original discovery of such a ship is still missing. Nevertheless, there are geographically and temporally broader finds that provide strong arguments for inferring the appearance of Bronze Age boats. Leading examples include the early Iron Age Hjortspring boat, as well as the British boat finds from Dover and Ferreby 1-3. From these, a ship can be constructed, which, while remaining a purely theoretical model, offers practical interpretations of aspects of Bronze Age boats that were previously only speculative.

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Kristiansen 2004
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S21-164

Pisum sativum: charred remains of a legumes storage find from the late medieval Vietze, Wendland

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The late medieval storage find from Vietze, mainly containing legumes, is an exceptional find since legumes in general are scarce in the archaoebotanical record. It was found during an excavation in 2022, in the context of a burned-down building within the abandoned settlement of the former village *Lutteken Vietze* near the Elbe River. The charred remains of the storage find mostly contains peas (*Pisum sativum*) and broad beans (*Vicia faba*). Identifying its contents through archaeobotanical methods gives a glimpse into late medieval agriculture and what people consumed in the 14./15. century. Dating the charred remains helps to contextualize the abandonment of *Lutteken Vietze* in the chronology of the archaeologically sensitive region surrounding the Höhbeck hill. While legumes were more prominent during previous times as during Slavic period, fewer traces of legumes (peas, broad beans etc.) are found in the archaeological record of high and late Medieval Ages when cereal cultivation dominated crop cultivation.

S 22: From Past to Current Knowledge

S22-165

Dimensions of knowledge transfer in the past and present

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This introductory paper will address two cross-cutting issues. The *first* is methodological, namely how do historical scientists combine or transfer different complementary knowledges of the past into one coherent account. This challenge is particularly apposite at the boundary of textual and non-textual history when different elements of knowledge are involved. The challenge also involves combining both qualitative and quantitative data, small scale and large-scale data, data from cultural, life sciences and earth sciences. The second relates directly to the Past. This theme covers the transfer of knowledge within early communities. This may relate to the transfer of knowledge of craft production between generations at a household level, or may relate to the memory embedded in monuments at a landscape level. Within literate societies, knowledge may be transferred beyond the individual lives by the legacy of texts. All these modes are open to political manipulation and thus may not be perfect renditions of the original concepts of knowledge, formed by their original formulations. Case studies will be provided to exemplify feature of the more abstract ideas outlined above.

S22-166

The concept of knowledge and knowledge transfer in (prehistoric) archaeology

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Knowledge and the transmission of knowledge are essential components in all societies. Be it the passing on of technical knowledge, knowledge about certain kinds of craftsmanship, social and cultural norms, or traditions (like burial customs). Knowledge may be gained, accumulated, transferred or lost in various ways depending on the societal preconditions. In the discipline of prehistoric archaeology, knowledge is omnipresent in a dual sense: on the one hand we as archaeologists reconstruct knowledge about past societies lost over time, on the other hand knowledge was an essential element in prehistoric societies themselves. Who had access to which kind of knowledge, which knowledge was passed on, which forgotten or even obliterated? From De Long's (2004) division into human, social, cultural and structural knowledge to Assmann's (2010) communication of identity-validating knowledge through cultural memory, there are many concepts that can be adapted for archaeological research. This contribution will explore how the concept of knowledge and knowledge transfer can be utilized looking at archaeological phenomena. A special emphasis will be on the transmission of knowledge in funerary practices using the examples of Neolithic megalithic tombs and Late Bronze/Early Iron Age cremations in metal urns.

S22-167

Understanding the acquisition of technological knowledge through social learning mechanisms

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Cognition and learning abilities of humans and other hominins are often discussed in the context of evolution and early stone tools, regarding questions of when certain behaviors seen as "modern" emerged, and when and how cultural knowledge started to build up, leading to the type of culture humans and no other animals display – cumulative culture. However, the mechanisms of individual and social learning are not just useful in understanding how technological knowledge was initially acquired, but also in classifying and comparing the technological knowledge of more recent human cumulative culture.

By classifying the knowledge that is needed to make a specific product according to the mechanisms of social learning established in behavioral biology, we can better envision what needed to happen for this knowledge to be shared. Some types of knowledge, such as knowledge which refers to locations, requires less in terms of interaction. Some know-how can be acquired through observing and recreating a product. Other know-how is copying-dependent, meaning direct contact of the learner and who they learned it from is necessary. While the positive identification of copying-dependent know-how is difficult, identifying learning for which copying did not need to happen allows us to explain aspects of technological similarities parsimoniously, and make more informed assessments of instances in which humans in the past learned from each other directly.

This theoretical approach is especially useful in understanding the spread of transformative technologies, such as heat

treatment of silica rock, ceramic making, or metallurgy. Additionally, it provides a mental framework to better envision interactions between distinct groups in the past, e.g. between Anatolian farming groups and hunter-gatherer-communities.

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S22-169

Bronze Age burial mounds as a source of common knowledge over the millennia

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Remembrance and reference to the past are an important process in many cultures, contributing to the strengthening of the social fabric. At the same time, political and social power can be claimed as a result. The legitimation of one's social position can thus be achieved, for example, with the erection of burial mounds or urn- graves at or nearby the "ancestors" burial. This presupposes that the knowledge of the burial place of the ancestors was known. This can be traced in a ritual context in northern Europe during the Bronze Age and into the Iron Age. But even in the Middle Ages and until the first early excavations, burial mounds were a source of knowledge, speculation and myths. The burial sites have been used, remodeled and extended since the Late Neolithic period, and reference is also made to the burial mounds later on. In addition, in Period V of the Later Bronze Age the custom of constructing large burial mounds is revived. In more recent times, they not only serve as landmarks, but are also used as boundary marks, e.g. for "Celtic Fields" as well as medieval to modern boundary markings.

This paper examines the complexity of ritual connections, their continuity and discontinuity at selected burial sites in Northern Europe. The dynamics in the temporal use of the burial sites will be demonstrated.

With the help of new 14C-datings gaps in the occupation can be identified. Isolated cases of destroyed mounds and natural elevations erroneously addressed as barrows testify to discontinuities. Robberies from later epochs such as the late Iron Age and reports from the modern period attest to traditional knowledge about the purpose of these prominent features in the landscape.

S22-170

Interdisciplinary approaches of acquiring knowledge about Doriskos and the region around the delta of the river Hebros.

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In order to gain knowledge about the ancient city of Doriskos in the region around the delta of the river Hebros, this presentation provides insights into an interdisciplinary project, which takes into account not only literary sources from antiquity but also other forms of knowledge gained from working with archaeological and geophysical evidence. Therefore the presentation touches on questions of knowledge transfer between different modern disciplines within a research network and the different ways of acquiring knowledge about the past.

In ancient times, the Hebros Delta was a region of contact in several respects, which are best explored in interdisciplinary collaboration, combining the results of geological and archaeological measurements and investigations on site with the knowledge gained from a close reading of ancient literature. Doriskos represents the connections between a mediterranean coastal region and the Thracian hinterland. Trade routes by land and sea converged here, and Greeks, Thracians and Persians left various traces in the region. The garrison of Doriskos, for example, which the Persian king Darius had built in 512 BC and which his successor Xerxes used as a main military camp on his campaign against the Greeks, is the only Achaemenid fortification identified in Europe. As an important source for Xerxes campaign and ist influence on the Hebros region an analysis of the narratives in Herodotus' Histories (Hdt. Hist.) provided important insights. In Hdt. Hist. 7,25 and 7,59-99, Herodotus emphasises the strategic role of the city of Doriskos for Xerxes' plans by naming it as one of several granaries for securing the army's provisions. Herodotus also describes the army census that was held in Doriskos and the subsequent organisation and deployment of the army according to the individual nations. In an ethnographic digression in Hdt. Hist. 5,3-10, Herodotus also writes from a Greek perspective about the Thracians, reporting on various Thracian tribes and their customs, as well as on the climatic conditions in the region and how the inhabitants adapted to their habitat.

The examination of the city of Doriskos against the background of ancient sources aims to show the development of the multicultural context of this region and brings new insights into the connectivity of ancient societies in the sense of cultural and infrastructural interdependencies, as well as the interaction of humans and the environment under changing conditions.

S22-171

On the knowledge of falconry and the question of its transmission

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In history, falconry was conducted on one stretch of land that reached from Europe and northern Africa in the west to Japan in the east. Han Dynasty China yields the oldest reliable evidence that is almost 2.000 years old. Among scholars, two possible areas of origin were discussed for falconry: the ancient, urban civilisations of the Near East or the mounted nomads of the Eurasian Steppe. There is a lack of compelling evidence but it may seem that the arguments in favour of the steppe are stronger. Three aspects have not been taken into account so far: the actual practice of falconry, the broader history of technical achievements and the question of single or multiple invention. From the practical perspective, falconry was easily learnable from nature and could have been invented more than once. However, one could also argue in an archaeological-interdisciplinary manner that the knowledge of falconry was transmitted by the mounted nomads of the Eurasian Steppe, or – to some extent – by Han Dynasty China, to areas to the east, south and west (c. 1.500 years ago).

S 23: Dealing with raising waters

S23-172

Submerged Landscape Archaeology: The Next Generation

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In September 2009, the 15th annual meeting of the European Association of Archaeologists held at Riva del Garda included a session dedicated to Submerged Prehistory, arguably one of the first occasions when a special session promoting this theme took place within a more general archaeological conference. This was closely followed a month later by the inauguration of the SPLASHCOS network funded by the EU COST program. Those events marked a growing interest in the development of a new disciplines and a surge of activity that has continued to accelerate to the present day, with many new research programs both in Europe and further field, new technologies, and much enthusiasm about the potential of underwater research. At the same time there is ongoing scepticism about whether the momentum can be sustained, whether archaeological remains can be revealed through purposeful and well-designed search strategies, and whether the discipline can really produce results that deliver on its aspiration to transform the narrative of world (pre)history. I will survey some of the issues currently emerging in current research, and likely directions in the coming decades.

S23-173

The Northern Frontier of the Lost North Sea Continent

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During the Last Glacial Maximum, the central and northern sectors of the North Sea were covered by the Scandinavian and British Isles Ice Sheets. With global sea levels approximately 120 meters lower, large areas of the North Sea were exposed above sea level following the ice sheets' retreat during deglaciation. These areas, initially barren, were colonized by a diverse ecosystem of plants, animals, and eventually humans, before being submerged by the rising sea as the ice sheets melted.

Here we present results from an ongoing project that aims to reconstruct this environment in the Norwegian North Sea and how it changed as the landscape drowned. We integrate geophysical data from 3D-seismic datasets and ultra-high resolution sub-bottom profiles, with data from sediments cores from the *Sørlige Nordsjø II* offshore wind area (Fisher Bank, North Sea), currently at a water depth of 50-70 meter (Petrie et al., 2024, Boreas 53, 186-226).

We use metabarcoding to analyse sedimentary ancient DNA (*sed*aDNA) in four vibrocores retrieved from infilled channels where laminated sandy, silty clays containing a mixture of marine and terrestrial biota, suggest a sheltered marine environment where marine sedimentation overlapped with detritic influx from the surrounding catchments as the landscape was inundated by the sea. Radiocarbon dates from both terrestrial macro fossils and marine foraminifer tests suggest that the channels formed a narrow marine inlet that were filled with sediments during the Bølling-Allerød interstadial, between 13 and 14 ka cal. BP. Radiocarbon dating of an overlying sand with an erosive lower contact suggests that the final transgression of the Norwegian North Sea plateau happened during the early Holocene, ca. 10 ka cal. BP.

For the *sed*aDNA analysis we targeted vascular plants with the *g–h* primers of the chloroplast P6 loop, and mammals with the MamP007 primers of the mitochondrial 16S. The *sed*aDNA data show a rich terrestrial ecosystem with a developed soil and over 180 plant taxa identified. The ecosystem supported large mammals such as reindeers and mammoths. At the same time, the presence of seabirds, beluga, cod, and other marine species points to a productive marine environment, and that the encroaching ocean also could have provided humans with resources.

S23-174

Last glacial and postglacial landscape evolution of the German Bight: from a geoarchaeological perspective

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The landscape change that accompanied the global warming since the Last Glacial Maximum rendered new potential habitats for Palaeolithic and Mesolithic men in the area of the today's North Sea. With the fading of permafrost soils and increasingly milder climate conditions, a diverse flora and fauna extended. Thus, the 'new' land became increasingly attractive to humans. The initially periglacial landscape, was mainly characterised by drainage structures from large to small scales (e.g. tunnel valleys, proglacial lakes, and gullies) as well as basal moraines and sander plains. In the course of climate warming and increasing humid, a river, lacustrine and forest landscape gradually developed. However, only a few centuries later, a rapidly progressing transgressional shift of the coastlines threatened this favourable landscape, where vast parts finally submerged by the North Sea. Over time, the landscape underwent considerable geomorphological

changes because of the periglacial, transgressional, marine and climatic processes. A stratigraphic complex erosion and deposition system building the Late Quaternary North Sea floor, which is challenging to unravel, is the result. The forming and preservation of the former land surface is regionally very heterogeneous. In addition to channels and other depressions of different time scales, origin and genesis, there are fluvial, lacustrine, aeolian, wetland soil, tidal, shallow-marine and full-marine deposits; partly in-situ, partly redeposited. In the area of the German Bight, the morphologic structures of the Elbe Palaeovalley with its secondary valleys and smaller tributaries, as well as a small part of the Dogger Bank dominated the post-glacial palaeolandscape. The associated former shore and coastal zones are of particular interest for geoarchaeological exploration. However, water depths and thickness of the sediment cover hamper in vast parts of the North Sea basin make any archaeological access by conventional means difficult. In recent years, geophysical and sedimentological investigations in the German Bight have considerably expanded our knowledge of the post-glacial palaeolandscape. The presentation provides an overview of the current state of the art regarding the development of the former landscape in the German Bight and the spectrum of morphological structures with respect to potential Palaeolithic and Mesolithic settlement sites in deeper waters.

S23-175

Late Glacial to Holocene erosion levels across the North Sea-1 offshore wind farm site - implications for preservation potential of drowned palaeolandscapes

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In this study, we present a seismic stratigraphic and morphological analysis of high-resolution geophysical data from the North Sea-1 offshore windfarm site in the eastern Danish North Sea. Our analysis provides valuable insights into the evolution and fate of a drowned palaeolandscape.

During the late glacial and early Holocene period (ca. 20.000-10.000 years before present), the study area featured a low-relief landscape characterized in the early Holocene by estuaries and rivers. Over time, the landscape was gradually flooded, leading to sediment deposition that reshaped the terrain before it was completely inundated by the sea. The transgression was furthermore associated with erosion by waves and currents and in our data, we observe several distinct erosional surfaces. The lowermost erosional surface is observed at the transition from estuarine to marine sediments, while overlying and younger erosional surfaces reflect multiple generations or (local) events of erosion within the marine sediments. The erosional surfaces along with the distinct variations in sediment thicknesses reflect the marine and coastal processes as they varied spatially and temporally during flooding of the landscape. By analysing the degree of erosion, it is possible to evaluate where the landscape is preserved and where it has been modified by the transgression – either due to erosion or (re)deposition of sediments.

The overall aim of the study is to test whether different types of landscapes may have had different responses to rising sea level and varying potential for preservation. Generally, it is expected that landscapes comprising of erosionally resistant sediments will be better preserved, but palaeoenvironment and local topography may influence this overall process, as sheltered areas tend to be protected from the largest waves.

Understanding how the rapidly rising sea level during the Holocene affected the palaeolandscapes, potentially has implications for how we design future climate adaptations of coastlines. The degree of palaeolandscape preservation is furthermore relevant for assessment of submerged archaeology including preservation of archaeological landscapes, sites and artefacts.

S23-176

Breaking the waves. Tracing the submerged palaeolandscape of late glacial reindeer hunters off the coast of Heligoland

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In the research project "TRAPA" we aim to reconstruct the late Pleistocene and early Holocene landscape in the present day North Sea area north of Heligoland that was once extensively exploited by Late Palaeolithic hunter-gatherer groups. For this early population Heligoland must have been of immense importance as a landmark that could be seen from very far. It was a reference point in a vast landscape, and at times perhaps the only solid object in a dynamic environment. Moreover, it offered accessible outcrops of high quality flints, which were extracted and subsequently transported over long distances into the present inland already in the Late (Upper) Palaeolithic, ca. 13,000 – 9,500 BCE. The reconstruction of contemporary palaeolandscape conditions in the area around Heligoland is therefore of central importance for our

understanding of the timing and nature of hunter-gatherer colonization, i.e., settlement and mobility patterns, in relation to environmental preconditions in Northern Europe during this period.

During a first research cruise with RV Maria S. Merian (Cruise MSM128) in May 2024, we successfully carried out hydro-acoustic mapping of an area northeast of Heligoland employing the Teledyne Parasound system at very high lateral resolution. The hydro-acoustic data were supplemented with a series of corings using a 6 m Vibrocorer for ground truthing of subsurface landforms. Several cores were very promising for further analyses with high-resolution, multi-proxy methods and are currently undergoing investigation.

In this contribution, we present first results and address perspectives for future research.

S23-177

Exploring drowned worlds at high tides – initial multiproxy studies into the first laminated palaeolake sediments from Doggerland

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The research project "TRAPA" / MSM128 resulted in 19 sediment cores from chosen locations at the bottom of the North Sea, off the coast of Heligoland. Sedimentological and palynological data was collected already on board as well as immediately following the cruise. While all the cores provide a range of insights into landscape development of these submerged territories, two sequences were chosen to represent both, the significance as well as the potential for further investigations. The cores stand out in quality and singularity.
For the first time, high-resolution palynological and palaeolimnological data from a laminated palaeolake sequence from the Doggerland area is presented (core MSM128_43-1). The sequence (i) contains the undisturbed transition from the Pleistocene to the Holocene, (ii) is preserved in annual lamination for large parts, and (iii) the former lake size is estimated from hydro-acoustic data. The preliminary results demonstrate similarities and divergences in diachronic vegetation development between the today submerged areas and mainland Schleswig-Holstein.
The sediment sequence covered by the core MSM128_9-1 reflects a deposition that occurred during an extreme event. While the impact of the Storegga slide tsunami is assumed to be of limited intensity in the German Bight so far, preliminary results of our multi-proxy study offer a diverse viewpoint.
The overall study is carried out with the aim of better understanding the dynamic and diverse palaeo-landscapes and its locally varied aspects.

S23-178

Between coast and bog - Prehistoric life in a dynamic environment on the southern North Sea coast

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In the low-lying plains of the southern North Sea coast, sea level fluctuations directly affect the coastal landscape. During this region's late Mesolithic and early Neolithic periods, the rapid sea level rise strongly influenced the groundwater level and led to the expansion of marine (tidal) environments. Waterlogging increased significantly and promoted the formation of fens which under an increasingly oceanic climate turned into bogs. The expansion of wetlands changed and spatially restricted people's living space. Archaeological remains were covered by peat over time. These protected sites can provide hints as to how people lived in this dynamic landscape. In the region between Flögeln and Wanna in the Elbe-Weser triangle, landscape dynamic is reconstructed through geological, botanical and archaeological investigations. These data help to understand the regional human-landscape interactions and the cultural activities in the landscape. The knowledge gained from regional studies can also be used to create models for research areas that were also located in similar surroundings but whose accessibility is no longer ensured or where some of the sources are no longer preserved, such as the drowned landscapes in the intertidal or subtidal areas of the North Sea.

S23-179

Early Mesolithic wetland sites at Ancient Lake Duvensee in different scales: geophysical prospection from landscape to excavation scale.

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A multi-method geophysical survey using ground penetrating radar (GPR), electromagnetic induction (EMI), and magnetics was carried out at the Early Mesolithic site of Lüchow, Hzgt. Lauenburg district, Schleswig-Holstein (northern Germany). The 2022 excavation uncovered the oldest cremation burial in Northern Germany, made by Mesolithic hunters, fishers, and gatherers around 10,500 years ago on the edge of ancient Lake Duvensee. This region is indeed a key site for the study of this period and has been investigated for almost a century, providing the location of 23 Mesolithic camps on former islands, including Lüchow 11, with the cremation burial, and the new site Lüchow 20. These two sites are located close to the former southwestern shoreline of ancient Lake Duvensee and provide different geomorphological conditions in contrast to the former islands in the northwestern lake basin. The aim of the research is therefore to trace the shoreline of the ancient lake using geophysical methods and to identify some key archaeological locations to guide future excavations with the primary aim of locating the cremation pyre. Both GPR and EMI show very clearly the position and extent of the shoreline. Based on the results of the excavations, it was also possible to identify former sandy shoals off the shoreline, which represent the preferred area of human occupation, and to link this to the long-running investigation at Duvensee. In addition, the newly investigated area of Lüchow was incorporated into the earlier 3D reconstruction of the ancient lake, providing important new insights into the geomorphology and evolution of the overgrown ancient lake. The archaeological excavations also provided new information on the use of this micro-region by Early Mesolithic human groups.

S23-180

The erosion of peat and lake deposits in the shallow coastal areas of the Baltic Sea and its archaeological implications

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During the last 10,000 years the water level of the Baltic Sea fluctuated several times by up to 20 m during the phases of the Baltic Ice Lake, the Yoldia Sea and the Ancylus Lake. Therefore, old limnic and terrestrial deposits, such as gyttja and peat sediments, are often found in the coastal areas of the Baltic Sea. This is of great interest for archaeological research, because riverbeds, lake shores and coastal areas were the preferred habitat of Mesolithic societies during the early to middle Holocene. Due to the low sediment availability - the Baltic Sea is sediment-starved in many areas - these deposits are not covered and are directly exposed on the seafloor. They are exposed to erosion by waves and currents. As a result, Stone Age remains are regularly washed ashore, where they can be picked up by tourists and professionals. Furthermore, the exposed limnic sediments offer a certain potential for finding underwater Stone Age settlement sites. However, the erosion rate of peat and limnic deposits and thus the release of archaeological finds is largely unknown in the southern Baltic Sea region. Between 2000 and 2006, the Institute for Baltic Sea Research carried out side-scan sonar measurements off the coast of Kühlungsborn. Repeated measurements in these areas provide information on the changes in the position of the erosion edges of the deposits and allow to constrain the cumulative erosion volume of the last 24 years. First results of a comparative analysis for the Trollegrund and the Conventer Basin will be presented here and their implications for the preservation of known archaeological sites as well as the potential for surveying new sites will be discussed.

S23-182

Seeds of Collaboration: The Archaeobotanical Potential of Submerged Stone Age Sites

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The role and importance of plants to the diets and daily lives of most prehistoric foragers is poorly understood. This even applies to the Mesolithic of southern Scandinavia, a particularly intensely studied prehistoric forager sequence. Through close collaboration between archaeobotanists and marine archaeologists, by means of strategic sampling for plant remains at submerged sites, it is possible to unlock a source of information that – despite important pioneering efforts – to a large extent remains untapped. Using a pilot study from the Late Mesolithic site of Hjarnø Sund, Denmark, this paper discusses the potential of this collaboration to substantially increase our knowledge of Mesolithic plant economies along with some of the methodological considerations relevant to this agenda. The paper advocates for an increased focus, strategic sampling and a sustained, longer-term research effort in order to improve understanding of this central aspect of prehistoric forager lives and culture. (Termansen et al., 2024).

