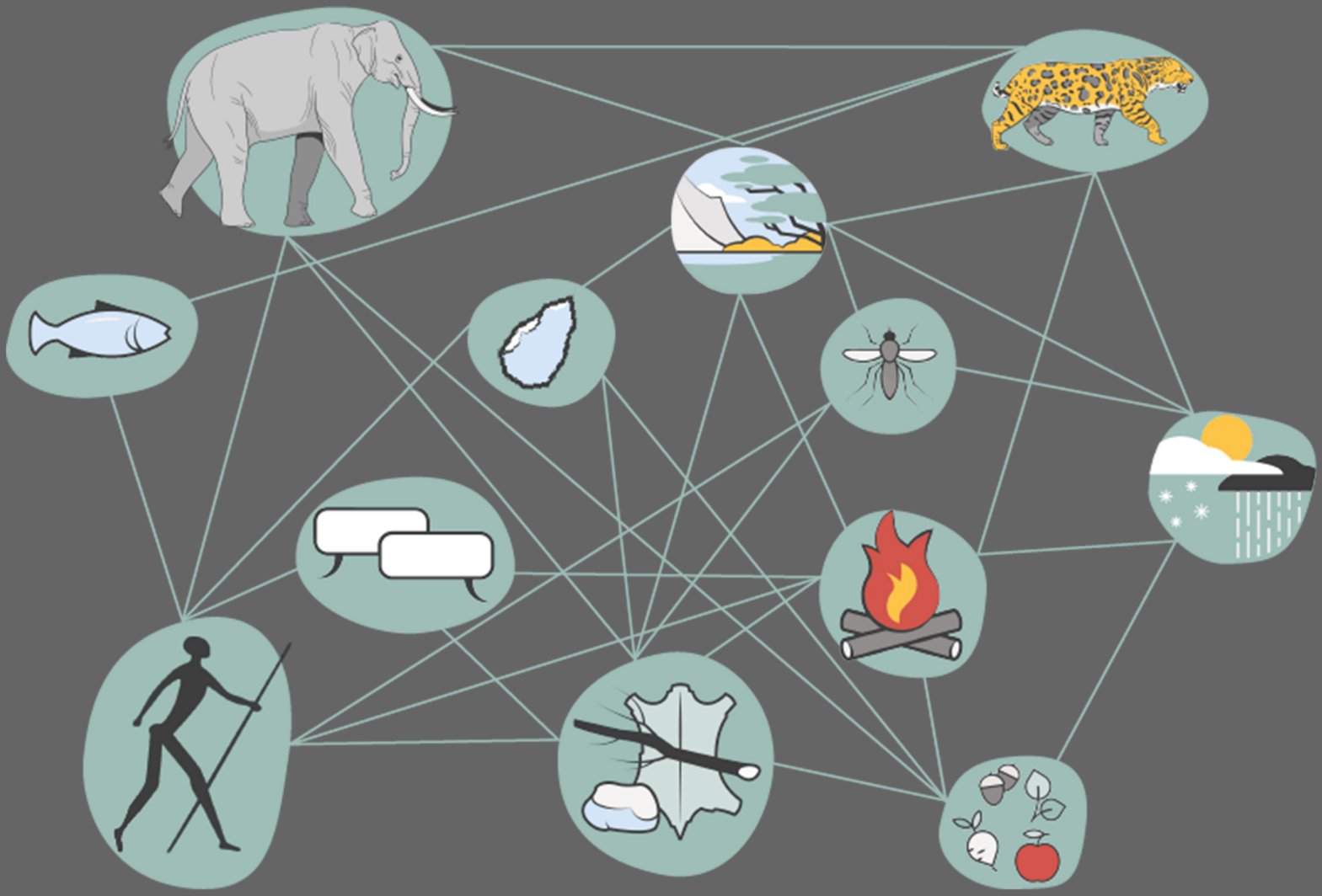

Symposium:
Diversifying Networks
How Culture Infuses the Environment

October 8 - 10, 2025
Senckenberg Research Institute, Frankfurt am Main

HEIDELBERGER AKADEMIE DER WISSENSCHAFTEN
Akademie der Wissenschaften des Landes Baden-Württemberg

EBERHARD KARLS
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THE ROLE
OF CULTURE