Termansen, Signe S., Astrup, Peter M., Out, Welmoed A., Johannsen, Niels N. 2024. Rebooting the Study of Forager Plant Economies: The Potential of Submerged Archaeological Sites. Environmental Archaeology, The Journal of Human Palaeoecology. [Online]. Available from: https://www.tandfonline.com/doi/full/10.1080/14614103.2024.2393015 [Accessed 30. October 2024]

S23-183

Stay sheltered and remain preserved: Landscape characteristics of Ertebølle coastal sites

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The last hunter-gatherer-fisher communities in southern Scandinavia and northern Germany left a rich archaeological record along the former coasts and in the hinterland, providing insights into economic and cultural aspects of the Ertebølle Culture. Often, the sites seem to have been situated in sheltered natural environments, such as along fjords and inlets, at lagoons and behind spits. Moreover, some are also known to have been located further inland on lake shores. In this presentation we would like to review a selection of Ertebølle sites in terms of their location in the landscape, the environmental characteristics and morphological features in their surroundings. Focusing on the question, which types of landscape features could be reconstructed, we would like to bring together settlement situations that were selected by hunter-gatherers in the phases of rising sea-levels. A source critical discussion will take the question into account which landscape situations provide the best preservation conditions and how to deal with a preservation bias we have to expect due to site erosion and destruction, resulting from processes in Holocene sea-level change .
The Ertebølle site of Strande on the outer part of the Kiel Fjord is presented as an example of recent investigations. It is shown that landscape conditions and their development in the vicinity of Ertebølle sites are not always easy to understand due to interacting taphonomic processes. Against the background of our overview of Ertebølle coastal sites we would like to propose and discuss possible landscape reconstructions for Strande.

S23-184

Reconstruction of late Pleistocene to Holocene drowned palaeolandscapes in Kalø Bay, central Denmark

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Kalø Bay in central Denmark is a shallow coastal bay reaching water depths of up to 20 meters. Several Mesolithic sites occur in the bay, typically at water depths of 6-8 meters following a trend of a drowned palaeocoastline. The sites have been correlated to the Maglemosian culture and clearly demonstrates how the bay used to be a prolific land area occupied by Stone Age people. Dates from tree trunks and twigs show terrestrial conditions 9400-9000 years ago, and relative sea level modelling indicate that the bay was inundated and flooded by the Littorina Sea at around 9000 years ago. Sea level reached a maximum at around 6000 years ago and has since gently dropped due to glaci-isostatic uplift of the area. Besides of these overall trends during the Holocene, the landscape evolution of the bay is poorly understood with little specific knowledge about landscape types, terrain and morphologies. This leaves a gap in terms of understanding the living conditions of the Mesolithic people.

In this study, we analyse the palaeolandscape in the bay using high-resolution sub-bottom profiler data and sediment cores acquired from 2018 to 2023. From the sub-bottom profiler data, we identify four major units reflecting variable depositional environments in the bay after the last glaciation approximately 20.000 years ago. We observe seismic facies indicative of glacial to proglacial depositional environments, followed by lacustrine and lagoonal infill stages that gradually developed into marine environments as the area was flooded. During the relative sea-level fall in the Middle and Late Holocene, we further observe various subunits reflecting stages of sea-level adjustments and changing coastal processes.

The reconstructed palaeolandscape evolution shows a highly dynamic environment, that was largely controlled by the relatively quickly changing sea level. Prior to the flooding, the landscape comprised lagoons, lakes, small islands, rivers, fens, and high-topography dry land, and it was likely very rich in terms of terrestrial and aquatic food sources. Understanding how the landscape evolved, provides important context to the archaeological findings, by presenting insights into the environmental conditions that the hunter-gatherers would have lived in. It is furthermore a useful tool for assessing the overall geoarchaeological potential of the area and may, if combined with archaeological knowledge of human behaviour, lead to discovery of older archaeological sites.

S23-185

Human responses to sea-level change

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Maps representing coastal change, and incorporating various sea-level curves, are common in the archaeological literature concerning the Mesolithic. Because such models tend to show changes that occurred over millennia and many generations, it is easy to get the impression that sea-level fluctuations were drastic events. Even though this may not be incorrect, the results may give a misleading impression of how such change was perceived in the past.
Responses to, and the consequences of, sea-level change clearly manifested over very different timescales, from hours and days and across centuries or millennia, and the selection of adequate spatial scales for analysis of such change is therefore crucial to identifying and evaluating responses, demographic challenges and the associated hazards/threats triggered by rising sea level.
This presentation investigates the variable impacts that sea-level change could have had on Mesolithic populations, and the different temporal and spatial scales at which these may have occurred in southern Scandinavia. Did people feel that they were forced to abandon and move their habitation sites due to sea-level change, and how did sea-level change influence the available resources in an area? The questions are central to how we perceive change in the past as well as how past communities reacted to change.

S 25: Unlocking the Past

S25-186

Archaeological "One Health", a tale told in isotopes

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Nothing better than health defines the connection of a society with its environment. "One Health" approach encourages current society to consider a more global view into well-being, understanding that "the health of humans, domestic and wild animals, plants, and the wider environment (including ecosystems) are closely linked and interdependent" (WHO). When applied to the past, the holistic approaches turn to be highly challenging due to the uncomplete nature of the archaeological record, the role of socio-cultural boundaries, and the timescales beyond human lifetimes that are needed for considering ecosystems dynamics. Health parameters are hardly defined by material culture, save paleopathological studies of humans and animals that are mainly shaped by the osteological paradox shadow. The different nature of the assemblage that must be interconnected in the "One Health" approach (humans, animals, plants, ecosystems, climate) makes it difficult to find adequate proxies. However, isotopic geochemistry connects all these levels through the cycles of the elements. In fact, isotopy could be the vehicle we have been looking for to connect human and environmental health over time. Here, I will try to expand the temporal and geographical scope of past health using isotopic analyses, by presenting examples with specific isotopic pairs. Pollution and stress are used as paradigmatic examples. Lead isotopes linked to the geological background but also to mining-metallurgical pollution are traceable in the environment (natural archives), artifacts, animals, and humans. Light isotopes are linked to trophic chain but also to stress levels and inform on the effect of disease on bone formation, being markers of the disease-scape. Thus, isotopic chemistry is presented using large-scale narratives with the final goal of opening a debate about its unique ability to address the "One Health" approach: using geochemical cycles to unlock the health in the past.

S25-187

It is written in the leaves: How multi-isotope fingerprints of modern environmental samples can help us to answer bioarchaeological questions

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Multi-isotope fingerprints of modern environmental samples (plants, soil, water) are used to establish local isotopic baselines, allowing, for example, the identification of primarily non-local individuals at a site. In coastal environments, these samples are prone to the so-called sea spray effect which causes an apparent marine isotope signal. This effect is also found in several isotopic systems measured in bones of animals and humans from coastal regions and has been demonstrated to mask or falsify the isotopic signatures of archaeological animals and humans from Viking Haithabu and medieval Schleswig in northern Germany, located at the Schlei inlet close to the Baltic Sea. The individuals' isotopic signature can be highly misleading with respect to diet, habitat, provenance, or dating. It is therefore important to predict the local isotopic signature, taking into account the local sea spray effect.

For the archaeological sites of Haithabu and Schleswig, we show how the locally expected isotope signatures (e.g., $\delta^{13}C_{carbonate}$, $\delta^{34}S_{collagen}$, $^{87}Sr/^{86}Sr$) in archaeological times can be reconstructed using, e.g., $\delta^{13}C_{cellulose}$, $\delta^{34}S_{total\ sulfur}$, and $^{87}Sr/^{86}Sr$ data of modern environmental samples collected in the study regions or grown in the greenhouse under artificial sea spray treatment.

By investigating the underlying plant physiology, it is possible to predict the expected isotopic signature of animal or human consumers, even in archaeological times. Moreover, the radiocarbon concentration in modern plants, affected by sea spray, allows us to understand the sea spray effect on radiocarbon dating of archaeological samples, where we have to consider an apparent aging of the samples due to either a direct or an indirect sea spray effect.

The multi-isotope fingerprints of the environmental samples from the greenhouse and those collected close to the Baltic Sea allow the prediction of the isotopic signature of individuals living in the vicinity of the archaeological sites of Haithabu and Schleswig as well as the identification of non-locals. In addition, these data allow the reconstruction of potential catchment areas of the settlements.

S25-188

$\delta^{34}S$ as a dietary proxy: a method in search of a problem?

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Collagen $\delta^{34}S$ is usually regarded as a marker of mobility, particularly in farming groups, as geological $\delta^{34}S$ variation is transferred from plants to animals and human consumers with negligible fractionation. In hunter-gatherer-fisher groups, however, $\delta^{34}S$ may be regarded as a dietary proxy, primarily because aquatic ecosystems can have different $\delta^{34}S$ signatures to terrestrial resources. Collagen $\delta^{34}S$ is effectively a compound-specific isotopic signal that only depends on protein sources, which in theory may be more useful as a dietary proxy than bulk collagen $\delta^{13}C$ or $\delta^{15}N$.
We review published data and ongoing research on prehistoric human remains to try to understand when collagen $\delta^{34}S$ becomes an attractive research tool for diet reconstruction, i.e. is more sensitive or less ambiguous than bulk collagen $\delta^{13}C$ and/or $\delta^{15}N$, and/or more informative or feasible than compound-specific $\delta^{13}C$ and/or $\delta^{15}N$. In some cases, $\delta^{34}S$ tracks $\delta^{13}C$ or $\delta^{15}N$ so closely that it appears to be redundant. Where it varies independently of $\delta^{13}C$ and $\delta^{15}N$, $\delta^{34}S$ should provide additional insights into the exploitation of different ecosystems (irrespective of trophic level or macronutrient concentrations in food groups), but interpretation of consumer collagen $\delta^{34}S$ patterns is complicated by geological $\delta^{34}S$ variation, reliance on limited reference data that may not always meet quality assurance criteria, and sometimes local deviations in terrestrial $\delta^{34}S$ caused by sea-spray or wetland growing conditions. Nevertheless, consumer $\delta^{34}S$ patterns must reflect dietary differences when $\delta^{34}S$ values in potential food sources are sufficiently distinct. Empirical evidence, including ^{14}C interpreted as a dietary proxy, confirms that differential consumption of aquatic species affects hunter-gatherer-fisher $\delta^{34}S$ values, at both coastal and inland settings.

S25-189

Exploring Agro-ecological Niches in the Early Neolithic: Isotopic Insights from Southeast and Central Europe

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Two thousand years after agriculture developed in Southwest Asia, farming communities expanded into Europe, introducing cultivars into new and often challenging environments. The ecological niches of these cultivars –shaped by bioclimatic factors such as daylight, precipitation, and temperature– were beyond the control of early settlers. However, they could partially manage other factors like nutrient and water availability, to secure reliable harvests despite unfavourable conditions. Grain yields, reflecting the outcomes of these strategies, have been estimated using models developed for Mediterranean climates. These models, however, are less applicable for estimating yields in regions with more continental conditions, such as Southeast and Central Europe. In this study, we analysed stable carbon and nitrogen isotope data from experimental crop growing under regimes simulating prehistoric practices in Southwestern Germany, to explore the relationship between grain yields and carbon isotope discrimination values in continental environments. We then compare the agronomic conditions of cereals and pulses from eleven Early Neolithic sites in Southeast and Central Europe, using a combination of $\delta^{13}C$ and $\delta^{15}N$ values, kernel weight estimations, and modelled ancient crop yields. The discussion switches from micro- to macroscale spatial units to infer how agricultural strategies were adapted as farming spread across latitudes.

S25-190

Tracking reindeer grazing and mobility patterns in northern Fennoscandia using a multi-isotope approach of reindeer skeletal remains from the Piteå and Skellefteå River valleys in northern Sweden

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Reindeer has always been present in northern Fennoscandia. They were used for food, transport, trade or offerings whether they were domesticated or wild, herded or hunted. The aim of this study is to investigate the development of reindeer domestication in Sámi contexts from the Late Iron Age to the 20th century, from the Swedish mountains to the Bothnian Sea along the Piteå and Skellefteå River valleys. For this we selected unburnt reindeer skeletal remains from different archaeological context, such as Stállo foundations, hearths, a marketplace, and a Forest Saami timbered hut. We used an interdisciplinary approach with various methods to obtain the most comprehensive information on past landscape use and reindeer grazing patterns. Analysis of multiple isotopes ($\delta^{13}C$, $\delta^{15}N$, $\delta^{34}S$, $\delta^{18}O_p$ and $^{87}Sr/^{86}Sr$) were combined with radiocarbon dating. Our investigation into reindeer grazing, modern herding strategies, local geology, and climatic fluctuations suggests temporal and spatial variations in diet and mobility across different archaeological sites and geographic regions. Furthermore, the application of a multi-isotope approach facilitates tracking of both large- and small-scale reindeer mobility, indicating differences in diet and movement that are likely a reflection of different nomadic and/or semi-nomadic lifestyles.

S25-191

Isotopic insights into the impact of the AD 536/540 climate event on Swedish Iron Age societies

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The mid-first millennium AD in Sweden is marked by significant shifts in the archaeological record, including settlement and farm abandonments and population decline. Various explanations have been proposed for these changes, sparking ongoing debate within Swedish archaeological research. Recent studies suggest that a prolonged cold period, caused by several volcanic eruptions and referred to as the AD 536/540 event or Fimbulwinter or Late Antique Little Ice Age (LALIA), was a primary cause for the observed changes (Gräslund and Price, 2012; Price and Gräslund, 2015). The suggested impacts of this climatic event include crop failure and spread of diseases, leading to famine, population decline and settlement abandonments. Previous research proposes that the reliance on agricultural resources was a significant factor in increasing vulnerability to these populations (Gundersen, 2021). However, the extent to which this climatic event affected Swedish societies remains uncertain. Isotopic analyses could provide further insights into this matter (Anagnostou *et al.*, 2024).
This presentation will explore the role of the isotope analyses in understanding the resilience and vulnerability of Iron Age populations in Sweden during this climatic event. Furthermore, preliminary isotopic results of my PhD project will be presented, aiming to provide new insights into the impact of this climatic event on Iron Age societies in Sweden.

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S25-192

Diet and lifestyle reconstruction of a whole population from the Middle Neolithic. Case study from Polgár-Ferenci-hát, Hungary

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The topic of this presentation is the Middle Neolithic (5400–5000 cal BC) site of Polgár-Ferenci-hát in northeastern Hungary. The 113 burials excavated, the largest known ALP (Alföld Linear Pottery) burial unit from the region. The study of the bone material of the graves excavated in this locality using stable isotopic chemical methods and the interpretation of the results.
The present study is a new one in both Hungarian prehistory and Hungarian archaeology. The dietary habits of the entire population of the sites have not been studied before. International research projects involving Hungarian sites have included only a few selected graves.
The Polgár-Ferenci-hát has previously been the subject of stable isotope studies (Bickle & Whittle 2013). Thanks to their studies, we have stab isotopic chemistry data from 33 individuals of different ages from the site.
In 2023, Enikő Somogyvári-Lajtár in her MA analysed the stable isotopic chemistry of children's bone material from three sites around Polgár. The research investigated the process of breastfeeding and weaning in the youngest individuals. Furthermore, the results of isotopic analyses and previous anthropological and archaeological observations were also used to interpret the possible role of children in the community.
The results obtained in the present study complemented with the results of previous studies and thus the feeding habits of the entire population of the site re-analysed.
We excavated and measured the bone and tooth collagen and hydroxyapatite portions of the samples at the Archaeoisotope Laboratory of the Institute of Geology and Geochemistry of the HUN-REN Research Centre for Astronomy

and Earth Sciences. Stable carbon and nitrogen isotope ratios were measured on bone and tooth dentine collagen samples, and stable carbon and oxygen isotope ratios were measured on tooth enamel apatite samples to examine the general dietary habits.
The research questions were the following:
What were the general dietary habits of adults at the site? Are there differences in dietary habits between sexes, age groups and individuals?
What are the correlations between the isotopic results and the previously made physical anthropological observations, in terms of general diet?
How can stable isotope geochemistry complement previous archaeological and physical anthropological interpretations?
Comparison of the isotopic results from each site with data from similar studies carried out previously.

S25-193

Resin-ating Challenges: The effects of $^{87}Sr/^{86}Sr$ in resin-embedded Otoliths

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Otoliths are calcified structures in the ears of teleost fish, which are used for palaeoenvironmental and seasonal fishing pattern reconstruction, as well as individual life-history. Since otoliths are paired structures and each layer grows incrementally while incorporating elements from their environment, we can detect minute changes over time. They are generally embedded in resin after excavation as a means of preservation and stabilization; however, it is unknown if resins affect isotopic values, including the one in question, strontium ($^{87}Sr/^{86}Sr$). Research has shown that some conservation methods, while meant to preserve and stabilize archaeological artefacts, may negatively affect specific isotopes. Therefore, this study investigates whether resins affect $^{87}Sr/^{86}Sr$. We look at otoliths from modern cod and manually embed one-half of the otolith in resin while leaving its twin unembedded to determine the effects of epoxy resin on $^{87}Sr/^{86}Sr$.

S 26: Central Europe at the turn of 6th and 5th Millennia BC

S26-194

What changed? Lifeways, kinship, and gender across the 6th and 5th Millenniums cal BC

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To those working outside of the European Neolithic, the 6th and 5th millennium, after the initial transition to farming, can appear to be characterised by a blur of ceramic cultures, which come and go without much change in the substance of social and economic life. We can see this evidently in the lower numbers of bioarchaeological projects targeting the 5th millennium (though thankfully this situation is now changing). The end of the LBK, alongside varied approaches to radiocarbon dates, emphatically demonstrates that this is not the case and change is a constant feature of prehistory. This suggests that some of the challenges of explanation may lie in our ability to theorise change in prehistoric societies, rather than always crises of their making.

As we refine regional and chronological sequences, our understanding of what changed in pottery styles, exchange networks, and house layouts has grown, yet we rarely ask what this meant for the lives of those who lived at this time. This presentation will therefore explicitly explore how lifeways changed across the fragmentation of the Linearbandkeramik culture (LBK) and subsequent development of multiple ceramic traditions across the 5th millennium. It will compare the biomolecular datasets for either side of the end of the LBK with the funerary sphere to consider change at the scale of lifeways. Drawing on this, it will consider the extent to which kinship and forms of identity, such as gender, changed. This discussion will then be used to reflect on how we can better theorise social change during the Neolithic at multiple scales.

S26-195

Demographic Shifts in Prehistoric Central Europe: A Comparative Study of Boom-and-Bust Cycles in the 6th and 3rd Millennia BCE

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Demographic boom-and-busts, or what might be more accurately described as periods of rapid increase in archaeological evidence followed by a subsequent decline, occurred at different points in European prehistory. The boom-and-bust event at the end of the 6th millennium BCE in Central Europe is unprecedented in terms of its intensity and scale, as well as its association with the emergence of a new economic and lifestyle paradigm: sedentary farming and animal husbandry. These events are typically interpreted as being related to population dynamics, whereby demographic growth is deemed to cause social stress, environmental devastation or the depletion of resources. Consequently, a collapse, disintegration or social transformation is assumed as indicated by a decline in the amount of archaeological evidence.

These patterns are also observable in the archaeological data collected from the Czech Republic. The emergence of the Linearbandkeramik (LBK) is associated with an increase in the quantity of archaeological evidence, which is followed by a rapid decline after a couple of centuries. Subsequently, the quantity of data remained low until the third millennium BCE, when it rose sharply again and reached the levels observed during the LBK period. It is noteworthy that the increase observed in the 3rd millennium is not followed by a rapid and long-lasting decline, as was the case with the LBK. Instead, it is followed by a period of sustained growth.

The absence of the demographic decline after the 3rd millennium BCE casts doubts on the theories of the inevitable unfavourable development caused by population growth. Although sharing similarities with LBK societies, such as immigration of new populations, the societies in the 3rd millennium BCE were seemingly able to cope with the increase of population density differently. It is now unclear if the reasons were different technologies, social or economic strategies, environmental conditions or something else. But we believe that the comparison of the different responses to population growth could help us better understand events during the Early Neolithic and even allow us to create new interpretative frameworks.

To do so we will compare the 6th and 3rd millennia BCE through analysing large data and proxies for prehistoric demography (radiocarbon-based) and settlement patterns (archaeological sites) in the territory of the current Czech Republic.

S26-196

Standing Stones, an Innovation at the end of the 6th / beginning of the > 5th millennium BC in Western and Central Europe

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At the transition from the 6th to the 5th millennium BC, large stones were erected for the first time. This probably happened first in Western Europe, but the erection of large stones in Central Europe can probably already be linked to the Hinkelstein culture, but certainly to the Rössen culture. Judging by the finds, these large stones are the centre of special places that we can call sanctuaries.

S26-197

Don't give up the day job – Changes in Flint artefacts from LBK to SBK

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From the flint inventories of northwestern Saxony, we can report similar to buildings, pottery or plant growing that there are changes at the beginning of the 5th millennium from Linienbandkeramik (LBK) to Stichbandkeramik (SBK), but no breaks or abrupt changes can be detected. At sites like Eythra, Kieritzsch, Gärtitz, Mertitz or Altscherbitz the transition from late LBK to early SBK can be observed directly, with Canitz and Kolka two seemingly pure SBK-sites are available. But since the excavations did not catch the whole site and a few LBK sherds appeared in both cases earlier settlements are supposed to be near.

Although the maintenance of flint raw material from the local ground moraines of Elster and Saale glaciations probably didn't change over times, SBK features often produce more artefacts than LBK-features, per building with adjacent features artefact numbers are many times higher in SBK than in LBK.

SBK-cores which often come as blade cores are normally clearly bigger and heavier than the exhausted LBK-cores. Regular blades as well as facetted butts play a tiny role compared to earlier times although we find "Mesolithic" components especially in SBK-context, like little trapezes, thumbnail scrapers, burin spalls, or a core concept very similar to handle cores.

Imported raw material is extremely rare: two blades made of Abensberger Plattenhornstein from each site in Eythra and Gärtitz, in both cases found in the surroundings of LBK buildings but never in clear LBK-features. Blades or their fragments of a light brown fine bohemian quartzite are confined to the settlements on loess slopes and were found in Gärtitz and in Mertitz, in Gärtitz they seem to be restricted to SBK features. In Mertitz for the first time we could save a core of this quartzite. Bohemian Quartzites also appear in pure LBK-sites in form of singular blades or tools and show constant contact to the southeastern area through the whole Bandkeramik.

S26-198

Resurgence of Hunter-Gatherer Lifestyles Between the Carpathians and the Dnieper River in the Post-LBK Period

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Recent advances in dating the demise of the LBK (Moskal-del Hoyo et al., 2023) and the expansion of Early Trypillians (Kiosak et al., 2024) have revealed a 200-300 year interval between these two events in the region to the east of Carpathians and to the west of the Dnieper River. Some radiocarbon dates fall within this period, derived from materials found in ceramic hunter-gatherer camps along major rivers such as the Southern Buh and Dniester, as well as from smaller, hinterland sites. These dates were previously attributed to Early Trypillian activity (Kotova, 2003), largely due to the presence of Early Trypillian artifacts at these sites. However, it is now evident that they postdate the decline of the LBK culture and predate the arrival of Early Trypillians. This paper provides an overview of archaeological sites that likely fit into this post-LBK period. Many of these sites were traditionally linked to the Savran phase of the Buh-Dniester culture (Tovkailo, 2005). While it cannot be definitively stated that the Savran pottery style was limited to this period—since some sites are dated earlier (Haskevych, 2021) —there is evidence to suggest that a significant part of its development occurred during post-LBK times.

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S26-199

Considering regional diversity in the LBK/post-LBK transformation

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The roots of the LBK crisis and its transformation into less integrated post-LBK cultures is a long-standing issue of Neolithic archaeology. The debate is governed mostly by well-known examples of (ritualised) violence and a decline in settlement density. Although taking place only in specific regions, these elements are extrapolated for the LBK area in general. However, LBK was hardly a singular uniform entity, especially in its late phases. The paper will address the LBK/post-LBK transformation from a more regionalised perspective. It considers Central Europe a mosaic of very different trajectories where not all regions evince any considerable attributes of crisis. Also, it will debate the role of so-called inner peripheries – areas that stayed aside from the neolithisation process and where the indigenous populations or just hunting and gathering as the main subsistence practices might survive for a considerable time. Although these communities start to be inferred from the current biomolecular data, they still escape the conventional archaeological approaches. Therefore, their part in the LBK/post-LBK transformation will be assessed by comparing key social and cultural attributes before and after the LBK/post-LBK transformation.

S26-200

Subsistence strategies in the 5th mill. BC in Brandenburg

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After the migration of Linienbandkeramik (LBK) – carrying people to Brandenburg in the 6th mill. BC, the development of the Neolithic in the area seems to have been a complex process. Brandenburg is part of the liminal zone of expansion of the early Neolithic and there is evidence of a mosaic of different subsistence strategies within the 5th mill. BC. Late hunter-gatherer-fishers co-exist with early farming communities, whose subsistence strategies are not yet clear in all aspects. This talk focuses on the post-LBK communities of Stroke Band Pottery Culture (SBK) and Rössen culture and draws on results from a work in progress PhD project, for which animal remains of two features assigned to to these cultures have been analyzed by Maaike Groot (Freie Universität Berlin). For SBK this is the site Seelow 20 (Märkisch-Oderland), which is located near the Oder river in Eastern Brandenburg. Animal remains from Bochow 2 (Teltow-Fläming) for the Rössen culture can be contrasted to already published materials collected in Flemsdorf (Uckermark, Teichert 1974). The results show a more diverse palette of subsistence strategies than what might be expected in comparison to regions that are considered core areas of the Neolithic distribution. They can also be contrasted to LBK settlements in Brandenburg, such as Prenzlau 95 (Benecke 2018), Zollchow 20 (Heußner 1989), Lietzow 10 (Benecke/Hanik 2024) and Dauerthal (Cziesla 2024).
Whether the results are supported by different land use strategies is still under consideration within the PhD project. The ongoing analysis of site location parameters will be a second column of evidence to connect to the archaeozoological research with the aim to reach a more secure understanding of the subsistence strategies in the 5th mill. BC in Brandenburg.

S26-201

The Polish Lowlands at the turn of 6th and 5th Millennia BCE in the light of the palynological record. Social and cultural consequences of the dramatic population decline

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The answer to what happened to the *Linearbandkeramik* (LBK) communities in the period 5050-4800 BCE is one of the most fascinating problems in the study of the Neolithization of Central Europe. In the case of the Polish Lowlands, there is an obvious lack of traces of settlement from this period, which is most often interpreted as the effect of complete depopulation. However, the latest palynological studies indicate the presence of small and mobile groups leading an agricultural lifestyle. This may indicate that the lack of archaeological traces of the LBK is illusory, because longhouses and pottery made in a style consistent with patterns typical of Czech and Saxony are sought. Meanwhile, the radical decline in population could have triggered adaptive reactions that changed local patterns of material culture. In this paper, we intend to present new hypotheses regarding the decline of the LBK and other cultural changes occurring in the Lowlands in the first half of the 5th millennium BCE.
Key words: Neolithic, Polish Lowlands, LBK, SBK

S26-202

Where is the crisis? The Gärtitz site as an example of an on-site transition from LPC to SPC in Saxony.

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The Linear Pottery (LPC) and the Stroked Pottery cultures (SPC) characterize the Early Neolithic in Central Germany. The simple term "Bandkeramik" for both cultures is apt, as it reflects many common features in material finds, house construction, settlement location and economy. The comparison illustrates the strong continuation of traditions from one to the other, but also shows gradual developments that indicate moderate innovations.
In Saxony, Bandkeramik settlements are mainly known from three regions: Northwest Saxony, the Elbe valley and the loess hill areas of Central Saxony. This study focuses on the investigations carried out over the last three years in Gärtitz in Central Saxony, one of the southernmost sites in the region. The excavations yielded features from the older LPC to the early SPC phase, including the transition between the two cultures.
Innovations based on long-standing traditions are evident both in house building and in the development of ceramics. Stylistic developments in ceramic decoration from the later to the latest LPC and into the early SPC are shown by means of techniques and motifs. The origin of the "canonized" SPC decorations can be traced back to some earlier decorations and regional LPC styles such as Šárka. As for domestic architecture, it already began to change during the later LPC. Certain elements disappeared while others were added, but the floor plans and orientations remained similar. As can be seen at other sites in Central Saxony, neither the architecture nor the material culture suggest an abrupt break or even a crisis at the end of the LPC.

S26-203

Reevaluating the LBK to Post-LBK Transition on the Northwestern Edge of Central Europe: A Comparative Model

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This paper examines the north-western margins of Central Europe, focusing on the regions encompassing Western Belgium, the Netherlands, and North Rhine-Westphalia. Historically, modern national borders have restricted studies on the transition from the Linearbandkeramik (LBK) culture to post-LBK cultures, which appear to follow distinct cultural trajectories.

In Belgium, the transition was marked by the shift from the LBK to the Blicquy/Villeneuve-Saint-Germain culture. North Rhine-Westphalia experienced a significant population decline before the arrival of Grossgartach/Planig-Friedberg communities, while the Netherlands has long been viewed as devoid of post-LBK traces. However, recent excavations in the valley floors of the Meuse and Rhine rivers show that these locations seem to be preferred. There are now multiple sites indicating a post-LBK shift in settlement location. Furthermore, some research suggests evidence of mobility between the Aldenhoven Plateau and the Netherlands at the end of the LBK (e.g., Balkowski 2017). The sharp reduction from approximately 300 LBK sites to two Blicquian sites in eastern Belgium (Jadin 2003) could also reflect a broader population decline within the same phenomenon, eventually associated with a major crisis illustrated by the emergence of ditched enclosures, two of which are precisely the one delivering the only Blicquy culture elements known in Hesbaye (Bosquet & Fock, 2025, forthcoming). For the Netherlands, a similar reduction is noted. The presence of three ditch enclosures dating to the end of the LBK adds to the notion of a major crisis. Their defensive function is however still debated (Van Wijk, forthcoming). Moreover, the study of micro-regions within these broader cultural trajectories reveals contrasting patterns: from a breakdown in transmission networks in western Belgium to a degree of continuity on the eastern side of the same Bliquy/VSG entity (Denis et al. 2024a, b).

In this paper, we aim to advance understanding of the LBK to post-LBK transition through transnational comparisons of new data. With this multidisciplinary approach, we hope to better understand the diverging regional trajectories at the end of the LBK. Although the data from the various regions are heterogeneous, we will present a multi-proxy synthesis that integrates different scales of analysis, from micro-regional to macro-regional, to compare the diverse processes and cultural trajectories at the end of the LBK period.

S26-204

LBK to Post-LBK Trajectories in Saxony and Bavaria: Comparison of Two Models

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This paper is part of a new doctoral project that examines the dynamics of the Linearbandkeramik (LBK) to post-LBK transition in Central Europe through the lens of lithic productions. In order to establish the historiographical basis for this project, our presentation will aim to provide a comparative overview of the transition processes identified in Saxony and Bavaria. Indeed, despite their proximity, these two areas seem to follow different cultural trajectories. In Saxony, the transition was marked by the shift to the Stichbandkeramik; in Bavaria, the LBK is followed by a regionally distinct group with both Stichbandkeramik and Lengyel influences, the so-called SOB.

At this transition, we witness fundamental changes in the archaeological landscape, with the emergence of large circular enclosures in the Middle Neolithic and the turning-away from LBK ceramic traditions. However, the decline of settlements at the end of the LBK in the Western part is contrasted by continuous settlement activity in the East. Moreover, the regional variability does not just start at the end of the LBK, but is rather present already during the early LBK.

This paper will synthesize a comprehensive range of available data (e.g., settlements, continuity and density of occupation, environmental settings, material cultures) to critically assess the differing cultural trajectories observed in Saxony and Bavaria during the LBK to post-LBK transition. Through this approach, the project aims to contribute to a nuanced understanding of the complex and regionally varied models that shaped Central European LBK transitions.

S26-205

A matter of conviction: The LBK-SBK-transition in the upper Danube region

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The transition from LBK to SBK in the upper Danube region sometimes appears as a hard rupture in the archaeological record, which has led to an intensive professional discussion about the interpretation. Due to the continuing scarcity of sources, the opinions of various authors differ widely: The scenarios range from a deep crisis at the end of the LBK with the abandonment of central settlement areas and subsequent resettlement on the one hand, to a temporal overlap between the two traditions and a correspondingly smooth transition on the other. The central problem is the chronology, which cannot yet be established beyond doubt either typochronologically or by means of radiocarbon dates.
Against this background, the available archaeological sources in southern Bavaria are evaluated as broadly as possible for evidence of breaks or continuities. Architecture and settlement structures, economic patterns, rituals and burials as well as symbolic behaviour and pottery style are included. In order to assess the respective developments, the possible time span according to the different chronological models must be discussed.
As a result, it is becoming apparent that the transition from LBK to SBK in this area is probably based on a consciously pronounced symbolic change, whereby many continuities have been retained in everyday practice. An intensive discourse within society is to be expected. Therefore, LBK and SBK at the turn from the 6th to the 5th millennium are more a matter of convictions than clearly definable chronological units.

S26-206

Enclosures of the LBK in Hesse – Signs of conflict and flexibel crisis management

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The increased occurrence of enclosures is seen as an indicator of a crisis at the end of the 6th millennium BCE. While a ritual use is assumed for some sites, which is particularly true for Herxheim (Rhineland-Palatinate/Germany), a fortificatory use is still under discussion. In addition to the more well-known sites, which are generally present in research, there are also numerous enclosures in Hesse/Germany. These sites are often poorly published and therefore make little contribution to the public discourse. Most of these sites have been uncovered by route excavations and construction activities within the recent settlement or by small-scale research excavations over the last 100 years and are mostly limited to a section-by-section recording of the sites, with varying degrees of documentation. A total of 17 enclosures, which can be regarded as secured for the Hesse region, have now been processed in a dissertation

using standardized methodology and examined in terms of their construction and function. The enclosures show both common features and individual characteristics that can be used to discuss different coping strategies. The need for a comprehensive study of the enclosures arose from the investigation of one of the rarely recorded mass graves in a Linear Pottery context and its contextual classification. The mass grave at Schöneck-Kilianstädten, in which at least 26 individuals show traces of torture and lethal violence, can be assumed to have been used for fortification purposes, as the bodies were placed in ditches immediately after the crime. Thanks to intensive processing, the construction method can be traced in numerous enclosures and several phases can often be identified. Numerous features also reveal intensive use of the sites after the ditches had already been abandoned for some time and suggest a possible dormant phase before the traces of the LBK-culture disappear.

S26-207

Human populations in the Morava River catchment at the turn of the 6th-5th millennium

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The transition between the 6th and 5th millennia is associated with the end of the Linear Pottery decoration style (LBK), and based on various proxy data, a population decline is assumed in most inhabited regions of Central Europe. While a diachronic development can be observed in ceramic decoration styles (LBK to SBK), population dynamics point to a significant disruption. In this paper, I aim to present the situation in the Morava River basin based on an analysis of changes in settlement patterns and a marked shift in the distribution of stone artefacts.
While LBK settlements covered the largest area of the studied region in prehistory, a significant portion of this territory was abandoned towards the end of this period. This is particularly characteristic of the subsequent settlement phase associated with the early stage of the Stichbandkeramik (SBK).
Regarding distribution networks, LBK populations were part of extensive exchange networks for both chipped and polished stone industries. After the turn of the millennium, there was a complete shift in these distribution structures, with long-distance trade routes disappearing and a shift toward local raw materials, or, in the context of polished stone tools, production became much less pronounced.
Based on the density of radiocarbon data and the evolution of settlement numbers, I hypothesize a significant population decline in the Morava River catchment, which is likely related to the transition in ceramic styles from LBK to SBK.

S26-208

Bandkeramik, Stroked Pottery and Lengyel in the Horn Basin (Lower Austria). A regional study and beyond.

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The Horn Basin of Lower Austria features one of the densest known clusters of early and middle Neolithic sites in Eastern Austria. Investigation of the Bandkeramik cluster revealed a fluid transformation of its structure as time progressed. This affected not only the number of findspots, but also the relationship between secondary settlements and places of regional significance. Geophysics established, that the late Bandkeramik central site of Breiteneich 5 possessed a massive enclosure, possibly superimposed by a younger, maybe Stroked Pottery period, feature. From the same region the Stroked Pottery enclosure of Frauenhofen and several Lengyel rondels, e.g. Kamegg, Rosenburg or Strögen are known. In my contribution, I want to give an overview of the regional settlement development between the late 6th and the early 5th millennium and the conclusions drawn in regards to spatial structures and population figures during that period. Since the Horn Basin analysis served as a template for the ongoing research on the Schletz cluster, we want to highlight differences and similarities between the two regions and take a look at some other, more recently discovered early/middle Neolithic sites in Lower Austria.

S26-209

The Upper Zaya Valley (Lower Austria) at the end of the LBK. A case study of decline and transformation.

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Since 2022, the research project “United by Crisis?” aims to explore the hinterland of the LBK site of Asparn-Schletz. This site is well known for its exceptional findings of slain individuals in Ditch II, associated with a violent massacre event. It is often referred to as a central place but little is known about its potential hinterland. We follow an interdisciplinary

approach including Line Walking Surveys with the participation of Citizen Scientist, further anthropological and geochemical analyses. A major task is the spatial structure and chronological differentiation of the hinterland settlements. In this paper we will present the results concerning the end of the LBK, showing the major shifts in settlement density and the general decline of the previously flourishing settlement cluster. Combined with new C14 and other anthropological analyses not only from the Schletz individuals, but also from the surrounding settlements, we are getting a clearer picture of the end of the LBK and the transformation to the Middle Neolithic in this region. Early Lengyel activity seems to be closely linked spatially to the preceding LBK settlements, but only in a few cases does a true, uninterrupted continuity appear to exist.

S26-210

The Late LBK Crisis revisited. Exceptional depositional practices in the enclosure ditch at Vráble, Vél'ke Lehemby

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The LBK and Zeliezovce settlement site of Vráble- Ve'lké Lehemby/Farské is among the largest Early Neolithic settlement sites in Central Europe. Since 2012, a joint research project of the Archaeological Institute of the Slovakian Academy of Sciences and Kiel University investigate settlement patterns, subsistence practices and social organization of this site. In the recent seasons of our excavations we found evidence of surprisingly rich and complex depositional practices of human bodies and body parts in and along the double ditch system surrounding the site. So far a minimum of 120 individuals have been recorded, 83 of which missing their heads. Especially spectacular is a mass deposition of at least 72 headless individuals in one section of the ditch. However, this is only a part of what is a complex and multi-layered set of depositional practices. These practices most likely date to the period between 5100-5000 BCE thus likely representing and adding evidence to the much discussed 'crisis' at the end of the LBK and in the transition to the following cultural expressions associated with the Lengyel complex in the region. Comparing the Evidence of Vráble with that of other contemporaneous settlement sites, such as Asparn/Schletz or Herxheim among others, is used to discuss the presence and nature of crisis-related developments and practices at the turn to the 5th millennium BCE in Central Europe.

S26-211

Ritual at Herxheim: crisis management, amplification of clan ties or something else?

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The enigmatic site of Herxheim, where destruction rituals included the killing and massive fragmentation of human individuals as well as the shattering of pottery and stone implements certainly played an important role at the demise of the LBK in Central Europe. At least in the Palatinate and other regions of the Rhine valley (e.g. Alsace) the population density seems to have declined considerably in the latest phase of the first farming culture of Central Europe – and before the Hinkelstein group emerged in the mentioned regions we have to consider a definite hiatus in the populating on the left bank of the Upper Rhine valley.
One interpretation for the highly destructive ceremonies at Herxheim could be the reaction to a significant socio-cultural crisis including the loss of potential parts of the LBK-immanent ideologies in certain regions or groups of LBK people. The aggressive destruction ceremonies might have been a last attempt at surmounting the potential cultural and ideological crisis. On the other hand the diverse ornamentation of the high quality pottery, imitating up to eight regional styles of the late LBK (pottery may also have been imported from distant sites) and imported flint stone varieties from different regions rather hint to a close meshed network of different groups of LBK people, perhaps linked through clan chains or old lineages. These groups may have convened at Herxheim to strengthen their reciprocal chains through highly extraordinary and violent rituals.
The strange actions at Herxheim, in their collectivity missing any links to LBK traditions still leave many questions open and the reason behind the violent ceremonies may well be something else which we don´t have a grasp on. But certainly Herxheim cannot be seen as THE clue to the general demise of the LBK. In other regions, e.g. Middle and Eastern Germany, a slow and gentle transition from the LBK to the following Stroke-ornamented culture takes place.

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T. Link, Die linien- und stichbandkeramische Siedlung von Dresden-Prohlis. Eine Fallstudie zum Kulturwandel in der Region der oberen Elbe um 5000 v. Chr. Veröffentlichungen des Landesamtes für Archäologie Sachsen 60 (Dresden 2014).

S26-212

Crisis again?! What's new in the discussion of LPC and post-LPC times.

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The aim of a new contribution to this session is to take up some of the pro and contra arguments and contrast them with new data. In addition to theoretical considerations, I will focus on the changes that are recognisable at the end of the so-called Linear Pottery culture and the beginning of the Stroked Pottery culture in Saxony. Do we really have enough arguments to speak of a 'dawn of the LPC civilisation' and with the SPC of a 'beginning of a new epoch'? Could we even capture such a moment in time and space with archaeological means, or is it just a more or less slow cultural change that we can and do only define artificially? In fact, the discernible big change in the archaeological data seem to take place later, within the Stroked Pottery itself.

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S 27: Sensory transformations

S27-213

Landscape and Sensory Experience in Iron Gates Paleolithic & Mesolithic Communities

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Cognition, emotion, and human behavior are interdependent. We gather information about the external environment through our senses, which allows us to understand, experience, and respond to events. Data is collected both consciously and unconsciously as we move through our surroundings. From this standpoint, I investigate whether the behavior patterns of hunter-gatherer communities, viewed as either residential or logistic mobility, demonstrate a different relationship with the environment in the cognitive-emotional domain.
The case study focuses on the Iron Gates area during the Late Upper Paleolithic and Mesolithic periods, where previous analyses of archaeological remains identified different types of mobility. A phenomenological approach was used to observe the environment over several seasons of archaeological research. Changes in the perception of the landscape were noted depending on the type of research: observations made during surveys were different from those during systematic fieldwork. Personal experience highlighted the differences between residential and logistic mobility, providing ideas and guidelines for further exploration, rather than serving solely as an interpretative tool for analogy.
Senses were considered in relation to the proximity of perceiving stimuli (e.g., sight – distant, touch – immediate), while environmental stimuli were evaluated according to appraisal theory and the basic division between the known and the unknown. In this sense, foraging and shared group activities lead to a collective, group experience, whereas in logistic mobility, the community has divided experiences depending on task groups. Additionally, it is essential to store information for intra- and inter-generational transmission. Verbal forms (myths and traditions) can be reinforced by the effects of other senses, especially visual and tactile, which are stimulated by objects ('symbolic' in archaeological remains) and do not require special actions.
The uncovered remains from the case study suggest differences in landscape perception and information storage and manipulation between different types of mobility, though it is important to consider the influence of other pre- and post-depositional factors in the formation of archaeological material culture. Nonetheless, the approach has shown potential for more comprehensive future research.

S27-214

The Transformation of Sacred Spaces: A Bottom-Up Perspective on Religious Experience from Hellenistic to Roman Times

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This study explores the transformation of sacred sites from the Hellenistic to Roman periods, focusing on how these changes manifest in material remains and the overall organization of centers. These transformations also impacted the experiences of visitors and pilgrims.

The classical Greek era is often viewed as more overtly religious, while Roman times saw sacred sites become centers of cultural significance. This raises an important question: Did the Romans' introduction of more complex, quasi-bureaucratic structures fundamentally alter the religious experience of these sites? Or, instead, was the perception of these spaces still religious, albeit with a greater interconnection of politics and economy? Despite the Romanization of sacred centers, the intertwining of these secular elements was not seen as unnatural by contemporary visitors, suggesting that the religiosity of these spaces remained intact. What differences emerged, and can we identify precedents suggesting the Roman modifications were not entirely new but represented a more impactful, wide-reaching version of earlier practices?

This study is primarily concerned with the transformation of sacred spaces, particularly those of the Oracle centers at Claros and Didyma, as well as the Mysteries at Eleusis. These sites provide evidence of the evolution of sacred spaces, particularly in how Claros evolved with the shift from the inland city of Kolophon to the coastal town of Notion and under Roman influence. By employing a bottom-up perspective, this research seeks to understand what these transformations meant for the people who visited and maintained these sacred centers, reflecting on the continuity and adaptation of religious experience under transformation.

These transformations are evident in the archaeological and architectural remains, literary sources and numismatic evidence. A vast corpus of studies on Claros and Didyma, mainly by the French archaeologists like Aude Busine, J.-C. Moretti, D. Laroche and others, will be utilized. The numismatic evidence will be compiled through the databases of Mantis, RRDP, CHRR, CCRO, Archer and others, especially for the coinage of Ephesus and Colophon. The study also draws

on biological studies that connect affluence with the emergence of ascetic wisdoms and moralization of religions. A primary example is by Baumard et al (2015).

S27-215

Between the Ordinary and the Sacred: The Social Impact of Punic Temples in Monte Sirai Through GIS-Based Analysis

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Sacred architecture not only shapes contemporary ritual experiences but also serves as a critical lens through which we understand ancient cultures, especially those for which architectural remains are the only surviving evidence of social and spatial practices. This is the case of the Punic civilisation that spread across the central and western Mediterranean from the 6th to the 1st century BC, for which no primary written sources have survived.
The temples, shrines and tombs that survive from this culture are more than static relics; their scale, decoration and spatial orientation suggest designs intended to evoke sensory and emotional responses that framed communal identity and shared meaning. In everyday life, these structures may have faded into the background of routine activities, but during ritual moments they came to life, transforming perceptions of urban space and anchoring a collective sense of continuity, belonging and identity.
This paper presents a case study of Monte Sirai in Sardinia (4th-1st centuries BC), where GIS-based analyses - in particular accessibility and viewshed tools - are used to investigate traces of a historically mixed community of North African, Levantine and local groups. These analyses reconstruct spatial visibility and movement, providing insights into how sacred architecture shaped the cityscape and collective memory. Combining 2D and 3D data, the study explores the role of sacred spaces in Monte Sirai, in particular the urban temple of Astarte and the extra-urban tophet dedicated to Baal Hammon and Tanit, each uniquely positioned within the landscape. Together, these temples reveal how ritual practices animated urban life, transforming spaces into active participants in shaping cultural identity and social cohesion, each with distinct influences on community life.

Pre-Recorded: Volatile Meanings and A-temporal Spaces: The Paradox of ancient Egyptian Sensory Narratives

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Material histories and places have often been studied as instances of a static reality–lost moments that once existed in tangible ways (e.g., "sensescapes"). In the last two decades, however, scholars have problematized the temporality of the past, emphasizing how its traces are studied *in* and *through the present* (e.g., Hamilakis 2013). This a-temporality of material history requires that archaeologists discuss not only the biographies of people, places, and objects, but their transformations through time.

Recent scholarship continues to embrace the concept of -scapes for addressing the (often less tangible) experience of place-making (Jürcke, Montes-Landa, and Ceccarelli 2021). Originating in landscape studies, -scapes have become the sine qua non of archaeological spatial analysis. The a-temporality of the past, however, requires a diachronic approach to sensory experience that is not limited to isolated artifacts but embedded in the evolving networks of interactions and cultural practices up and to the present.

This presentation takes the 'nude servant girl' trope from ancient Egypt as a case study. Modern, Orientalist biases have sensationalized this icon, projecting current fantasies of exotic sensuality onto ancient Egyptian history. Such biases have redefined our understanding of ancient sensory practices, influencing both academic and popular narratives. While sensory indulgence in ancient Egypt did exist, it was confined to restricted contexts and dependent on culturally specific social norms and hierarchies.

This research discusses explicitly the transformation of the past into the present, emphasizing how sensory experience is embedded in material histories and the agents who engage with them. Scholars must wrestle with the paradox of history as both a static and dynamic process. The a-temporality of sensory experience calls for a diachronic approach to the past as a means for understanding how historical legacies and contemporary narratives continually reshape our perceptions of the past and present.

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S27-217

Pre-Recorded: Sensing the dead: bodily and sensory transmutation of the Etruscan dead inside 6th-3rd c. BCE chambered tombs

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The Etruscan chambered tomb space is essentially a physical reminder of transitory burial rituals enacted after death. Although multiple typologies have ensued in pre-Roman archaeology to categorise burial objects, tomb architecture, and funerary iconography, we still know woefully little regarding sensory and physical exchange with the body itself, hence between living bodies and those of the dead. As noted by Trucco, in Italian archaeology, bodily remains (whether intact or cremated) have been overlooked in lieu of burial objects, especially pottery.^[1] I argue that a sensory approach offers an innovative way to address these deficits not only in terms of the Etruscan mourner's experiences, but also modern perceptions of burial practices in Etruria.

This paper draws on iconographic clues such as polyvisceral 'votives' and the chambered tomb itself to explore Etruscan post-mortem exchange in 6th-3rd c. BCE Tarquinia. Questions include: How did the living sensorily experience the dead following death? Was there a laying out period for Etruscan elites in the home as is presumed in Roman traditions, and if so, how was the body engaged and envisioned? Moreover, what can post-mortem realities involving decomposition tell us regarding such processes? Asking such questions improves our understanding of the funerary process in Etruria, particularly with respect to post mortem encounters and iconographic representations of the dead.

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S27-218

Minding the gap: making, employing and interpreting sensory data in archaeological fieldwork

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This paper first summarises some of the different methods developed by archaeologists in the field which add a phenomenological and sensory approach to traditional data collection. What does close multisensory observation add to traditional methods of field archaeology? How are phenomenological survey forms developed and applied to different physical and (ancient) cultural contexts? How are they explained to fieldwork participants? What are the issues in overlaying our sensory experiences and perspectives onto past people, environments and cultures? Having set out sensory fieldwork methods, and reasons for them, the case study of the Potentino Exploration Project will be considered. This multidisciplinary project includes sensory surveys, with a focus on the immediate environs of the Castello di Potentino (comune di Seggiano, Tuscany, Italy) and the wider landscape of the comune. Different approaches (and consequently, different survey forms) are required to record, interpret and understand this landscape from the Etruscan to Medieval periods at micro- and macro- scales.

S27-219

Do (not) touch! On the interaction of domestic art and graffiti in Pompeii

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In the modern-day museum, artefacts may be seen, but they are rarely made to be touched or closely observed. Precious objects are physically separated from the viewer. Yet, we know that numerous ancient objects *were* designed for touch, whether to be carried, manipulated or worn. A difference in use and perception of artefacts between then and now is unsurprising (and a post-Enlightenment development), but this has significantly informed how we approach ancient art. Even when 19th century art historian Alois Riegl already recognized a tactile dimension to classical art, his idea of 'haptic viewing' rarely refers to actual tactile contact with artworks, but to a visual awareness of material properties like volume, space, texture.

Roman frescoes have been approached in a similar way. Scholars minutely studied the meaning of their imagery as if they are museum pieces, yet the painted rooms of Pompeii were not picture galleries, but spaces of daily life. Increasingly, contextual studies are uncovering their role in the spatial and social contexts of the Roman house, while some even delve into the visual experiences, like the affect of illusory architecture or animated perceptions of mythological scenes (See e.g. Beacham and Denard 2023). Frescoes *were*, of course, meant for viewing. However, for my paper I would like to approach

Pompeian mural decoration not only from a visual perspective but explore how haptic interactions in the form of graffiti added to domestic wall paintings altered experiences. The modern idea of graffiti as defacement becomes misleading as writing and drawing over wall paintings inside the Roman house does not appear to be unusual nor undesirable. This attests to an interactive relationship with domestic art that can tell us more about the sensory, lived experience of the space, which contrasts with (art-)historical and archaeological perspectives.

Inspired by new materialism and assemblage thinking, I will take as my central case study a fresco from dining hall p in the Casa del Sacello Iliaco, Pompeii, which is accompanied by a short, inscribed text and drawing that would have transformed the aesthetic and social context of the banquet through engagement. As such, I will explore emic sensory considerations of Roman wall painting that seem at odds with our own encounters with art.

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S27-220

Sacred Soundscape in Pausanias. The case of Boeotia

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While a great deal of attention has been devoted to historical and archaeological aspects of Pausanias' *Description of Greece*, the sonic dimension of his work has been largely neglected. This paper aims at focusing on the sacred soundscape of Greek shrines, in line with the most recent development of sound studies in the field. I will consider not only the musical and performative sounds, but also the whole phonosphere, including sounds, voices, and silences of people, animals, and nature. All these elements contributed to the creation of ancient sacred soundscape. It will be interesting to point out: What did Pausanias 'record'? How were sounds, voices, and silences perceived and interpreted?
At the same time, this paper will offer a methodological approach for the study of sound which will go beyond its application to ancient sacred contexts.

S27-221

Investigating sound as experiential through-line in a rural sanctuary to Zeus

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This presentation starts from the premise that sound is an expression of the physical, material, and use dynamics of any place. Analyzing the acoustic and sonic characteristics of a site allows the researcher an alternate perspective on a site's arrangement and possible functions - sound can be an organizing force to human interaction. This is particularly helpful when no written accounts of daily life of a site have survived in any physical or literary record. Any archaeological interpretation that may be derived from such study, however, may seem ambiguous due to the temporary nature of sonic experience – a sound is gone in an instant. However the power of aural experience as an investigatory stratum is anchored by its consistent repetition through time.
As an example, ongoing sound investigations at the ancient sanctuary to Zeus on Mount Lykaion, Greece have mapped out a sacred terrain of shared and singular experience orchestrated by sonic connectivity on the mountain. A combination of soundscape and psychoacoustic approaches have enabled new kinds of queries concerning how sounded events may have been perceived in the past in addition to how architecture or landscape may have harbored sonic experience. Findings have pin-pointed moments of exceptional sonic dynamics throughout the Hellenistic lower sanctuary, from surprising connectivity between distant locations to sonic isolation achieved through powerful proximate echoes. Importantly, findings also point to contemporary biases in considering sonic experience 'exceptional'. A collected review of these dynamics will help situate the mountaintop sanctuary as a communal and directional experience – one continuously shaped by the landscape, the architecture set within it, the sequence of experience one might pursue, and the expectations of those visiting the site in both antiquity and today. The presentation will strive to demonstrate not simply the insights into antiquity that are contained within the existing sonic dynamics, but also the consistency between ancient and contemporary visitor engagement, particularly those of ancient ritual pilgrims contrasted with contemporary tourists and ritual reenactors. The mountain thus offers the session a challenge – is there room in current scholarship for more blended understandings of sensory transformation over time? What assumptions are embedded in our considerations of about sensory-based data in relation to ancient and contemporary visitors?

S27-222

Dancing in the cavelight: Sensory communities and funerary practices in Late Iron Age Mallorca

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In Late Iron Age Mallorca, the funerary practices of the Post-Talayotic communities reveal a nuanced relationship between the living and the dead, one profoundly shaped by sensory engagements within burial sites. My research explores how these communities formed “sensory communities” through a range of activities—adornment of the deceased, ritual consumption, music-making, and rhythmic movement—conducted within dimly lit spaces, such as caves and hypogea, where small fires cast a faint glow. Burial sites, often former Bronze Age spaces, became active sensory arenas, linking participants to a distant past while creating sensory bonds in the present through touch, sound, smell, and taste.
This work illuminates transformations across short-term experiences—such as the transient sensory impacts of individual rituals—and more enduring sensory frameworks established by the intergenerational use of these burial sites. By focusing on these sensory dimensions, this study contributes to understanding how archaeological practices can move beyond object-centered approaches, offering insights into the social fabric and lived experiences surrounding death in prehistoric Mallorca. This research emphasizes that sensory archaeological methods provide a vital means of interpreting past lives, allowing a deeper connection with how ancient communities engaged with death and the afterlife.

S 29: Human Mobility and Landscape Transformation

S29-223

Introducing Human Mobility and Landscape Transformation: Insights from the Iron Age hillfort Heuneburg on the Upper Danube

Quentin Sueur

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Mobility is a fundamental concept for understanding human societies, past and present. Being on the move has been an inherent feature of humankind since its very beginnings. The term mobility encompasses not only the ability to move and circulate, but also movement itself, migration and the routes it takes. Landscape, for its part, is not limited to wilderness, nature without humankind, but includes the human and non-human components of a territory. Mobility is therefore closely linked to the landscape and its transformations, whether sudden or deliberate.
Climatic events and environmental disasters, as we see all too often today, can drive people off the roads in search of a better future in other areas. However, changes to the landscape are not always the result of chance or environmental factors, they can also be the consequence of human activity. Humans have always shaped the landscape, digging ditches, building ramparts, laying out roads, ploughing fields and exploiting natural resources.
To introduce session 29, 'Human Mobility and Landscape Transformation', and to illustrate some of the key concepts that we will be discussing during the day, we propose a journey back in time to the banks of the river Danube to explore the early European Iron Age site of the Heuneburg. This site, one of the best preserved for the period, has a long tradition of archaeological research. While the citadel and the rich burial mounds that surround it have been extensively documented in the past, the Heuneburg territory is gradually being revealed thanks to the most recent research. We will explore the exchange networks and communication routes, focusing on the movement of goods and people on a regional and European scale. Finally, we will look at a number of recently excavated hillforts and the monumental architectural features that have left a lasting mark on the landscape of the region.
Using the Heuneburg as an example, we hope to highlight the complex links between human mobility and landscape transformation, and open up a range of perspectives for discussion and exchange throughout the day.

S29-224

Mobility, Environmental Adaptation, and Settlement Patterns in South-East Iran: A Reassessment of the Aliabad Period

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The valleys of south-east Iran offer an ideal setting to explore the relationship between human mobility, environmental adaptation, and landscape transformation. The Aliabad Period (c. 3700–3300 BC), marked by characteristic ceramics, is the crucial period preceding the global interaction networks of Early Bronze Age West Asia. Traditionally seen as a time of seasonal mobility with dispersed highland settlements, this view has been challenged by recent evidence from surface surveys, revealing diverse settlement trends, including decreases, increases, locational shifts, and continuity (Mutin et al. 2017; Mutin & Garazhian 2019; Sarhaddi-Dadian et al. 2019). At a regional level, recent research has uncovered a complex network of movement corridors spanning the Late Chalcolithic to Early Bronze Age.
This study re-examines settlement patterns across four key valleys, the Bampur Valley, Daulatabad Plain, Darestan Plain, and Bardsir Plain, focusing on similarities and differences in settlement development. Through detailed spatial analysis, we examine the proximity of settlements to vital resources like water and minerals, along with geographic barriers and movement corridors, to understand how communities inhabited and transformed their environments. We explore continuity and change in settlement site selection investigating the role of shared knowledge across geographically distant valleys in shaping settlement choices. This allows us to evaluate the role and types of mobility, whether seasonal, long-distance, or localized, for communities during the Aliabad Period.
By integrating local and regional spatial analyses, this study looks at the interaction between regional mobility and local settlement variations. It further investigates how mobility influenced settlement patterns, focusing on trade routes that fostered cultural exchange between these communities. The research provides new insights into the dynamics of mobility and shared knowledge during the Aliabad Period, enhancing our understanding of how various forms of movement impacted settlement practices and landscape transformation. By reassessing traditional perspectives on the Aliabad Period, this study illuminates broader patterns of human-environment interaction and socio-economic adaptation in ancient landscapes.

S29-225

Mobility patterns and landscape use in Late Prehistoric SW Iberia

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Mobility patterns are intrinsically linked to the use of resources and the design of cultural landscapes. In the past, communities modified their landscape through agricultural practices, herd management, resource provisioning to sustain communities, the organisation of surplus and the control of demographic patterns. This process was driven by two main factors: the use of the environment and human mobility. In this study, we offer through the application of stable isotope analyses (87Sr/86Sr and $\delta^{18}O$) on human and animal remains, a reconstruction of the mobility patterns in south-west Iberia through the study of Bronze Age sites such as Cobre de las Cruces, Mesa Redonda and Siete Arroyos (prov. Sevilla). In order to interpret the human mobility patterns, an $^{87}Sr/^{86}Sr$ isoscape of the Sierra Morena and the Guadalquivir valley is provided in combination with GIS in order to understand the catchment area and to infer possible connections between prehistoric sites. Furthermore, the detailed analysis of different pastoral strategies is combined with an $\delta^{18}O$ isoscape to reconstruct landscape use and mobility strategies. The results show different degrees of mobility for humans and animals, including gender differences in mobility patterns and interspecies mobility strategies offering new avenues for the interpretation of human mobility in Bronze Age Iberia.

S29-226

Exploring monastic landscape of Vikramshila: Settlements, semiotics and lived experiences

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Vikramshila was a Buddhist monastery and a center of knowledge production that thrived in eastern India between the 8th-12th century CE. The spatial analysis of the monument and its landscape provides insight into why this particular landscape was chosen and how it aided the subsistence and growth of this monastic structure. Drawing from Henri Lefebvre's work on the production of space, this research explores space through his conceptual triad of Spatial practice, representation of space and representational space.[1]

Spatial practice refers to physical and perceived space, including the geographical features and the anthropogenic activities within the landscape. Representation of space examines space as an abstract concept shaped by ideological forces, including the religious and political foundations of the monastery. Representational spaces embody the idea of a lived and experienced space, incorporating sensory experience along with practice centered investigation of the monument and its adjoining landscape.

The physical study of the monastery is based on archaeological explorations and excavations that have mapped settlements and their relationship with the monastery. Comparable studies at the Buddhist sites like Sanchi and Anuradhapura provide valuable context of this research in south Asia.[2] The political and religious presence is examined through the sculptural and architectural features. The idea of mandala cosmology and the making of landscape as a Buddhist landscape underpins the religious impact onto space, whereas the strategic significance of the region coupled with evidence of five centuries of royal patronage affirms the political conception.[3] Sensory experience is explored through the geo-ecology of the landscape, supported by data from multiple seasons of fieldwork. Lastly, evidence of everyday human practices such as votive stupas commemorating the death of the monastic dwellers and the laity highlights the experiential aspect of space.

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S29-227

The Early Bronze Age burial mounds in the valley of Tundzha River and the new landscape

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The first half of the 3rd millennium BC is one of the most dynamic and interesting periods in Balkan history. This is the time of migrations of people, transfer of technological know-how, exchange of ideas and innovations, and cultural influences. During this time, the communities of the Yamnaya culture crossed Stara planina Mountain and reached the valley of the Tundzha River. The hilly landscape in the valley of the River offered the optimal natural conditions for the newcomers.

The aim of this report is to present how the burial mounds – one of the main markers for the presence of the Yamnaya culture, changed the local landscape. Burial mounds represent a new, different way of treating the dead. They are monuments for remembering and worshiping venerated relatives and ancestors.
Burial mounds are conical earthen constructions ranging from 0.5 m to 10 m in height and up to 60 m diameter. Most of them are situated on the top of the hills and surrounded by pastures and sometimes with visible bedrocks. They have high visibility and for the next millenniums marked the sacred places. By separating the world of the living from the world of the dead, burial mounds marked the main roads in the ancient time and probably the boundaries of the separated villages.

S29-228

Colonization and Human Mobility in Taranto: A Spatial Analysis of Landscape Transformation

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The landscape represents a multifaceted, dynamic, and ever-evolving reality, a social construct where different forms of interaction coexist. The relationship between humans and their environment, the resources and limitations of a territory, social structures, and the relations between different communities all contribute to the continuous creation of new landscapes, which interact with each other.
Reconstructing these dynamics in archaeology is a methodological challenge, but their definition allows us to contextualize the data at our disposal and analyze complex phenomena through new interpretative frameworks. The case study of Taranto and its archaic colonization serves as an excellent example, one that cannot be fully understood without a comprehensive landscape study, which emphasizes the spatial nature of archaeological data and helps overcome certain methodological preconceptions, particularly in the case of colonization. The establishment of a Greek colony in Taranto must be contextualized within the broader settlement growth in the Salento peninsula, which began in the later phases of the Iron Age, and as part of the complex process of Mediterranean mobility.
However, a proper study of the ancient landscape requires two fundamental prerequisites: a census of known evidence and a reconstruction of the ancient territory as close as possible to its original state. By conducting spatial analyses, such as visibility and cost-path analyses, it has been possible to reconstruct the relationships between various settlements and between communities and the surrounding landscape over time, highlighting both continuities and discontinuities.
Based on these principles, the city of Taranto and its territory have been analyzed from the protohistoric phase to the 6th century BCE, when significant transformations occurred in the city's urban fabric. The study follows these steps:
-Census and cataloging of known data;
-Creation of a GIS-database system for data recording and analysis;
-Analysis of data related to both the Iapygian and Greek phases of Taranto;
-Reconstruction of the evolution over time of the relationships between the territory and surrounding communities, using the capabilities of spatial analyses, focusing both on the Iapygian settlement reality and the relationships between the Greek city and its *chora*.

S29-229

Crossing the Carpathians – environmental conditions in the Early-to-Mid Holocene and the spread of Neolithic populations north of the Danube

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The aim of this presentation is to investigate the environmental conditions during the Early-to-Mid Holocene and the possible constrains they have put on the spread of Neolithic populations across the Carpathian Mts. in the processes of neolithization in Central Europe. To this extent, we have combined 1) seasonally-distinct reconstructions of air temperature and precipitation amounts with 2) maps of vegetation and 3) reconstructions of floodplain processes in order to obtain a clear image of the landscape in and through which Neolithic populations were moving and leaving.
Our data combined data points towards distinct environmental conditions north and south of the Carpathian Mts., as well as different floodplain dynamics that could have hindered the spread of agriculture, potentially directing Neolithic populations moving north from the Balkan peninsula towards central Europe, delaying the spread of agriculture north and eastwards.

S29-230

Chimú Agricultural System in Pampas de Huanchaco-Peru

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This research examines Chimu agricultural fields located 5 km west of Chan Chan (mainstate), to understand environmental processes and Chimu agricultural policies. Constructed in the middle Chimu period (1200-1300 A.D.), these fields were part of a complex system of irrigation which included secondary, tertiary canals and "*Melga*" and Serpentine Furrow crop patterns. Using empirical evidence from aerial maps, pollen and phytolith data, X-ray fluroesence data, survey of the area, and a broad literature review indicates that these fields are part of a Chimu agricultural expansion project and supported through flood irrigation, which were fed by water of Chicama-Moche lntervalley canal and Wichanzao. This project provides a glimpse of favorable climate processes during the Middle Chimu Period and the socioeconomic agenda of the Chimu State during this opportune time. Socio-economic issues are characterized through discussion of the archaeological site of Cerro la Virgen, located adjacent to Pampas De Huanchaco, and its relationship with Chan Chan in the second half ofthe Chimu dynasty in the Moche valley.

S29-231

Changes in the agricultural landscape of Normandy, France post WW2. A political evolutionary phenomenon or a direct result of the conflict? Operation Cobra - a case study.

Helen Basson

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The 'War of the Hedgerows' in Normandy following the D-day landings in the summer of 1944, appeared to have changed the 'bocage' landscape irrevocably as tanks and troops burst through the steep-sided field boundaries in order to break the military deadlock. Operation Cobra was the action that created the breakthrough that allowed the subsequent liberation of France. This paper examines the changes in hedgerow density and orchard disappearance in the years post-war to the present, to establish whether the policy of 'remembrement' (field indivision), implemented immediately after the war had a greater long-term effect on this singular landscape than the movement of troops in the Second World War.
Using two neighbouring villages as a case study, La Chapelle-en-Juger, in the direct firing line of the aerial bombardment and St Ebremond, just outside the fiercest shelling. The former deliberately refused the policy of remembrement post-war whereas the latter undertook the severe agricultural changes the policy dictated. Results show the ecological, social and historical effects of this comparison, and show that post-war policy changed the landscape far more dramatically than the direct effects of the conflict.

S29-232

A multidisciplinary GIS based investigation into the problem of settlement desertion in Central Hungary - the example of County Pest and the Great Hungarian Plain

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Our case study presents a multiscale and long-durée approach, synthesizing historical data (a digital topographic database of late medieval settlements), archaeological data (a collection of small finds from systematic field-surveys and metal detecting surveys) and environmental data (a comprehensive evaluation of pollen sites) to illustrate the divergent development of settlements within the hinterland of Buda and Pest, in County Pest, in Central Hungary. We integrate the quantitative and qualitative assessment of archaeological finds with GIS based topologic and distance based parametric modelling to understand historical settlement hierarchies and to highlight the role of internal and long-term factors (socio-economic changes in the 14th-15th centuries, and the impact of the Ottoman conquest in the early 16th century) on settlement desertion.
We specifically address the diverging historical trajectories of settlement development in peri-urban setting, the emerging hierarchies due to settlement desertion, relocation, internal migration – influenced/catalysed by the socio-economic context, climate change and by the Ottoman war, which seem to have had. The presentation underlines the necessity of a multi-scale and multi-disciplinary approach evaluating/interpreting different data types (historical, environmental, archaeological), and advocates for a more nuanced view of the desertion process, in the face of the difficulties implied by weaving together historical and archaeological information, and with regard to the problem of differentiating between land desertion and settlement desertion, as well as between temporary and permanent desertion.
More generally, we intend to reflect on the concepts of marginality and frontier and on the theory of the so-called "Alföld (Great Hungarian Plain)-syndrome", i.e. the long lasting ecological and socio-economic historical impact of the Ottoman frontier zone, one characteristic of which was the lack of traditional urban centres, and the belated development of rural market towns. Furthermore, our analysis provides environmental geographical, historical and archaeological perspectives on current issues of landscape development and protection in this peri-urban landscape, impacted by conflicting interests of development strategies (emphasizing industrial functions) and landscape protection policies (promoting cultural-natural values and local tourism).

S 30: Architecture as ‘micro-universe’ of prehistoric societies: social, economic and environmental reconstructions

S30-233

A world set in earth and stone - insights into the built environment at Neolithic Göbekli Tepe

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The Early Pre-Pottery Neolithic in Southwest Asia can be seen as a nursery for man-made architecture. In the absence of building codes or established building traditions, Neolithic builders tested a wide range of construction techniques and materials, sometimes going far beyond the structural capabilities of the material or design chosen, resulting in structural failure. The architectural findings are reflections of the Neolithic builders attempts to achieve stability, durability and ‘functionality’. The architecture at Göbekli Tepe offers insights into these attempts and can be studied there in detail. However, the buildings also reflect the early Neolithic myths of origin and conception of the world. This paper will present some insights into the conception of special buildings, and domestic dwellings at the site, as well as the development and stratigraphy of the built environment at Göbekli Tepe in general, based on the results of the ongoing research carried out by the German Archaeological Institute - Istanbul in cooperation with the Istanbul University.

S30-234

Socio-economic aspects of residential interior in Provadia-Solnitsa tel (5600 – 4350 BC)

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Provadia-Solnitsa is a prehistoric salt production and urban center located on the right bank of the Provadiyska river, south of the town of Provadia, in northeastern Bulgaria. The origin and development of the settlement and its accompanying complexes is directly related to the earliest production of salt in the Eastern Balkans (Nikolov 2017, 320). The specialized production of the strategically important raw material is reflected in the structure and interior of the residential buildings in the village of the first salt producers. So far, residential buildings from three stages of habitation have been studied in the settlement mound - from the Late Neolithic, Middle Chalcolithic and Late Chalcolithic, which provide enough information about the available facilities and the organization of the household.
Observations of the interior structure and facilities made for the buildings from the three periods of occupation make it possible to trace socio-economic changes occurring with the development of salt production and its growing role in local society. Of the two Late Neolithic buildings studied, one is a two-story building combining production functions (the first floor) and residential use (Nikolov 2008, 97, Nikolov 2021, 224). In the later periods (Middle and Late Chalcolithic) no production facilities were recorded as part of the interior of the dwelling. During the Middle Chalcolithic, the structures uncovered probably had only domestic functions, with houses being used as dwellings and storage for food supplies. Then, in the two-story houses, both floors were used as living quarters. A change occurs during the Late Chalcolithic, when all houses are two or three stories high and the entire household is moved to the second floor. In the case of a three-story building, the third level was also used for residential use. The first floor was freed from facilities and probably this space was used as a warehouse for storing ready-made salt (Nikolov et al. 2024, 208). The development of the interior through the successive stages of habitation is a reflection of the changes of the economic development of the society in Provadia-Solnitsa.

S30-235

Cattle collaborators - Animal architectures and human-animal interaction in Bronze Age West-Frisia

Floor Huisman

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A defining character of the Middle Bronze Age archaeological record in several areas of northwestern Europe is the appearance of extensive fieldsystems in combination with evidence for permanent settlement, including recognizable (long)houses. These new forms of architecture have been linked to economic intensification and the emergence of property ownership, with competing warrior chiefs accumulating and trading personal wealth in a prestige goods economy. Such approaches focus wholly on (particular) humans (mostly males) as the main social actors. This results in a somewhat limited and rigid model of Bronze Age social organisation. To write richer and more inclusive social narratives,

we need to take a different approach, which examines how Middle Bronze Age fieldsystem and settlements came into being, how they functioned and which actors, including both human and non-human ones, were involved in this.

This paper will approach Bronze Age fieldsystem and settlement architecture from an 'animal perspective'. Using a posthumanist, relational approach and drawing on ethnographic and historic examples which emphasize animals and their active role in small-scale farming societies, it will consider how animals and their daily interactions with humans greatly influence the spatial configuration of Bronze Age fieldsystems and settlements, and thereby also people's identities and social organisation. Several Bronze Age sites in West-Friesland (the Netherlands) will serve as case studies to demonstrate that social organisation in this area was not predicated on hierarchies and powerful (male) leaders, but based on collective decision making around the creation, use and maintenance of a wide variety of 'animal architectures', including structures, fieldsystem enclosures and animal management features. Using a multi-scalar approach which moves from houses to settlements and the wider landscape, and from daily activities to longer term developments, allows us to trace the effects of constantly changing human-animal interactions on these architectures and associated social organisation at multiple spatial and temporal scales. Thus, applying an 'animal perspective' to Bronze Age fieldsystem and settlement evidence enriches our interpretations of prehistoric architecture and provides a more complex, dynamic and detailed reconstruction of Bronze Age social life.

S30-236

Comparing plant economy of two Trypillia sites in the Podolian uplands under consideration of differences in settlement lay-out, architecture and chronology

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The plant assemblages from two Trypillia sites in the Dniester-Southern Bug interfluve are the focal point of this presentation. Bilyi Kamin (3950□3690 BCE) with 97 ha size dates to the Trypillia C1 megasite period, while the site Kisnytsia (3640□3450 BCE) with 6,5 ha is one example for settlement dispersal in the later Trypillia C2 period. Distinct architectures (normal houses, megastructures) characterize each of the settlements. In both cases, in addition to the excavation of houses, "pit archaeology" was also carried out that revealed sound botanical material. Pits are usually located close to the building and are therefore associated with the architecture. They contain household waste, reflect on household inventories and allow the reconstruction of routine activities. Other pits, located in greater distance from buildings, reflect specific on-site activities. Veritable waste layers were further observed next to some of the buildings at Bilyi Kamin. From the archaeobotanical assemblages, a homogeneous picture of cereal cultivation emerges for Bilyi Kamin, which was mainly based on fertilized barley. This is in contrast to Kisnytsia with a diverse range of crops, where emmer was grown alongside einkorn and barley, timopheeviiis wheat and pulses had a small share. We will disentangle how the different plant assemblages reflect on the differences in settlement lay-out, architecture and chronology.

S30-237

House Societies of Pelagonia: spatial organization and architecture in the Early Neolithic Balkans

Goce Naumov

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The Neolithic of particular parts of the Balkans witness the abundant presence of architecture with distinct technological, symbolic and social features. The elongated valley of Pelagonia is one of these regions that demonstrate intensive building activities and varieties not rarely supported by series of symbolic practices and items. These buildings are frequently present in period between 6400 and 5800 BC when several waves of Neolithization are evidenced in this valley. The research exhibits several models of settling Pelagonia which are determined by environmental factors, subsequently having an effect on architecture and spatial patterning of the settlements. The constructive changes and transformation of building features can be traced on various sites and they are evident on the character of dwellings (pit houses or wattle and ground daub dwellings) and their household installations (ovens, bins, granaries etc.). The continuous residence on particular parts of the settlements will contribute in the gradual development of tells, which besides its historical component also will demonstrate strong symbolic relationships with present and past members of the Neolithic villages. In these terms the common enclosing of the settlements with ditches can be also regarded as practical, social and symbolic acts which are further supported by exquisite house models frequently produced on various Neolithic sites in Pelagonia.

S30-238

The Late Neolithic House of Hódmezővásárhely-Kökénydomb

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The current research of Hódmezővásárhely-Kökénydomb, a well known tell site on the southern part of the Great Hungarian Plain, started in 2022. The excavations, based on the geophysical survey of ELTE and RGK, focus on a deliberately burnt house. During the two seasons, the entrance area, the debris of the house and the furnishing constructed during the rite have been investigated. Two different excavation methods have been applied. Inside the house, 3D scanning was used to document the debris, while in the forecourt of the building intersection walls were created with a density of 2 m. A 3D model was created from the 44 m long drawing documentation. Based on the stratigraphical position identified by levels and square metres 393 units were separated. In the outer part we found 130 cm thick series of layers, main part of which was contemporary with the house. This sequence started with the foundation of 170 cm deep postholes, while the debris enclosed the stratified substratum of floors, hearths and ash layers, which was linked to the architecture not only by physical proximity but also by the renewed external roof of the house. The life span of this stratigraphic micro-universe, based on the C14 chronological model, was 82-177 years, i.e. the building was used over several generations, whose finds qualify the activities that took place in and before the house. Based on the archaeological features, it is possible to reconstruct different areas of human life, and based on the finds, to identify activities. In particular, it is useful to consider the temporal variation of similar activities, such as the periodical renewing of external floors. There are several markers that can be used to identify individual decisions: the variation on the material applied, the thickness of the plaster, the amount of material used, the extent of the formed surface. We can discover the archaeological imprint of successive generations behind the 3-4 times repeated and then changing activities. The temporal dynamics of human activities can be detected also in the position of hearths, in the spatial distribution of fish bones, or in the trends of the timber use, i.e. in the caprological samples. To analyse the latter, more than 100 samples were taken from 36 stratigraphic units covering almost the entire stratigraphic sequence of the entrance area. Our data and analysis allow a complex social, economic and environmental reconstruction of the household activities.

S30-239

From Cucuteni to something else. What was preserved in the architecture of the dwellings?

Ghenadie Sirbu

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The standard dwellings specific to the communities of the Cucuteni-Trypolian cultural complex are represented in the form of rectangular structures, the dimensions of which vary from one complex to another, with a platform-shaped floor made of half planks of beams, over which a layer of clay mixed with organic remains was applied. The walls consist of a wooden frame (beams interwoven with wicker) faced on both sides with clay with organic remains. In the end, of all the architecture of the dwellings, the only somehow better preserved element remains the platform, which some scholars believe was burned accidentally or intentionally.

The attempts to reconstruct the dwellings are based exclusively on the investigation and interpretation of the remains of burnt remains of the houses. These, depending on their state of preservation, can, on the one hand, provide information about the shape and dimensions of the dwellings, the nature of the floor and walls, and the building materials used, but on the other hand, they leave space for speculation about the plan of the houses, but above all, about their structural resistance.

If for the Cucuteni-Trypolian settlement complexes there is sufficient information in the specialized literature, for the Late Eneolithic local groups it is few and incomplete. This situation is largely due to the lack of exhaustive research over large areas, which would allow a general picture of the distribution of dwellings within the settlements to be created. Specialists believe that the small number of dwellings is directly related to the low degree of valorization of the excavations carried out.

The aim of this presentation is to show the situation related to the specific dwellings of the Horodiștea-Gordinești group in the East-Carpathian area. From the available sources, two types of dwellings have been identified for the mentioned group: surface dwellings and dwellings with a deepened base, although in some sources three types are mentioned: surface dwellings with platform, semi-dugout and dugout dwellings.

S30-240

Organization of built space and architectural patterns in the settlement of Brinzeni III – Țiganca

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The Late Eneolithic period in the Prut-Dniester region is characterized by significant transformations reflected in almost all categories of archaeological finds. The spread and topography of settlements, the layout and organization of inhabited spaces, the size of dwellings, ceramic assemblage, faunal and archaeobotanical remains, the industry of raw materials

(bones), etc., provide evidence of the archaeological reality (and historical processes) of the period succeeding the Cucuteni B – Trypillia CI phase. Distinctive features are particularly noted in the size and structure of the settlements, which reflects a process of habitat reorganization - from rows of dwellings arranged in concentric circles to an irregular distribution within a restricted space.
A relevant example is found at the late Eneolithic site of Brînzeni III – Țiganca, where the remains of 37 dwellings forming groups of 2-7 constructions were investigated. A unique situation is characterized by a group of seven dwellings in the southern part of the fortified enclosure, while those numbered 23-27 were aligned in a row along the north-south axis. Based on stratigraphic data, dwelling 23 was built directly on the limestone bedrock, for the others terraces were prepared to create flat surfaces. Dwellings 24-27 feature similar characteristics: rectangular in plane, with dimensions within the limits of 8×4.2 m, and a practically identical internal structure, characterized by construction techniques and the placement of interior elements (fire installations, clay benches and boxes, etc.) featuring original technical solutions.
The presence of architectural patterns within the Brînzeni III – Țiganca settlement opens up a broad perspective on interpreting the organization of households within a community and establishing social differences. The potential of this data for obtaining precise results in the context of demographic reconstructions is significant, as the site is considered a regional benchmark for identifying the typological specifics of an entire group of Late Eneolithic settlements identified in the north of the Northern Moldavian Plateau region.

S30-241

Households in Neolithic and Chalcolithic Southeast Europe: Rooms and Storage

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In recent decades, the increased applications of magnetic surveys contributed decisively for a better understanding of the structure and demographic development of settlements in Neolithic and Chalcolithic Southeast Europe. Accordingly, communal buildings, residential houses, pits, and ditches are the most frequent elements of settlement plans. After the increased attention paid to special buildings in recent years, in our contribution we would like to turn to domestic structures. We would like to address two important aspects of human settlements in Southeast Europe in the period between 6000 and 3000 BCE. On the one hand, we would like to discuss the question of the formation of households and the development of the size and composition of households on the basis of the dimensions, subdivision and furnishing of houses. On the other hand, we would like to review the existing evidence on storage and relate it to household composition and their transformations. On the basis of these parameters, we hope to be able to reconstruct the broad lines of development and transformation of households as social and economic units.

S30-242

Manifestations of monumental architecture and its social significance for the Cucuteni-Trypillia cultural complex

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Large-scale structures, which were erected to demonstrate the power and strength of society traditionally are considered as “monumental architecture”. As a rule, they are associated with the wide use of stone in construction. However, the tradition of building large-scale structures using earth, wood and clay is no less widespread. Some of them are larger in scale than objects made of stone. The main criterion in this case should be the resources used for the construction of certain objects.
The result of archaeological research of the sites of Cucuteni-Trypillia in recent decades was the confirmation of the existence of structures on which the ancient society spent significant resources. In our opinion, their number should include not only large buildings, after which the name of mega-structures was established, but also fortifications around settlements. In a certain sense, mega-settlements themselves also fall under the definition. All of them are a demonstration of the possibilities of Cucuteni-Trypillia communities, their strength and power.
Megastructures, fortifications and large settlements are also a demonstration of the level of knowledge in the field of architecture. This uncludes the organization of the space of settlements with certain zoning into production zones, sacred and public space together with taking into account the defense factor, and logistical efforts for large-scale construction. Thus, the creation of the defense system of a large site is a manifestation of the combination of the development of military knowledge and the use for the purpose of protection of certain architectural achievements.
Megastructures in themselves are evidence of the development of design thinking. On the example of the Nebelivka temple, we see a solution to the problem of covering a large space over twenty meters wide. The standardization of the planning of mega-settlements is evidenced by the ability to break down quite complex structures on an area of several square kilometers.

S30-243

Tradition and monumentality: The Mangolding Neolithic earthwork complex in comparison

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In the Neolithic, earthworks were repeatedly constructed at central locations. This need for collective communal work at the same place was observed several times in Bavaria. To the east of Mangolding, one such earthwork complex was fully explored by a magnetometer prospection. An oval-rectangular earthwork with an internal area of 3.1 ha was recognised. At least three causeways once provided access. To the north of it is a large oval ditch with an internal area of 1.8 ha and a maximum diameter of around 160 m. This is followed upslope by a smaller complex of three ditch rings. The three representative access areas, which consist of inwardly tapering earth bridges, are remarkable. This earthwork encompasses the highest point in the surrounding area. In the Final Neolithic, settlement activities shifted 3 km upstream, where two enclosures where erected in the typical style of the Altheim and Cham cultures. Ditch systems could be set up in a relatively short time, and the spatial relationship between contemporaneous settlements and monumental earthworks is of particular interest. Once they had fulfilled their purpose, they remained recognisable for subsequent generations as monuments of former landscape design. It is unclear whether settlement continued without interruption from the Early to the Final Neolithic. A pulsating settlement activity with alternating centres over the course of two and a half millennia is the most likely possibility. In this respect, continuity depends on the chosen spatial and temporal parameters.

S30-244

Exploring Middle Neolithic (3300 – 2600 BCE). Timber Circles in Southern Scandinavia: A Biographical Approach to Architectural Complexity

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In Southern Scandinavia, Neolithic timber circles—constructed with timber arranged in circular plans—are significant yet understudied archaeological features. While several timber circles have been documented in Scania, a more substantial number have been recorded on Bornholm. My research focuses primarily on the Scania material.

Timber circles are typically located in sites with extensive histories from the Neolithic and onwards, often functioning as large settlement, enclosure or burial complexes. At first glance, these sites conform to prevailing interpretive models of Neolithic landscapes. However, closer scrutiny reveals complexities that challenge traditional interpretations, such as the varied distribution of timber circles across different contexts and the blending of Middle Neolithic Cultural affiliations.

This paper aims to illuminate the arrangement of timber circles from a local perspective, followed by a comparative analysis of similarities and differences across regions and contexts. The study is grounded in detailed examinations of excavation records. Given that timber circles are a relatively newly discovered phenomenon and have not been systematically explored within Swedish archaeology, this research requires an exploratory approach, and the development of methodologies tailored to their documentation.
To address these broader questions, I employ a biographical perspective, focusing on the life histories of individual structures (e.g., Bailey 1990). This approach emphasizes the temporal dynamics of timber circles, moving beyond traditional categorizations that focus solely on physical characteristics. Instead, the biographical perspective highlights the processes involved in constructing, maintaining, decaying, and occasionally altering these structures (van Oyen 2015:70). This approach prioritizes the *becoming* of buildings rather than their static existence.

I propose that the architecture of timber circles is a heterogeneous assemblage of various elements—physical structures, people, objects, events, artifacts, experiences, and values. These elements should be studied together to fully understand the architecture and the interactions within it. This comprehensive approach sheds new light on the diverse projects and affects associated with the architecture of timber circles.

S30-245

Beyond the Eneolithic Tell Settlements: An Intriguing Structure in the Cemetery of Sultana-Malu Roșu (Romania)

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The presentation aims to explore one special archaeological find in the context of *off-tell* habitation during the Eneolithic timespan (c.5000-3900 cal. BCE) in the Balkans. In our latest research at the Sultana-Malu Roșu site, Southeastern Romania, we have unearthed the remains of a burnt wattle-and-daub construction, situated near the main tell-settlement in the cemetery area, dated on the middle of 5th millennium BCE, which has several particular features.
First, its size is atypical for Gumelnița culture. Foundation trenches of construction indicate a 190-square-meter structure (19x10 m). It was supported by the wooden internal structure of the wattle-and-daub walls, but also by three rows of wooden posts inside, and another two external rows parallel to the long western and eastern sides. The construction had two rooms, seemingly designated for different functions.
Our investigation reveals that the construction burnt down around 4500 BC in an intense fire, hot enough in some areas to vitrify the clay.
Also uncommon is the location, because it was found in the perimeter of the Eneolithic necropolis. This construction that belongs to Gumelnița communities overlaps and cuts through the oldest graves in the cemetery (Boian), while its destruction layer is, in turn, cut by graves of the same community (Gumelnița) that originally built it.
Although, we recorded and recovered thousands of small finds, this construction is uncommon due to the lack of the typical rich pottery assemblage found often in burnt Gumelnița buildings at the tell settlements. Keeping the comparison with the dwellings from the settlement we have noticed that the abandonment layer is unusually thin or, in some areas of structure, completely missing. Normally, this type of action leaves behind a consistent brittle and dusty layer of burnt daub atop the destruction layer. This absence suggests the layer may have been intentionally swept away. These unique characteristics—the off-tell location, positioning within the necropolis, its size, the lack of a typical abandonment layer and pottery assemblage, and the site's reuse for burial purposes—make this construction particularly intriguing and distinct.

S30-246

Buildings for the living vs. buildings for the deceased. Architectural relics as a source for reconstruction of social and mental organisation from the 3rd mill. BC in the Polish Lowlands

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In the Polish Lowlands, but also in other parts of Europe, archaeologists studying the 3rd millennium BC have long noted the contrast between relics of residential buildings and structures with a funerary function dating from the same time. The former are generally very modest and only fragmentarily preserved. Most often their remains are in the form of clusters of traces of wooden posts, outlining the more or less legible shape of the walls. Cultural layers delimiting the extent of space intensively used by residents are rarely observed. Other functional infrastructure components, such as fireplaces, are also relatively rare.The consequence of such limited observations is the uncertainty of the produced building reconstructions. Meanwhile, burial structures dating from the same period are often clearly marked in the landscape by different forms of embankment. Many of them are of stone or timber construction, the workmanship of which indicates advanced engineering expertise. Such a profound difference between the relics of the two categories of buildings seems to signal the existence of deep ideological structures that influenced people's behaviour. On the one hand, they may have led to a high valorisation of the world of the deceased and, at the same time, forced the involvement of larger human communities in the creation and maintenance of funerary sites. On the other hand, the very meagre remains of residential structures indicate a lack of the high valorisation of the home that was so common to earlier of Neolithic communities. They may also indicate that the residential structures were the work of smaller and not necessarily highly skilled groups of people. At the same time, it may also be a marker of the increasing mobility of human communities, attested by other sources including bioarchaeological ones. Altogether, the contextual analysis of architectural relics from the 3rd millennium BC yields very inspiring results for the attempt to reconstruct the social and mental organisation of human communities not only in the Polish Lowlands.

S30-247

Using Comparative Ethnology to Explore the Kinship Structures of Eneolithic Populations of Romania (5000-4000 BC) through the Study of their Built Environment.

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Kinship has been shown to constitute a structuring principle in pre-industrial societies, influencing most aspects of social and material life. Of particular interest for archaeologists, the discipline of comparative ethnology is dedicated to using statistical methods to identify underlying relationships between specific types of kinship systems and certain cultural traits (Hrnčíř and Květina 2023). Therefore, it makes it possible to provide a series of "proxy measures" that can

be retrieved in the archaeological record to increase our understanding of prehistoric societies. Among these material correlates, architectural remains constitute an infinitely valuable source of information for exploring the nature of kinship systems that existed among the Neolithic communities of the Northern Balkans. In effect, the built environment of this period is generally well-preserved and has been the object of archaeological research in the region for a long time. This communication will offer a diachronic examination of the evolution of building practices in Muntenia, Romania, during the fifth millennium BC, from the Boian-Vidra to the Gumelniţa B1 phase. In the region, this time frame corresponds to the passage from local material "cultures" to the rise of a significant material koine that encompassed a large territory spreading from southwest Ukraine to northern Greece. Consequently, it is likely that significant changes occurred in the social organization of the groups that lived in southern Romania during this period. We will rely on two main approaches to assert which forms of kinship were prevalent during this period. First, we will rely on the well-established link between post-marital residence and dwelling size. Secondly, we will examine the overall layouts of the settlements and interpret the data through Ensor's (2021) analytical framework to glean information on the inner organization of the corporate groups that can be considered as the foundation of Eneolithic society in Romania.

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S30-248

Houses of Sumba (Indonesia). Architecture, social function and symbolic properties of the house in a today's pre-state context

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We propose to present the state of knowledge about the house in traditional societies on the island of Sumba (Indonesia): architecture, construction techniques, reconstruction procedures, distribution of space according to gender, secular and sacred spaces, place of ancestor spirits. In the second part, we look at variability according to social status (noble, commoner, slave) and type of social organisation (trans-egalitarian vs. stratified).

S 31: Social significance of settlement plans

S31-249

Neolithic societies in the south-western Carpathian Basin: translocality, collaboration power and liminality

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In the south-western part of the Carpathian Basin, numerous Neolithic sites have been documented, most of which are known only from field surveys (Botić 2017). With development of non-invasive methods, the information about inner structure of Neolithic settlements increased. Combined results from several applied methods indicate that the development of these settled spaces ranges from several dug-out features to full size timber or wattle and daub houses of different dimensions and from small size tell sites to large flat settlements, with or without earthworks (ditches). Notably, the size of settled spaces and their features are temporally and geographically dependent, especially in several transformative periods noted in the entire set of remains of material culture.
The aim of this paper is twofold: to examine the social organisation, interests and strategies of the Neolithic societies in the key study region by applying the bottom-up approach to analysing non-state societies, based on theoretical approach by M. Furholt and colleagues (Furholt et al. 2020; Furholt 2023), of several key study sites and to examine their perception of geospatial liminality. The results obtained within the "Transformation of identities through past" (TIPS) project (NextGenerationEU), indicate the existence of translocal sociospatial systems based on collaborative power rather than violence-based dominance, with potential indications of change in population sizes over time. It is also notable that the environmental component may have had an impact on the formation and development of Neolithic settlement patterns. Furthermore, this environmental component may have played a role in the perception of geospatial liminality (Fourny 2013), contributing to the discussion on divergence of liminality from its original concept (Banfield 2022).

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S31-250

Creating a microcosm within macrocosm – the location and role of a Neolithic rondel within the Lengyel settlement network

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The typical Late Neolithic earthwork of the Western Carpathian Basin is the Lengyel culture rondel, which significantly influenced the settlement network. Our research team, *Axis mundi*, is conducting micro-regional research on the Zalaapáti ridge, investigating the role of rondels in the settlement network and society. We present the relationship between settlement patterns and rondels and their surroundings at the local level through our investigations at the *Gétye-Gyomgyáló lejtős* site and its surroundings.
The rondel is a single slightly oval-shaped ditch with four symmetrically arranged entrances. Based on AMS dates, it is the earliest known rondel of the Lengyel culture. Its use (more precisely, filling of the ditch) may have begun between 5030 and 4945 cal BC and, after some 90 to 200 years of use, may have ended sometime between 4880 and 4765 cal BC. Field walking was undertaken to survey the Lengyel settlement network within a 2 km radius of the rondel, and a geophysical survey was carried out at a Lengyel site adjacent to (but separated from) the rondel by a stream valley, known as *Gétye-Forrásos oldalú patak mellett*. The survey revealed a complex multi-period settlement plan and an internal double pseudo-ditch system with an irregular plan and several interruptions. Our presentation focuses on the relationship between this pseudo-ditch system, the rondel, and the local Lengyel settlement network system.

P. Barna, Judit – Tóth, Brigitta – Pásztor, Emília – Tokai, Zita Mária – T. Biró, Katalin – Puszta, Sándor – Eke, István – Puszta, Adrián – Busznyák, János – Kocsis, Napsugár – Tugya, Beáta – Száraz, Csilla, 2019. Non-invasive Investigations of a Late Neolithic Roundel at Gétye, Western-Hungary. In: Bánff y, Eszter and P. Barna, Judit Hrsg. *„Trans Lacum Pelsonem". Prähistorische Forschungen in Südwestungarn (5500–500 v. Chr.). Prehistoric Research in South-Western Hungary (5500–500 BC).* Castellum Pannonicum Pelsonense 7. Rhaden/Westf.: Verlag Marie Leidorf, 73–94.

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S31-251

Enclosed spaces and entrenched views

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During last two decades a local revolution has been happening with the use of remote sensing surveys in Balkans. This is especially visible on the topic of settlement organization during Neolithic and Eneolithic periods in Central Balkans. This paper covers new results from Šumadija region, where SRGAP joint project between University of Pittsburgh and Center for Archaeology "Dragoslav Srejović" have been developing multilayered and multi-method approach to non-invasive and minimal invasive techniques to the study of Neolithic period transitions. Some of the results that show emergence of complexity in the diachronic perspective of Starčevo, Vinča and later communities in the Šumadija region of Central Serbia has been transformative of our understanding of Vinča culture organization. Analysis of sites of monumental size, such as Grivac and Kusovac show very structured approaches to the settlement planing and organization. Multiple rings of fortification ditches, and placement of settlements are going against the grain of the decade old views of Vinča organization, while wider landscape use and progressive centralization are not so compatible with the traditional settlement fissioning theory. These are even more striking when compared to diachronic picture of the wider region with the new LIDAR and geophysical reserch on Eneolithic sites in the region.. Changes in land use, demographic grouping and resource catchments highlight population changes in 7th and 6th millennia BCE and importance of systematic regional approach to research.

S31-252

Neolithic complex settlement templates on the southern fringe of the Carpathian basin

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In this paper we will present results of analysis of satellite imagery and magnetic survery on five Middle and late Neolithic sites in Eastern Slavonia, Croatia. This is a region with rich archaeological landscape,where numerous Middle and Late Neolithic sites have been uncovered through aerial reconnaissance and satellite imagery. These methods led to the identification of many sites, later confirmed by field surveys and surface finds. In the vicinity of Đakovo, Croatia, magnetic surveys conducted on five confirmed sites revealed extensive Neolithic settlements, showcasing complex spatial organization within enclosures. These spatial organization suggest the existence of common template for settlement organization. The research adopts a multidisciplinary approach, using various archaeological techniques to explore the types and chronology of rondels located on the southern fringe of the Carpathian Basin. Research on this templates does not only contribute to a deeper understanding of local archaeology but also provide broader perspectives on the diffusion of material culture and cultural interactions, enriching our knowledge of prehistoric communities in this transitional zone. The spatial complexity and cultural implications of these expansive settlements, challenge conventional views on settlement patterns, underlining the importance of comprehensive study and preservation efforts.

S31-253

The social significance of the Neolithic rondels in the western Carpathian Basin

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The emergence of monumental enclosure ditches is dated to the first half of the fifth millennium BCE in the Carpathian Basin, as well as in Central Europe, where these earth-timber constructions became a widespread phenomenon (Bertemes et al. 2012; Řídký et al. 2019; Petrasch 2015). The term rondel (Kreisgrabenanlage) refers only the highly symmetrical circular ditch systems, with V-shaped cross-sections and several (mostly two or four) gates, which had a circular wood palisade in the middle and mostly no buildings in the inner part (Trnka 1991). This monumental architecture displays many similarities across Europe, although, on the (micro-)regional scale, several different characteristics can be identified about their morphology, location in the landscape, relative position to surrounding settlements, etc. The spatial arrangement within rondels and the social connection between rondels, settlements, and burial places reflect remarkable differences, from single rondels with empty interiors to double multiple ditch rondels with houses in the centre (Vondrovský et al. 2022). The use of circular ditches has inspired a wide range of interpretations, from practical functions, cattle dens, defensive fortifications, gathering/meeting places, astronomic observatories, and sports arenas to ritual activities.

We argue that these functions are not mutually exclusive; moreover, they could have had several functions, which could depend on the current activity. We can assume that not only a single inhabitant group could have access to one rondel, and

the different forms of communal use of them indicates social bonds among communities. These monumental structures actively influenced the social connections and the communicative memory of the community in multiple ways. For this reason, all actions/manipulations (renewing, rebuilding, doubling, destruction, etc) could be seen as social acts about group identities.
We compare three regions (southwest-Slovakia, west and southeast-Transdanubia) in the Carpathian Basin to investigate: 1) what kind of spatial characteristics are identifiable as regional patterns, 2) how the rondels were related to the surrounding settlement and burial places, 3) what kind of manipulations are detectable which could indicate particular social negotiations.

S31-254

Visibility Analysis of Late Neolithic rondels in southern Transdanubia and south-western Slovakia

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This study uses Geographic-Information-Systems (GIS) to investigate Late Neolithic rondels, which can be found mainly between 4900 and 4500 BCE in the Carpathian Basin and in a broader context in the mid-fifth millennium BC in Central Europe. The interpretations about the possible functions of these rondels are diverse, for instance, livestock folds, observatories, and multifunctional communal sites. This study attempts to deal with the question of how the circular ditches were situated in the landscape and how they related to it and the regarding communities. For this purpose, visibility analyses were carried out for several rondels in two regions, southern Transdanubia and south-western Slovakia. Digital elevation models (DEM) were used to investigate from where the monuments were visible, whether there were direct visual axes between different rondels and whether regularly applied spatial patterns could be identified. The preliminary results for the two investigated regions revealed regularities and indicate that the rondels, unless they were multiple rondels, were at least visually separated from each other and that several rondels were rarely visible from individual points. These results raise the question, assuming that this regularity was deliberately chosen by the builders, to what extent communities aimed for a unique position of the rondels or a distinction from other rondels, whether the rondels were erected in such a way that only members of the building community could see them directly in the landscape and what this may have meant for rondels as representative structures to the outside and as unifying structures to the inside for the societies.

S31-255

LBK, Lengyel and the rondel phenomenon: Analysing the transformation of settlement patterns between the Middle and Late Neolithic in the Carpathian Basin

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The end of the Linearbandkeramik Culture (LBK) around 5000 BC is often interpreted as a time of violence and social collapse, marked by very prominent mass depositions. While their material culture disappeared, their people most likely stayed and reformed their beliefs and ideologies. In the Carpathian Basin the subsequent Lengyel Culture (Phase I and II from approx. 4900 – 4400 BC) is believed to have changed their settlement patterns from bigger, more centralized settlements to smaller, more scattered villages consisting of 4 – 5 houses. While their true purpose is not yet fully understood, circular ditch enclosures – so called “rondels” – where also newly erected in the first two phases of the Lengyel Culture and might have been utilized as new social centres and communal spaces between settlements.

The aim of this paper is to analyse and visualize this potential change in settlement patterns, possible placement strategies of sites, soil preferences and other spatial characteristics. Therefore LBK and Lengyel settlements as well as rondel locations have been collected in Austria, the Czech Republic, Hungary and Slovakia. Geographical quantitative analysis and modelling techniques like site location analysis, point pattern analysis, Kernel-Density-Estimation and other multivariable statistics can show a new point of view on change and transformation of settlement strategies between the Middle and Late Neolithic on a larger scale.

S31-256

Late Neolithic circular ditch system from the site Gönc-Kenderföldek (Northeast Hungary, Borsod-Abaúj-Zemplén County)

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The number of Late Neolithic sites in Northeast Hungary seems to be increasing thanks to the systematic research of recent years. The Gönc-Kenderföldek site is located here, which can provide new data regarding the period in this region. We have been conducting research, field trips, magnetometer tests, and most recently, soil core samplings in the area since 2013. As a result, we were able to identify a large, quadruple circular ditch system. In our presentation, we would like to summarize our knowledge of the site so far.

S31-257

Geophysical Contribution to the Analysis of Settlement Patterns within the Case Study Project Borđoš: Insights from Recent Archaeological Research

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Although "Settlement Archaeology" has been recognized since the 1950s, the study of societal relationships through archaeological data remains challenging, particularly in prehistoric contexts. However, advancements in geophysical prospection methods have significantly enhanced our understanding of settlement structures and their spatial organization. These non-invasive techniques allow for detailed mapping of subsurface structures, revealing the evolution of settlements over time. This progress aids in analyzing residential and communal spaces, as well as illustrating population dynamics through changes in settlement plans. In the territory of Vojvodina (Republic of Serbia), large-scale geophysical prospection had not been undertaken before 2014. Therefore, Project Borđoš aimed to address this gap, focusing on Neolithic sites. By 2024, data collected since 2014 have provided a new perspective on Neolithic settlements in Vojvodina, particularly in the central and southern Banat and eastern Bačka regions. Prospection has been conducted at several sites, notably Borđoš, Perlek, Žabalj-Nove Zemlje, Jarkovac, and Opovo – Ugar-Bajbuk. These sites are located on slightly elevated areas within the fertile Pannonian Plain, with the settlements built on dry, drained loess terraces or plateaus. The analysis of geophysical images raises several pertinent questions about these settlements: their size, location, and development; the structure of individual settlements, including house dimensions, positions, orientations, and potential street layouts; and the possibility of central communal areas or larger houses indicative of social differentiation. Furthermore, the presence of a chief or leader within these societies is worth exploring. Relevant discussions also include the role of ditches in the settlements' layout, potential conflicts or warfare, backfilling of trenches, and possible sites of human body deposition. Additionally, the phases of settlement growth and the enlargement of these sites can be examined, enriching our understanding of social organization in the Neolithic period.

S31-258

The new complex settlement plan of Opovo, Serbia: Settlement dynamics and monumental ditches.

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Opovo– Ugar-Bajbuk is a well-known Vinča Tell, as it was excavated in the 1980ies in a trend-setting interdisciplinary approach by Ruth Tringham, Mirjana Stevanović, Bogdan Brukner and colleagues (Tringham et al. 1985; 1992). In 2022 we were able to conduct a geomagnetic survey and create a detailed magnetic plan of the site. This revealed a tightly packed Vinča settlement with a large number of burnt houses and at least six different ditches surrounding different sections of the site. This indicates a spatio-temporal complexity that extends beyond the tell area proper, but also includes a flat settlement surrounding it. Especially the outer ditch stands out as up to 10 m wide, which could be confirmed in a recent excavation. Drawing on our magnetic plan, a coring and dating program of burnt houses and ditches, and a systematic survey on the surface, we aim to disentangle the chronology of the visible houses. We are also combining the already published materials of the 1980ies, which focused on the vertical stratigraphy, with our horizontal data. Further we draw conclusions based on our observations and the numerous studies that have been published about the sites material (Borojević 2006; Milić 2016; Orton 2016; Russell 1993). From these considerations we will approach the current state of the art concerning socio-economic and political developments in this site, seen in its regional context.

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S31-259

Geophysical prospection and excavations reveal a circular late Neolithic settlement layout in Žabalj, Northern Serbia.

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The late Neolithic Vinča settlement site of Zabalj has been known, from small-scale excavations, since the 1960ies. In 2019 and 2021 a magnetic survey was carried out, which revealed a complex arrangement of burned houses and ditches. In 2023, we excavated two burnt houses near the centre of the site, revealing a large number of complete late Neolithic vessels, which are currently being studied for their typological and technological characteristics. Two deep sounding showed a minimum of 4 consecutive house layers in a 2,5 m stratigraphy – indicating that we are indeed dealing with a tell settlement, accumulated between 5100 to 4800 calBC. The settlement pattern shows a circular arrangement, including house positioning and enclosure ditches. Within this circular arrangement, rectangular quarters can be discerned, adding up to a multidimensional overlay of house, quarter/neighbourhood and settlement. Another interesting feature is the apparently intentional refilling of parts of some ditches, which reveal a dynamic history of changes in the settlement outlay.

S31-260

Transformation of settlement structures in the Rhineland and Northern Bavaria from c. 5300 to 4300 BCE

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During the 5th mil. BCE in the Central European loess landscapes, settlement structures reflect social and economic changes. In our talk, this will be illustrated using the example of three sites from the Rhineland and Northern Bavaria dating to the middle Neolithic (c. 4900-4300 BCE). They are analysed in terms of the development of their internal structures and architecture. To understand the transformations within these sites, they will be compared to already published contemporaneous sites within and beyond our research area and to the preceding Bandkeramik (LBK). Already in the 1980s it was postulated, that the internal organisation of middle Neolithic settlements reflects an increase in municipal structures compared to the early Neolithic (Lüning 1982). These are represented by collectively used pits, prominent architecture, fences, ditches or palisades, as well as collective strategies for the storage of food. The development towards a village-like appearance of settlements is already evident in isolated cases in the late LBK (Hohle 2023), but these changes become more tangible in the middle Neolithic. While most LBK settlements display a rather uniform structure, with longhouses and the surrounding pits being interpreted as autonomous economic units that are usually designated to nuclear families, the settlements of the following 5th millennium BCE present a different relationship between longhouses and pits. Instead of pits accompanying the buildings, areas on the margin of the sites are commonly used for the collection of daub and waste disposal. The development of residential architecture further implies changes in social structures. The size of buildings increases, with houses of the late middle neolithic being almost twice as big as the early neolithic architecture (Broich 2021). These must have been inhabited by more people and the tenants would most likely not only be connected by kinship but also by their living and working arrangements. Furthermore, the structural patterns within the settlements indicate changes in economic activity, with fences surrounding smaller areas for gardening or livestock, or certain types of architecture build for storage. Additionally, many sites are collectively surrounding their settlements with palisades or ditches. In this talk the first results of this comparative study will be presented.

S31-261

‘Shifting Sedentism’ and ‘Decentralized Centralization’ – Contradictions in Early Fourth Millennium BCE Settlement Systems?

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When looking at settlement systems and population dynamics in Europe at the turn from the fifth to the fourth millennia BCE, a considerable increase in both population proxies as well as site sizes becomes apparent.
This increase is all the more astounding as – at least for some societies – a rather volatile settlement system is interpreted from the archaeological record. Particularly communities of the Michelsberg Culture (4300 – 3500 BCE) in western Central Europe and adjacent regions seem to have lived in shifting settlements with a reduced agricultural spectrum and a strong pastoral component.
Despite this volatile settlement system communities also engaged in massive building activities, most notably in erecting sometimes very large enclosures which occasionally encompassed about 100 hectares. Some enclosures were analyzed

in high resolution, and it became apparent that also these seem to have undergone phases of erection and temporary abandonment. This may also be considered for the very large enclosures like Urmitz and Kapellenberg.
Considering this shifting sedentism pattern connected even with large sites, Michelsberg settlement organization may be termed as 'decentralized centralization' in which sites, and possibly their inhabitants, played shifting and continuously changing roles. Nevertheless, have some sites – notably those with enclosures – served as local or regional, maybe even supra-regional economic, political, and social foci.

S31-262

On an Island in the Sun: The Aeneolithic Pile-Dwelling Site of Kapuzinerinsel in Lake Wörthersee, Austria

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The study of pile-dwelling settlements in alpine lakes and wetlands of the perialpine zone has profoundly shaped our modern understanding of European Prehistory. The Austrian province of Carinthia, a part of the Alpe-Adria region, holds considerable potential for further contributions to this field, yet remains underrepresented in international research discourse. Archaeological surveys conducted at Lake Wörthersee have led to the discovery of a previously unknown pile-dwelling site at Kapuzinerinsel in 2021. The island, situated centrally within the lake, contains remains of domestic structures associated with the Kanzianiberg-Lasinja culture and groups featuring pottery with furrowed incisions from the 4th millennium BCE. A newly initiated underwater archaeological excavation aims to provide detailed insights into this multi-phased site. Systematic documentation conducted in autumn 2024 captured rich evidence of architectural structures, with scientific divers sampling over 100 well-preserved piles across a 20m² area, laying the groundwork for high-resolution dendrochronological dating. These structures rank among Austria's oldest wooden architectural remains, raising key questions about the site's function—whether it served roles related to mobility, representation, or fortification—given its unique location fully surrounded by water. The project provides novel insights into Chalcolithic societal transformations within Austria's lakescapes, particularly highlighting interactions and connections among the inhabitants of Lake Wörthersee. The Kapuzinerinsel project represents a pilot study in Austrian prehistoric archaeology, addressing key gaps by providing new data on Aeneolithic settlement history and examining societal transformations during the Chalcolithic in Austria's lakescapes. The paper aims to contribute to the discussion by updating the current state of research allowing for a better contextualisation of this crucial key region in pan-European archaeology.

S31-263

The Vučedol Site (Vukovar, Croatia) – New Insight into the Spatial and Social Organisation of the Settlement in the Chalcolithic Period

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Muzej vučedolske kulture / Vučedol Culture Museum, Vukovar, Croatia

Considering that only 10-15% of the Vučedol settlement has been excavated, it is somewhat challenging to reconstruct the social structure of its population. Nevertheless, even the earliest of the archaeological research showed that the settlement organisation and planning was approached with great thought. The best example is certainly the Gradac platou with its prominent position and one building of large proportions–the Copper Casters's Megaron. It alone indicates a well organized society.
We learn the most about the organization of the settlement, and thus about the social structure, from research at the position of Streim Vineyard and Streim Cornfield. Excavations that begun in the early 1980's and then later in the early 2000's showed a well organised settlement, with planed house positioning and frequent rebuilding. The houses on the Streim Vineyard show a different organization from those on Streim Cornfield in its construction, but also in the spatial solution. While the houses on Vineyard are more spacious, with larger dimensions, usually divided into 2 to 3 rooms and act as houses exclusively used for a comfortable living, houses in the latest research at Streim Cornfield conducted from 2012 to 2021 show a slightly different picture. The houses on Streim Cornfield are smaller in size, usually with 1 or 2 rooms. Even the building technology differs slightly adding some new elements and materials into the house structure. The layout of the rooms and archaeological finds such as furnaces and waste products indicate the possibility of a workshop area of the settlement. However, the very existence of a hearth with cooking vessels, as well as items for carrying out cult activities, can suggest that the craftsmen lived in their workshops at the same time. Another factor that tells us about prominent individuals and complements the picture of the social structure of the settlement are the graves, especially those with burials that have traces of lesions on the skulls already known in the literature from Streim Vineyard, and one recently found at Streim Cornfield. The research at the Karasović Vineyard in 2024, the first larger trench excavated in this platou, so far gives a completely different picture than the one assumed until now.
This presentation will give an overwiev of the last 40 years of archaeological research in order to expand previous knowledge and contribute in giving a more detailed picture of the Vučedol settlement and its society.

S31-264

The Hunyadihalom culture has it all: Diverse settlement patterns in the Middle Copper Age

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The Hunyadihalom culture, which existed in the eastern parts of the Carpathian Basin during the Middle Copper Age, between 3900 and 3700 calBC, displays a unique settlement pattern. Few sites of this culture are known, and most of them are smaller, low-intensity settlements with scattered inner structure. However, there are exceptions: one of the most significant Copper Age settlements in Hungary is the Tiszalúc–Sarkadpuszta site, which consisted of 45 timber-framed houses and was surrounded by a palisade. We also know of other large, intensive but less structured settlements.

The most striking common feature across these settlements is the very distinctive pottery style, which prominently features the *'Scheibenhenkel'* motif, and which diverges from the preceding local Copper Age pottery styles. The use of the Hunyadihalom pottery style suggests some level of connection or communal identity among the residents of these otherwise very different settlements. However, this raises the question: why are there such strong differences in the intensity and structure of these sites? Could this indicate a settlement hierarchy? Or perhaps they served different functions, with some only being occupied temporarily? Can we detect the traces of this in the artefacts uncovered on these sites?

In the presentation, I explore these questions through the study of individual communities across multiple sites, with the goal of deducing their ways of social organisation. Alongside the detailed examination of pottery use and spatial analysis, I also include the results of radiocarbon dating and archaeozoological studies.

S31-265

Hidden horizons: possibilities for interpreting the everyday and symbolic life of Late Copper Age societies in the Carpathian Basin

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Studying the arrangement of settlements is essential for archaeologists to understand the orgasnization of past societies. The reconstruction of household units or settlement patterns of the Late Copper Age (end of 4th millennium BC) in the Carpathian Basin is a great challenge. The main reason of this is that only minmal traces of the one-time buildings considered the center of the household can be observed during the excavations In order to overcome this challenge, in addition to the spatial distribution of the built structures, it is important to take into account othe rfactors, such as reconstructing the size of the household from the amount and function of the finds and determining the activity zones within the settlement. This concept is based on the assumption that the basic activities of everyday and symbolic life were carried out within specific and analytically delimitable areas and within a specific time frame. To achieve this, we use multidisciplinary methods and a multidirectional archaeological approach to explore the locations of everyday and symbolic activities. This investigation is based on studying excavated settlement materials from five Late Copper Age Baden complex sites. By examining large-scale sites across different regions and landscape units in the Carpathian Basin, we aim to model "household clusters" and activity areas as well as to map their local and regional networks. The final goal is the integration of the different inquiry levels and the description and interpretation of the the socio-political dimensions throug the settlement patterns and organization.

S31-266

Settlement patterns at the turn of the Middle and Late Bronze Age in southern Hungary: environmental/economic and social factors

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There are many factors that can influence where settlements locate within a region. Physical factors that influence the location of a settlement include such as climate, water supply or defence. The economic factors include for example communications or natural resources. Also, the formation of housing and settlement patterns, such as shape, space enclosure and organisation, are influenced by physical, economic and social factors. **Some scholars even argue the primary role of sociocultural circumstances in dwelling formation.** Ethnographic analogies can prove how greatly these patterns were influenced by their tradition due to their beliefs, customs, culture. These patterns reflect cultural traditions, beliefs and other social practices. They demonstrate how people adapt and use available resources, as well as

how they face challenges and limitations in order to survive.
In our presentation we want to focus on the settlement patterns of the Koszider – Tumulus culture – Pre-Gáva periods on the Southern Great Plain of the Carpathian Basin, also on the changes in house types and households during this period. We also draw attention to the effect of climate, soil types and environment to the lifeway and settlement patterns, and point out to the human impact to the environment through case studies (Domaszék and Csengele).
In the conclusion we seek for answer to questions such as how these Bronze Age people decided where they would settle? What factors played a role? How did they adapt to their surroundings? How did ancient settlement patterns change and under what conditions? The study of settlement patterns examines the range of activities these societies participate in and might reveal how Bronze Age populations interact with the natural environment.

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S31-267

Interconnected Houses: Rethinking Nordic Bronze Age Settlement Patterns and Community Cooperation

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The development of Nordic Bronze Age settlements introduced new construction techniques and social structures, driven by extensive long-distance interactions. Traditionally, these advancements have been oversimplified as basic diffusionist processes, neglecting the complexity of house-building practices in regions like Scandinavia. Recent research utilizing methods such as Big Data and paleoclimate analysis has provided significant evidence of mobility and exchange during this period. However, much of this evidence lacks interpretative context grounded in robust theoretical frameworks. This paper aims to address these limitations by applying a novel theoretical model based on collective action, supported by comprehensive datasets from the region. This approach reveals diverse construction strategies and housing networks across the western Scandinavian Peninsula, illustrating how local communities engaged with broader European architectural trends. The paper seeks to provide a refined understanding of the social and structural dynamics of Bronze Age houses, highlighting the interplay between community-based and hierarchical construction approaches within the wider Nordic Bronze Age context.

S31-268

Cohesion and Conformity: What 5000 years of settlement patterns tell us about social institutions and resilience in the Carpathian Basin

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The emergence of sedentary farming economies, especially in contexts intensified by plow agriculture, has been argued to underpin marked increases in economic inequality and its intergenerational transmission across Eurasia. To investigate this idea, we consider changes in inequality in house size over a 5000 year period, from the Early Neolithic to the Late Bronze Age in the Carpathian Basin. We also track changes in digging ditches around sites as a measure of community investment, the organization of housing within settlements, and quantify the length of time settlements were used. We find that although farming did increase the potentials for both relational and material inequalities, that potential was rarely reached, and then only for short durations. A series of leveling mechanisms, which shifted over time, are identified including community fission, and investments of surplus labor in infrastructural investments.

S 32: Development of palynological tools for understanding past human-environmental interactions

S32-269

Automatic recognition of pollen and non-pollen palynomorphs using the TOFSI AI approach

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Palaeoecological studies using pollen and non-pollen-palynomorphs (NPPs) are limited by the hitherto slow manual analysis of samples at a microscope. The number of samples that can be studied in a research project is strongly limited, and therefore also the number of study sites and/or sample resolution. The recent progress in automatic image recognition using convolutional neural networks (CNNs) and machine learning can reduce these limitations; it potentially enables faster (semi)-automatic analysis of pollen and other microscopic objects. As one example, TOFSI approach has been shown able to classify more than 10 pollen types in lake sediment sample (Theuerkauf et al. 2023). TOFSI combines two CNNs to first detect and then classify such objects on stacked microscope images. Combined with further tools, the approach is also suited to determine the size of pollen, which is useful for example for the separation of tree and shrub birch pollen (Theuerkauf et al. 2024).

We currently further develop the approach with the aim to recognize more pollen types as well as NPPs, including the spores of coprophilous fungi. These spores indicate megaherbivore presence at a study site. In a pilot study from the Mid-Pleistocene archaeological site of Schöningen (Lower Saxony), we explore the suitability of TOFSI to detect and classify such fungal spores.

We additionally explore the suitability of TOFSI to detect micro-charcoal particles and determine their morphological parameters. Using those parameters, more detailed information about past fires can be extracted, e.g. about the type of fire and the burned material. A first pilot study includes also samples from Schöningen as well as from the Eemian/Early Weichselian archaeological site of Lichtenberg (Lower Saxony).

Using these examples, we illustrate the current capabilities and discuss the future potential of automatic image recognition approaches in palynology.

Theuerkauf, M., Siradze, N., Gillert, A., 2023. A trainable object finder, selector and identifier for pollen, spores and other things: A step towards automated pollen recognition in lake sediments. The Holocene, 34(3), 297-305.
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S32-270

Diversity of dung fungi spores in dung and sediments: case study Reiherbachtal (Naturpark Solling-Vogler), Germany

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Dung fungi spores are used to reconstruct herbivore abundance in the past. While only three palynological types related to *Sporomiella*, *Podospora* and *Sordaria* are usually used in palaeoecology, hundreds of species can grow on dung. In this study, we investigated the diversity of dung fungi spores in the primary substrate dung, moss surface samples and lake sediments collected in the pastoral forest in Reiherbachtal located in the Naturpark Solling-Vogler in Lower Saxony, Germany, near Nienover. A total of 30 spore types were connected to dung fungi taxa based on the reference collection and literature survey. The results emphasise that this more precise association of spore types can be used to differentiate between herbivore-specific dung on basis of the occurring spores. The relative composition of dung fungi spore types in incubated dung is similar to the spore spectra in the lake sediments, however differ strongly from the spectra in moss samples. The results confirm that lake sediments can reflect fungi taxa found on dung in the area. Further comprehensive reference collection and more precise identifications of spore types is required to exclude non-coprophilous taxa and improve indicative values of types. Overall, our investigations suggest that the full spectrum of dung fungi spores can make refined statements about herbivores in the past possible.

S32-271

Multidisciplinary investigations of ancient adhesives and sediment samples from archaeological and experimental contexts

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Palynological research can benefit significantly from complementary analytical techniques that address potential taphonomic challenges and provide a more comprehensive understanding of past environments. This study presents an overview of integrated microfossil analysis combined with DNA extraction and organic residue analysis across a range of archaeological sites, spanning from late prehistoric and Medieval contexts to contemporary experimental settings. We also emphasize the potential of typically overlooked microfossil sources, such as ancient adhesives (tars and pitches), to yield a diverse array of informative proxies. Our findings reveal a substantial amount of data, particularly regarding plant and fungal species that are rarely represented in the microfossil record, underscoring their relevance for interpreting agro-pastoral practices. This study further highlights the essential role of experimental research in elucidating taphonomic processes and examining how cultural and environmental variables influence the incorporation of proxy records.

S32-272

Holocene palaeoenvironmental history of Lac De Guiers, Senegal

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Pollen and diatom evidence from Lac De Guiers in Senegal provided evidence of Late Holocene vegetation and hydrological changes during the last 5000 yr BP. The mangrove swamp forest was well established within an environment that was also characterised by active hydrological systems and humid conditions signaling a northward extension of the Guinea savanna vegetation zone. Archaeobotanical evidence from the region indicated that the domestication and spread of cereals and pulses, crops that were critical to the origins of indigenous food production systems in the African Sahel, coincided with this development. After 3000 yr BP, there was a gradual decline in the mangroves, as well as an expansion of Sahelian and Sudanian elements. These indicated a southward shift in the vegetation and corresponding climatic zones. The inferred subsequent environmental changes influenced the emergence of complex and organized pastoral societies, the histories of which are closely linked to the modem near arid conditions of the Sahel.

S32-273

Human-environmental interaction during Chalcolithic to Roman Age times deduced from a palaeolagoonal sedimentary sequence in southern Iberia: A palynological perspective

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The semi-arid climate in southern Iberia is a major challenge to modern society – and so it was during prehistoric times. Despite the general arid climate and superimposed aridity events such as the 4.2 ka BP event, prehistoric societies in some parts of southern Iberia flourished. How and why did societies in different but adjacent regions in southern Iberia took so different developments? How did the communities cope with climate challenges? The details of these developments, however, are still quite underexplored. Combining various proxies offers a promising approach to shedding light on many of the unanswered questions.
We aim to answer these questions by high-resolution multi-proxy analyses on a palaeolagoonal sedimentary record of high chronological resolution, backed up by multiple radiocarbon datings. The chosen lagoon was situated at the river mouth of the Guadalquivir draining the Sierra Morena and western Sierra Nevada mountain ranges. In addition, the lagoon was densely inhabited during prehistoric times as documented by the Chalcolithic mega-site of Valencina de la Concepción and various Roman settlements such as Italica. This talk focuses on the vegetation variability with regard to human impact. These results are accomplished by NPP data, X-ray fluorescence data, sedimentary aDNA data and biomarker analyses. The comparison with biomarker data is of particular importance as it allows the discussion of a human or climatic driver of vegetation change. The details of the biomarker study will be presented in another session, however.

S32-274

A very high-temporal-resolution analysis of early anthropization of plains and plateaus in north-western France (Cairon, Vey valley, Caen Plain)

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Palaeoenvironmental studies based on palaeobiological multi-indicators have rarely been carried out in north-western France, and despite the importance of the pollen sequences analysed, knowledge of the biophysical trajectories of hydrosystems under the influence of climate and ancient societies is still fragmentary. In western Normandy, especially in the Caen plain, pollen studies are numerous, but apart from a few recent studies, they are often poorly dated, even though the results of the first geoarchaeological research highlighted the potential of this area. The aim of the present study is to produce new data to further develop understanding of the impact of early human activity on landscape of the plains and plateaus of north-western France. A high-temporal-resolution approach using multiple palaeobiological proxies (sedimentary, pollen, non-pollen palynomorphs (NPPs), charcoals and sedimentary ancient DNA (sedaDNA)) was adopted to analysis a new sedimentary sequence taken from alluvial marsh in the Vey valley, at Cairon, in the Caen Plain. New empirical data with good chronology can be compared with the archaeobotanical and archaeozoological data from local archaeological excavations. Our specific objective was to propose a reconstruction of landscape changes under human influence at a local scale, to gain a precise understanding of the processes of anthropization of the Caen Plain from the end of the Mesolithic and during the Neolithic periods. At the end of the Mesolithic period (5900—5200 BCE), charcoal analysis provides a new information for the study area, pointing to a transformation of the environment by local populations. At Cairon where Neolithic occupations have been identified, the results reveal a succession of human activities that have had a lasting impact on the vegetation landscape since the Middle Neolithic (4400 BCE). The combined use of sedaDNA, NPPs and charcoal analysis demonstrates the importance of pastoral practices and fires in opening up environments and transforming fluvial wetlands. At the scale of the Caen Plain, this new study points to a slow transition characterized by territorial disparities during the Neolithic period. Where changes related to the development of agro-pastoral activities are detected, the valleys appear to have been transformed from this period onwards. However, other areas (low valleys and peat bogs) remained poorly used.

S32-275

Human influence on landscapes during the Metal Ages in the Tyrolean lowlands (Western Austria): insights from pollen-based vegetation modelling and archaeology

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By correlating archaeological and pollen data, the main aim of the present study is to assess the anthropogenic influence on landscapes and vegetation patterns during the 2nd and 1st millennium BC in the Tyrolean lowlands (Western Austria). For this purpose, we are focusing on an area dominated by mining and metallurgical sites – supposedly drivers of vegetational changes (e.g. deforestation) – and an area predominantly characterized by settlement activity. This provides an evaluation of the extent of the influence of various human activities such as housing, subsistence and economic practices on vegetation composition and plant abundances.

In the present study, we have collected information about a few hundred archaeological sites – including settlements, burial grounds, industrial or mining sites, ritual sites, depots, stray finds, etc. – and 18 pollen profiles from the study area. The overall period under consideration ranges from 2400 BC (Late Neolithic or Copper Age) to the end of the Metal Ages around 15 BC, so that the Bronze and Iron Age – and thus phases of prehistoric copper ore mining in the area – are both fully represented. To link archaeological and pollen data, we combined all data into time windows of 200 years. The pollen count from the pollen archives (lakes and bogs) have been used for the application of the *Landscape Reconstruction Algorithm* (LRA; Sugita 2007a–b), the *Regional Estimates of Vegetation Abundance from Large Sites* (REVEALS) as well as the *Local Vegetation Estimates* (LOVE). The LRA provides quantitative vegetation reconstructions at a known spatial scale based on pollen count by correcting biases related to inter-taxonomical differences in pollen production, dispersal and deposition mechanisms. The resulting local plant abundances are brought together with the archaeological data using distribution maps and the density of archaeological sites. Furthermore, the extent to which archaeological site density is a relevant factor influencing vegetation patterns is also statistically examined.

Together, archaeological and pollen data provide deeper insights into human-induced vegetation and landscape changes and correct certain previous views on the age and scale of anthropogenic impact.

Sugita 2007a, Theory of quantitative reconstruction of vegetation I. The Holocene 17/2, 229–241; DOI: 10.1177/0959683607075837.
Sugita 2007b, Theory of quantitative reconstruction of vegetation II. Same volume, 243–257; DOI: 10.1177/0959683607075838.

S32-276

Palaeoecological investigations on human-environmental interactions during Trypillia times

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In order to gain a deeper understanding of the influence of Trypillian settlements on natural resources and biodiversity, a palynological archive was drilled near a settlement that was recently discovered in the area of Trinca (Moldova) in 2023. A number of cores, up to 5 m long, were taken at varying distances from this settlement.
XRF scans and LOI data are already available. Initial datings suggest that the palaeoecological archive obtained goes back well beyond the Last Glacial Maximum (~21 ka). Until the beginning of the Holocene, biological productivity was relatively low, and there are indications that periods of drying out of the lake occurred, as evidenced by gypsum layers. The beginning of the Holocene is marked by a higher proportion of organic material and a change in pollen abundance. It seems that remains of the settlement were incorporated into the lake sediments, building a layer with small fragments of red daub, possibly indicating an erosion phase. The preliminary findings suggest a partly relatively good pollen concentration including some anthropo-zoogenic indicators. The sediment is unfortunately very poor in material suitable for 14C dating, efforts are made to overcome this shortcoming.
This lecture will provide a comprehensive overview of the palaeoecological results on human-environmental interaction in the initial phase of agriculture in a climatically sensitive region. It will also address the possible role of nutrient input related to the elaborated way of food production by Trypillia cultures (Schlütz et al. 2023).

S32-277

Sedentary pastoralism and no environmental change? – Palaeoecological investigations regarding socio-economic dynamics in the Eurasian steppe (Russia) during the Bronze Age

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Since 2008, our German-Russian project has been dealing with Bronze Age cultures in the Trans-Urals, their environmental framework as well as their ecological and economical impact. Among many innovations, the emergence of permanent fortified settlements during the Sintashta-Petrovka culture around 2000 BC turned the region into a socio-cultural hotspot. In the Late Bronze Age, however, a more mobile lifestyle with smaller unfortified settlements was resumed.

Among the possible reasons are cultural adaptations and climatic influences, but our palynological data indicate that no major climate change occurred during the Bronze Age. The regional feather grass steppe always contained a certain percentage of pine and birch forest islands while a meadow steppe with varying levels of riparian trees such as alder existed in the floodplains. The most substantial changes are manifested by the deciduous tree curve (Stobbe et al. 2015). Studies on macro remains and carrying capacity reveal that even larger populations were able to sustain themselves without additional crop farming (Rühl et al. 2015, Stobbe et al. 2016). The vast floodplains with their high biomass production have always been an ideal habitat for nomadic and sedentary pastoralist societies. Apart from migration as a likely factor for changes in settlement patterns, catastrophic events such as pests or diseases may have to be considered as well.
The differences in land management practices throughout the Bronze Age are emphasised by isotope data from plants, herbivores and humans. Both $\delta^{13}N$ and $\delta^{15}C$ levels are raised in the Sintashta samples, compared to those from semi-nomadic Late Bronze Age cultures. Since not only climatic variations but also the consumption of C4 plants can be excluded, we assume that different grazing practices may have played a decisive role.

Rühl, L., et al., A., 2015. Archaeobotanical analysis of plant use at Kamennyi Ambar, a Bronze Age fortified settlement of the Sintashta culture in the Southern Trans-Urals steppe, Russia. Veget Hist Archaeobot, 24, 413-426.
Stobbe, A., et al., 2015. Palynological and sedimentological evidence from the Trans-Ural steppe (Russia) and its palaeoecological implications for the sudden emergence of Bronze Age sedentarism. Veget Hist Archaeobot, 24, 393-412.
Stobbe, A., et al., 2016. Bronze Age human–landscape interactions in the southern Transural steppe, Russia – Evidence from high-resolution palaeobotanical studies. Holocene, 26 (10), 1692-1710.

S 33: Scales of Transformation

S33-278

Pioneers of the North: Transitions and transformations in Northern Europe evidenced by high-resolution datasets

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In the research project "Pioneers of the North" (funded by the German Research Foundation within the CRC1266, 2016-2024) we have examined the cultural and socio-economic transformations in mobile hunter-gatherer groups that were confronted with different and changing environmental conditions during their colonisation of Northern Europe c. 15,000-9,500 BCE. During this period (i.e., the late Pleistocene and earliest Holocene), hunter-gatherer groups had to cope with extensive climatic changes. When glaciers melted and water levels rose, large areas were flooded. Familiar landscapes disappeared, whereas other areas were slowly made available for exploitation. Human groups exploiting these pristine territories were few and remains of their settlements are elusive. Investigating socio-environmental interactions at this spatio-temporal scale requires the collaborative effort of several scientific disciplines. In this contribution, we highlight important results from eight years of interdisciplinary research within the CRC1266 and address perspectives for future investigations.

We have reviewed a number of well-preserved sites from Northern Europe regarding the dynamics of technological developments, subsistence strategies, mobility patterns, and local and regional interaction networks. With specific case studies providing high-resolution datasets, the results can be contextualised with changes in the environment.

At the start of our research, four major changes (T1-T4) in the human-environmental interactions were already known from the region (https://www.sfb1266.uni-kiel.de/en/projects/cluster-b-complex-foragers/b1-pioneers-of-the-north). These observations of change can be explained by diverse interpretations ranging from a first migration and subsequent adaptation events, over changing environment as push/pull factors, the phenomenon of repeated extinctions and re-settlement, etc., to various combinations of these. Depending on the favoured interpretation, pioneers could have played very different roles in these scenarios. In the course of our research, we have analysed the observed changes and their development in more detail in order to understand the complex interplay of knowledge transfer within and between human groups, and to evaluate specific challenges of pioneers in this process. Finally, we will also address the hypothesis that perhaps this whole period under study should be considered one multi-scale, high-level, long-term transformation period.

S33-279

Transformations of diet in an Early Bronze Age society

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This study examines the transformative processes of human diet and animal management strategies in the Early Bronze Age society of Jelšovce (okr. Nitra, Slovakia) through stable isotope analysis of Carbon (δ13C) and Nitrogen (δ15N). By analyzing a dataset of 82 human and 24 animal samples, the research highlights shifts in dietary practices and resource management among three distinct cultural groups—Nitra, Maďarovce, and Unetice—over a period spanning 2300/2200–1600 BCE. These transformations visible in the isotope data reveal significant changes in subsistence strategies, likely driven by cultural and environmental adaptations.

The Jelšovce burial ground provides an exceptional context for exploring these transitions due to its rich interdisciplinary data, including radiocarbon dating, Sr-isotope studies, and anthropological analyses. Previous research (e.g., Bátora 2000; Reiter/Frei 2015) has established the site as a key reference for Early Bronze Age societal developments. The δ13C and δ15N values indicate evolving dietary patterns, with variations linked to the specific practices of the Nitra, Maďarovce, and Unetice groups. These shifts suggest transformations in agricultural production and animal husbandry, reflecting broader socio-economic and cultural changes in the region.

By focusing on transformations processes visible in the isotope data, this study uncovers dynamic interrelations between diet, wealth distribution, and cultural identity in a period marked by technological and societal transition along the rivers Nitra, Váh, Hron, and Žitava.

S33-280

Transformation of agricultural land use from the Neolithic to the Bronze Age in Northern Central Europe based on the study of arable weeds

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Building upon the extensive archaeobotanical dataset of Neolithic and Bronze Age sites in Northern Germany and Southern Scandinavia, produced and/or collected by the University of Kiel in the framework of the Collaborative Research Centre 1266 “Scales of Transformation”, we explore the transformation of crop growing conditions over time (4000-600 cal BCE) through a detailed consideration of arable weeds. By analysing habitat requirements and life forms of the weeds found alongside crops in archaeological layers, we reconstruct key elements of arable land use such as the agricultural soil properties and aspects of the field management, including the time of sowing, harvesting methods and fallow periods. These factors determine the effort, time and social organisation required for arable farming. Our refined understanding of how they manifested and changed over time allows us to track transformations in land use among early farming communities and the corollary modifications of their environment.

S33-281

From Fallbygden to the lake Dümmer - Monumental transformations in Early and Middle Neolithic Northern Europe (c. 4.100-2.800 BCE)

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*Contributed equally

The Neolithic period saw remarkable transformations in the social organisation and the use of the landscape through the rise of monumentality. At the end of the 5th millennium BCE the Funnel Beaker societies emerged and left behind an extensive archaeological and paleo-environmental record in northern Central Europe and Southern Scandinavia. The construction of large-scale, communal monuments, such as megalithic graves and causewayed enclosures, suggests a high degree of social organization. Linked with the introduction of agriculture and larger settlement structures, the construction of these first monuments displays a well-researched example for investigating the triggers and meanings of Neolithic structures and processes.

This paper aims to describe and interpret the development of monumentality and the construction of cultural landscapes in northern Central Europe and Southern Scandinavia based on the research of the project C1 of the CRC 1266, University of Kiel. To achieve this, a cross-section through Northern Europe - from south-western Sweden through the federal state of Schleswig-Holstein in Northern Germany to the wetland region around lake Dümmer in Northwestern Germany - provides a plethora of examples from the Early and Middle Neolithic to detect spatial-temporal transformation patterns, using a multi-proxy approach based on the environmental record and extensive fieldwork on domestic sites as well as monuments.

S33-282

Archaeo-demographic regional population estimates and population transformations

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The size and density of prehistoric populations are considered important indicators of population conditions. While many relative results on population dynamics are available, absolute population sizes are still underrepresented in research. Estimating absolute population size and density from archaeological sources is challenging and often based on a single proxy.
The aim of this project is to conduct a diachronic multi-proxy estimation of absolute population sizes based on two approaches: the geostatic (Cologne Protocol) and the Bayesian approach. Both approaches will be combined, with the geostatic approach preceding the Bayesian approach. The analyses are carried out in selected regions of Central Europe for the period between 6000 and 1300 BC. The regions for which absolute population sizes are to be calculated include in particular those that were the focus of CRC-1266. These include the Middle Neolithic East Holstein, the Early Neolithic Northwestern Carpathian Basin and the Tripolye Northwestern Black Sea region.

S33-283

Unveiling coss-site connections in late Neolithic Central Europe through ancient DNA analysis

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The late Neolithic period (4400–2800 BCE) was a time of significant cultural change across Central Europe, giving rise to many small, regionally distinct societies. Among these was the Wartberg cultural group in present-day Germany, known for its collective burial practices in megalithic tombs. Although primarily agrarian and sedentary, the Wartberg communities carried a notable proportion of Western Hunter-Gatherer (WHG) genetic ancestry (~30%) (Immel et al., 2021; da Silva et al., 2023). In contrast, the contemporaneous Ostorf-Tannenwerder site in northern Germany represented one of the last Mesolithic fisher-hunter-gatherer populations during the late Neolithic. In this study, we significantly expanded the available genomic ancient DNA dataset by adding 130 new genome-wide samples: 56 from Sorsum (Wartberg), 54 from Warburg (Wartberg), and 20 from Ostorf-Tannenwerder. Through genetic analyses, we examined population structure, admixture patterns, sex-biased gene flow, and kinship connections among these groups and other contemporaneous populations. With the expanded dataset, we observed a higher influx of early farmer-related ancestry (EF; ~23%) in Ostorf-Tannenwerder than previously assumed (Posth et al., 2023). This EF ancestry was likely introduced mainly through females, as revealed by our sex-biased admixture analysis (i.e.: males with large WHG ancestry predominantly mated with females carrying relatively more EF ancestry). This pattern of sex-biased admixture was also observed within Wartberg groups. Additionally, we uncovered extensive cross-site kinship connections, primarily within Wartberg sites, as well as more distant relationships between Wartberg samples with individuals from other sites such as Blätterhöhle, Mont Aimé, and Makotrasy/Baalberge. Furthermore, we found kinship connections linking Ostorf-Tannenwerder individuals to the sites of Blatterhöle, Sylthom and Tangermünde. Interestingly, we also found shared IBD segments between individuals from Wartberg and Ostorf-Tannenwerder, hinting to a shared genetic history. These results suggest an extensive social network that promoted gene flow across various communities, bridging even agrarian and hunter-gatherer groups. The findings highlight a remarkably interconnected social landscape during the late Neolithic, where mobility and intergroup interactions were central in shaping genetic diversity throughout Central Europe.

S33-284

Property rights and transformations in the domestic sphere

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This study explores transformative land-use practices and agricultural strategies among the Cucuteni-Trypillia and Funnel Beaker groups, synthesizing findings from the CRC 1266. Advanced dung-based pulse cultivation and intensive livestock management in Trypillia sites, as demonstrated by high δ15N values in cattle and crops, highlight a sophisticated nutrient recycling system that enabled the support of proto-urban mega-sites. In contrast, Funnel Beaker agriculture, characterized by isotopic and residue analyses, reflects a more mixed strategy with emmer and barley cultivation. These differing approaches reveal transformative shifts in land management and resource allocation within domestic contexts. By comparing intra-site resource distribution among households in both groups, this research synthesizes key insights into the interplay of property rights, agricultural intensification, and socio-political structures, emphasizing the dynamic transformations shaping Neolithic Eastern and Central Europe.

S33-285

Transformative Processes at a Ritual Site in Nagaland, Northeast India: The Case of Shangnyu's Saotong

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A recent ethnoarchaeological project conducted in Shangnyu, Mon District, Nagaland State, India, has helped reconstruct the transformative history of a ritual monument known as Saotong. This research combined ethnographic and archaeological methods, including the excavation of the ritual site (a stone terrace with standing stones), for which ethnographic reports have existed since the first half of the 20th century.
The excavation focused on reconstructing the site's biography, particularly exploring the monument's role within the community and its connections to Angh (the local chief) relations and headhunting activities. These aspects were documented both by earlier ethnographers and in interviews with the local community.
Archaeological investigations aimed to corroborate these ethnohistorical and oral accounts while expanding knowledge about the site's origins and transformations. The excavation results reveal changes in the monument's use from the 17th century to the Christian era.

This interdisciplinary approach significantly contributes not only to the reconstruction of this specific case study but also to the broader understanding of events, processes, and structures related to ancient monumentality.

S33-286

An ethnoarchaeological study of changing resource use among the ethnic tribes of Assam (WestKarbi Anglong and Dima Hasao), Northeast India

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Archaeological studies have traditionally examined natural resource utilisation from specific perspectives, such as settlement patterns and dietary practices. However,
ethnoarchaeological evidence reveals that natural resources are often employed in
multifaceted ways, spanning social, cultural, economic, and political contexts. In Northeast India, tribal communities maintain a symbiotic relationship with their natural surroundings, offering a rich lens to study the diverse uses of these resources.
Recent ethnoarchaeological field surveys conducted in the hilly districts of North Cachar and Karbi Anglong, Assam, provide insights into the extensive application of natural materials. Bamboo, for instance, is used in food preparation, construction, material culture, and rituals. Beyond its utilitarian roles, bamboo carries significant social and cultural value, serving as both a practical tool and a symbolic element in ritual practices. Bamboo utensils, in particular, play a dual role as functional items for serving and as components imbued with ritualistic meaning. However, there is a rapid transformation in resource utilization and selection due to the influence of different factors like urbanisation, Cash crop adaptation, road connectivity, local government policies etc.
The study of the contemporary societies living in the area and their behaviour towards the natural/wild resources available in the area or environment may help provide a probable picture of the early people who had adapted to a similar environment.
Through this interdisciplinary framework, the research aims to shed light on the intricate dynamics of resource use, cultural practices, and environmental adaptation in prehistoric societies of Northeast India. These findings contribute to a broader understanding of human lifestyles and the diverse ways natural resources have shaped societal evolution.

S33-287

Temporal patterns in Mesolithic activity at Duvensee

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Over 250 radiocarbon results date a dozen Mesolithic sites beside the palaeolake Duvensee, Schleswig-Holstein, to an extended period spanning the early 9th to the mid-7th millennia cal BC. Each site may only have been used briefly – perhaps only for a single season in some cases – but some were used repeatedly over the course of decades or even centuries. Meticulous excavation, excellent organic preservation, and a rigorous approach to radiocarbon sample selection permit the application of Bayesian chronological modelling to the results. Individual site chronological models contribute to an overall model of the fluctuating intensity of recorded Mesolithic activity at Duvensee. This model confirms that a sharp spike in the intensity and diversity of human activity coincided with a steep increase in hazelnut pollen influx at the start of the Boreal biozone, but dated activity declined dramatically in the later 9th millennium, well before the hazel maximum in local and regional pollen diagrams at c.8000 cal BC. Subsequent occupations were more irregular and ephemeral. While this pattern appears to contradict the idea that hazelnut productivity dictated the intensity of human activity at Duvensee, we suspect that site formation processes, such as a falling lake level and peat cutting, and their effect on site visibility, obscure any relationship between hazelnut abundance and human activity. Moreover, although the Duvensee radiocarbon results can be construed to support arguments that rapid climate change had a significant impact on human activity, known climate events (at 10.3, 9.3 and 8.2ka cal BP) occurred when the record of human occupation was already discontinuous. It is therefore difficult to infer (or exclude) climate shocks as triggers for changes in the archaeological record at Duvensee. Our results, which are mirrored to some degree in other Mesolithic landscapes in northern Europe, should encourage debate about the extent to which aggregated radiocarbon data can reveal temporal patterns in the activities of complex forager groups.

S33-288

We are not the same: understanding how societies transform.

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Since the 1970s, there has been a strong rejection of the idea of historical progress, and with it, the idea that history is a process in which societies transform over time. We are living in an age where we have forgotten how to think historically. There are multiple reasons why this has happened. The emergence of a truly global economy in the postwar period has disclosed the explanatory limits of long-term narratives – too much is going for any narrative to capture. Furthermore, the collapse of the Soviet Union and with it, any viable communist project, has led to the perception that we are living at the end of history. Finally, the collapsing of borders, facilitated by the global economy, has warped our experience of time – red-eye flights, 24-hours supermarkets, working weekends, are just some examples of how we have lost the rhythms and textures of time. All of this together has made us believe we live in an eternal present.
This talk will explain why despite everything that has affected history, narratives, and the experience of time, archaeology is still dependent on these elements, in fact, one can only understand the past if we recognize the historical transformations that societies have undergone, from the Paleolithic to our current ages.

Poster Session

P01-289

And they were tomb mates: Conceptualizing gender and sexuality in the Ancient Near East

Thomas Prins

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Feminist and queer archaeology both find their origins in the academic feminist movements of the 1970s and 80s. They opposed the political and academic androcentric climates of the time, and have since achieved legitimacy in academia. Still, we are constantly developing our understanding of gender in ancient cultures. This thesis takes the next step in deconstructing our understanding of gender, namely building our interpretations of gender identities of people in the past with incorporating our modern biases. The main question in this thesis is How can we practically research queer gender identities in the Ancient Near East based on the material evidence? To do this, the author focusses on literature about case studies from across the ancient Near East. In this study, the author analyzes these diverse case studies to pinpoint what methods those researchers used and what evidence they built their arguments about gender constructs and gender identity in the past. This study puts a specific emphasis om material, iconographic, and textual evidence. Based on these case studies, the author aims to construct a strategy future researchers can use in their research of gender in the ancient Near East, to reconstruct gender identities without incorporating their own personal biases. This research shows it is especially important to understand that the way people in the past conceptualized gender and the gender identity of themselves and those around them may be very different from the way we think now. This means, we can only ever make reliable claims about gender constructs and anyone's gender identity with sufficient evidenciary support. The author has found, that the best first step is understanding the context of gender in that time. Usually textual evidence, such as laws, stories, and religious rules, are particularly useful to develop such an understanding. Afterwards, once the researchers has a sufficient understanding of gender in a specific past culture, they can being theorizing over individuals. This should be done based on iconography and textual evidence connected to that individual

P01-290

Ceramics as a Source for Research on Cultural Variability

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The most important source available to archeologists is pottery, the most mass product of prehistorical communities, which has specific local characteristics and, as a result, defines regions and cultural zones.
At the turn of the 3rd and 2nd centuries BC, various civilizational trends intersected in Greater Poland, resulting in a new civilizational model that is visible among the communities of the region. However, the reconstruction of the dynamics of this process and its components encounters a serious barrier, which is the lack of precise possibilities for separating ceramic materials from this phase. In the area of the European Lowlands, covered by the Pleistocene glaciation, the source material is common and easily accessible. Also, in Central Europe, it was observed that country potters used local outcrops and change them as needed. They mix till and clays from different sources to obtain a proper paste.Our study revealed that the chemical diversity of ceramics is smaller than the diversity of the source material and concluded that in postglacial areas, the preparation process might be more influential on the chemical composition than the source material. We observe rather "taskscape" than provenance, but the role of each component is unknown. This shows an entirely unique, hitherto unexplored problem on the border of archaeology and natural sciences.

P01-294

Exploring the production of engraved bones by Neanderthals during the Middle Palaeolithic

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The cognitive development of the human brain is an integral aspect of our evolutionary timeline, and symbolic behaviours and artefacts are tangible manifestations of these cognitive abilities. The past few decades have been of particular importance in this area of study due to increasing evidence of symbolic behaviours exhibited by Neanderthals in the archaeological record, one of which is the production of engraved bones. Archaeological approaches concentrate on collective group behaviours, neglecting the individual agency that contributed to artefact creation and use. Symbolic artefacts infer a lot of information about a society, yet the artefact is created through a series of individual choices.

As such, it is vital to consider the individual creator and their agency in the production process. There is a significant amount of research examining Upper Palaeolithic artistic manifestations, as such representation is commonplace, as well as extensive studies of other cognitively important artefacts (e.g. handaxes). However, there is little focus on earlier time periods, in the case of this research the Middle Palaeolithic, which can be attested to the lack of artefacts to work with. Indeed, currently there are only four artefacts of study in this research from Einhornhöhle, Zaskalnaya IV, Pesturina and Les Pradelles. Although these four artefacts have all been examined separately, this research will provide a detailed examination and comparative analysis, considering material (taxa, bone type, to the material availability) and technological (engraving technique, tools) choices. The experimental framework will consist of three phases of bone engraving: a free form engraving phase, followed by two separate replications of the Einhornhöhle giant deer phalange, as it is the best preserved and has a unique motif. These experiments will consider individual choices made during the actual creation process, such as gestural movements, motif choice and layout/incision placement (particularly in Phase 1), and material affordances and constraints (e.g. bone surface, bone shape). This research aims to present an experimental approach to the chaîne opératoire and techniques involved in the creation of these bones, and allow insights into the skills, problem-solving abilities, and symbolic thinking of the individual creators, and on a larger scale illuminate the cognitive processes and cultural context that underpin the production of these engraved bones by Neanderthals.

Archaeobotanical evidence from the lake-shore site "Iznang unter Eichen": a case study for unusual water-logged preservation

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Since Oswald Heer published "Die Pflanzen der Pfahlbauten" in 1866, research on botanical remains from pile dwellings in the Alps region has continued. Expanding on the vast research history, the results of the investigation on archaeobotanical macroremains of the Late Neolithic lakeshore settlement "Iznang unter Eichen" (3274-3250 BCE) will be presented. The pile dwelling settlement dates to the end of a climatic phase with cold, wet conditions and with high water levels of Lake Constance. This resulted in the discovery of unusually high-elevated cultural layers of this lakeshore settlement at 395 m asl. Today below the average water level of lake Constance in Radolfzell near the site. After the inhabitation of the site and the deposition of the botanical remains, lake levels dropped and therefore constant waterlogging of organic matter did not occur, resulting in preservation where only fossilized (i.e. charred and mineralized) botanical material endured. The results of the investigation show that almost half of all archaeobotanical finds belong to tetraploid naked wheat (*Triticum* "durum-type") and one fifth belong to many-rowed free-threshing barley (*Hordeum vulgare*). The hulled wheats Einkorn (*Triticum monococcum*) and Emmer (*Triticum dicoccum*) occurred only in minor quantities. Cereal remains of chaff are in a good to very good preservation condition, whereas cereal grains show deformation due to charring, surface pitting and fragmentation. Sporadically, flax (*Linum usitatissimum*) and pea (*Pisum sativum*) could be identified, although in very low numbers. Quantification of the wild plant remains show exploitation of resources in the area surrounding the settlement and a transformation of adjacent vegetation. Furthermore, possible inferences on the special distribution of the specimens on the site and contemporary climate change will be discussed.

Exploitation of a medieval coastal landscape - extensive peat extraction around Hallig Hooge, Wadden Sea of North Frisia (Germany)

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The unique coastal landscape of the North Frisian Wadden Sea – today protected as National Park and part of the UNESCO World Heritage 'Wadden Sea' – has a changeful past characterised by intense human-environment interactions. It is especially in medieval times that Frisian settlers cultivated and at the same time exploited the low-lying salt marshes and fenlands. Around the Halligen islands Langeness, Gröde and Hooge, peat extraction for salt production on an industrial-like scale significantly lowered the ground surface and turned large areas into wasteland.
Using a combined geoarchaeological, geophysical and archaeological approach, we investigated a medieval salt production site on Hallig Hooge to evaluate the impact of the large-scale peat extraction on the landscape development and coastal vulnerability, especially regarding the impact of storm surges.
Our results show that the salt production site was set up on an artificial dwelling mound (so-called 'terp') built in an area that was subject to peat extraction before. In the direct vicinity of the production site, the ground surface was lowered by the excavation of peat into the range of the mean high tide at that time, thus significantly increasing the risk of storm surge-induced flooding. Although it remains unclear whether the production site was destroyed by the severe storm surge of 1362 AD or abandoned beforehand, human impact on the landscape's geomorphology strongly favoured the advance of the North Sea and led to an increasing vulnerability of the coastal landscape.

P01-296

The Holocene history of a high-mountain area in Southern Balkans: A pilot study from Pelister Mountains, North Macedonia

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The study of Holocene development in Southern Balkans has a long history, which has been mostly intertwined with the study of human-environmental interactions in the Neolithic and later periods. In case of North Macedonia, however, only very large lakes have been studied so far. As such, the surrounding mountain areas represent one of many places which were not researched using traditional paleoecological methods. In this work, we present a first paleovegetation and paleofire record from a high-mountain area in the Pelister Mountains. The studied locality provided a rich assembly of pollen species and non-pollen palynomorphs. High percentages of steppic elements and near absence of forest indicators at the base of the record indicate an open glacial landscape, while the small but persistent tree percentages likely owe their presence to the nearby glacial refugia. Both primary and secondary indicators of human practise (cereals, ruderals) appear early on in the record. The overall high percentages of open-land vegetation, the presence of cereals and coprophilous fungi, suggest intense human activity during the Late Holocene.

P01-297

Estimating human existence potential using deep learning neural networks

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The Human Existence Potential (HEP), as proposed in [1-2], has been successfully applied to the reconstruction of human dispersal on the pan-European scale [3]. This method verifies locations with archaeological records and offers insights into human dispersal routes. Previously, HEP was obtained in two steps: first, using logistic regression (LR) with second-degree polynomials on presence and absence records for suitable climatic predictors derived from simulated bioclimate variables, such as temperature and precipitation; second, refining HEP by considering accessibility factors such as topography, glaciers, water bodies, and vegetation.
In this study, all driving parameters—including bioclimate predictors, presence and absence records, and accessibility conditions—are used as multi-input images for a deep learning neural network (NN), with the output being the accessible HEP. Two modern NN architectures, namely the pre-trained convolutional neural network (CNN) and the Transformer with multi-head attention, are investigated to achieve a one-step HEP estimation. The final performance of these architectures will be comprehensively compared with the LR approach under different environmental conditions during exemplary cultures.

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Reconstructing Neanderthal global corridors during the Last Interglacial (LIG)

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Homo neanderthalensis, the genetically closest species to *Homo sapiens*, appeared in Europe at least 400,000 years ago, then dispersed over a vast territory that covered the entire European continent, the Middle East and extended towards Central Asia and Siberia. Here we used species distribution modelling (SDM) and corridor mapping methods to reconstruct global corridors of Neanderthal during the Last Interglacial (LIG). We were particularly interested to identify corridors connecting European Neanderthals to Central Asian Neanderthals. Results show a major corridor from East of Europe to Asia crossing North of Black Sea and Caspian Sea. We found that this archaic human probably used the southwestern coast of the Black Sea (current day Istanbul) to enter Southwestern Asia. Then, they dispersed to Levant and further east to Iran

crossing Central Iranian Plateau toward east. The Southern Caspian Sea was previously introduced as a dispersal corridor for the Neanderthals but we found that, Southern Caspian Sea corridor was not a dispersal corridor during the LIG. Going through literature we found important archeological sites supporting the identified corridors. Finally, our corridor map demonstrates areas with high suitability for acting as dispersal corridors, and future field reconnaissance in these areas can increase our understanding of the species global distribution and dispersal.

P01-299

Scripta manent? About Some Early Inscribed Objects in 'Alphabet of Lugano' of the Gallic Sequani Tribe.

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A recent doctoral work on the chronology of Gaulish inscriptions in eastern Gaul has enabled us to isolate a small but valuable corpus of inscriptions in the 'Lugano alphabet' from the *Sequani* territory on locally produced objects. Dated to the 6th and 5th centuries BC, they have been known since their respective discoveries (Collet, Briquel 1994; Verger 2001). However, their local attribution is only recent, following new research on the artefacts (e. g. Dubreucq et alii 2018).

The Lugano alphabet has only been attested to date in Switzerland, with the Sequane territory situated close to this area via the Jura mountains. This suggests an attempt to transmit writing beyond the Jura reliefs during the Final Hallstatt and early La Tène periods. However, the available documentation and the rarity of these early written testimonies in Central-Eastern Gaul indicate that this transmission was episodic : no other written mention of a Celtic language was found before the early 1st century BC, when other cultural and economic contacts took place.

The objective of this poster is to present these objects, examine the value of these inscribed messages and put forward hypotheses for the transmission of a written practice in the Jura region, taking into account the circulation routes.

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P01-300

Unveiling Urbanization in Ancient Udyana (Swat, Pakistan): A GIS-Based Archaeological Investigation

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The application of GIS techniques in archaeological research offers valuable insights into the dynamics of settlement and urbanization. This study explores the urbanization process in ancient Udyana (modern-day Swat, Khyber Pakhtunkhwa, Pakistan), a region with limited previous research. Through field-intensive investigations, this research identifies major and minor habitations from the ancient period, analyzing factors influencing urbanization. The study area encompasses two distinct landscapes: valleys and hilly regions. Key findings indicate: 1. Valley regions urbanized earlier than hilly regions. 2. Valley plains were preferred over hilly areas for settlement. GIS analysis revealed spatial patterns and relationships between: 1. Environmental factors (topography, water resources) 2. Infrastructure (roads, trade routes) 3. Settlement distribution This research contributes to understanding the urbanization process in ancient Udyana, shedding light on the historical and archaeological context of the region.

S33-287

Temporal patterns in Mesolithic activity at Duvensee

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Over 250 radiocarbon results date a dozen Mesolithic sites beside the palaeolake Duvensee, Schleswig-Holstein, to an extended period spanning the early 9th to the mid-7th millennia cal BC. Each site may only have been used briefly – perhaps only for a single season in some cases – but some were used repeatedly over the course of decades or even centuries. Meticulous excavation, excellent organic preservation, and a rigorous approach to radiocarbon sample selection permit the application of Bayesian chronological modelling to the results. Individual site chronological models contribute to an overall model of the fluctuating intensity of recorded Mesolithic activity at Duvensee. This model confirms that a sharp

spike in the intensity and diversity of human activity coincided with a steep increase in hazelnut pollen influx at the start of the Boreal biozone, but dated activity declined dramatically in the later 9th millennium, well before the hazel maximum in local and regional pollen diagrams at c.8000 cal BC. Subsequent occupations were more irregular and ephemeral. While this pattern appears to contradict the idea that hazelnut productivity dictated the intensity of human activity at Duvensee, we suspect that site formation processes, such as a falling lake level and peat cutting, and their effect on site visibility, obscure any relationship between hazelnut abundance and human activity. Moreover, although the Duvensee radiocarbon results can be construed to support arguments that rapid climate change had a significant impact on human activity, known climate events (at 10.3, 9.3 and 8.2ka cal BP) occurred when the record of human occupation was already discontinuous. It is therefore difficult to infer (or exclude) climate shocks as triggers for changes in the archaeological record at Duvensee. Our results, which are mirrored to some degree in other Mesolithic landscapes in northern Europe, should encourage debate about the extent to which aggregated radiocarbon data can reveal temporal patterns in the activities of complex forager groups.

P01-305

Lithics and landscapes: Archaeological material and geomorphological forms at Maralaleng Pan, southern Kalahari basin.

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Southern Africa is renowned for its wealth of Palaeolithic sites, specifically cave sites on the Cape coast. However, the semi-arid interior of the continent has been neglected due to the assumption that the environment was unfavourable for hominins during the Pleistocene. Recent research from the Kalahari has proven that the region can contribute to our understanding of human evolution. Archaeological surveys conducted near Tsabong (Botswana) identified surface scatters of quartzite lithics from the Pleistocene to the Holocene associated with geomorphological forms such as quartzite outcrops, pans (seasonal water bodies), and sand dunes. Most artefacts relate to early Middle Stone Age typologies. This contribution focuses on Maralaleng Pan and discusses where lithics are located in relation to different geomorphological forms inside the pans and whether this can provide insight into hominin landscape use during the Pleistocene. Single finds and scatters of lithics on the surface were recorded in systematic survey lines using a mobile Geographical Information System application. Eight archaeological test pits, two geotrenches and four sand auger cores were opened in different parts of the pan based on the results from the surveys. Lithic assemblages were examined to quantify the number of artefacts, types, completeness and weathering stages. Sediment samples were taken from each geomorpohological form and analysed using particle size by laser diffraction and X-ray Fluorescence to establish the depositional environment of the sediment and to better understand the context of the lithics and their association with certain geomorphological forms. Roughly 4400 lithics were collected and counted in types, about 25% were analysed using an attribute catalogue featuring size, weathering, completeness etc. The number of lithics decreases downslope where the sediment becomes increasingly poorly sorted. Artefacts were manufactured on the outcrops where raw material is available and likely moved towards the pan centre by natural erosional processes. The combined data on lithics and geoarchaeology will give an outlook on the context and movement of the archaeological material over time, and can provide insight into site choices of archaic humans within the landscape during the Pleistocene. This case study provides an opportunity to gain a better understanding of geomorphological forms and how they contributed to hominin site choices in the Kalahari overall.

Dispersal of Homo sapiens to East Asia

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The dispersal of Homo sapiens from Africa to East Asia is a fundamental aspect of human evolutionary history, yet many questions remain regarding the mechanisms, routes, and timings of this migration. Climate may play a crucial role in early human dispersal:

1. Glacial-Interglacial Cycles create the migration corridor such as Bering Land Bridge.
2. Temperature and Precipitation Changes, affecting the distribution of habitats and available resources.
3. Seasonal changes in climate, such as monsoon patterns in certain regions, influenced the availability of water, vegetation, and animal resources.
4. Abrupt climatic events, such as Heinrich events and Dansgaard-Oeschger events, caused rapid and dramatic changes in temperature, precipitation, and atmospheric circulation patterns.

This research aims to explore the dispersal routes of Homo sapiens to East Asia and investigate the related impact of climate change based on the Human Dispersal Model (HDM).

Molluscs and Ostracods as Bioindicators in Holocene Floodplain Sediments of the Rivers Echaz and Eger (Southern Germany)

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The development of overbank silt-clay deposits from the Middle Ages to early Modern times in central European floodplains is still poorly understood. In the rivers Echaz (3rd order tributary of the Rhine) and Eger (3rd order tributary of the Danube) in southern Germany, these deposits are typically up to one meter thick. Both floodplains are characterized by calcareous sediments, as their springs derive from the limestones of the Swabian Jura, and they are therefore promising study sites for micropalaeontological investigations.
In fluvial systems ostracods are especially useful to document changes between fluvial activity and standing water, and to reconstruct the spatial distribution of water bodies. Oxygen or heavy metal sensitive species allow recognizing organic and heavy metal pollution levels. Anthropogenic usage of water bodies can be assessed and the provenance of sediments can be identified. The frequency of aquatic and terrestrial gastropods, bivalves, and macrobotanical remains provide further information about the floodplain development, the palaeoenvironment, and the past land use.
As part of the SPP2361-subproject “Local pathways to the Fluvial Anthroposphere at Echaz (Rhine) and Eger (Danube)”, we study indicator species, ecological tolerances, palaeoecological assemblage analysis and taphonomy in sediment cores and profiles from the floodplain sediments. In a next step we plan to compare the subfossil ostracod faunas with recent faunas in the floodplains today. Thereby information on not only the overbank silt-clay deposits development, but also e.g., historical fishponds, channel engineering and hydro-energy installations, floodplain land use and irrigation systems, craft and waste disposal and pollution will be obtained. In this contribution, we present a project overview and first results.

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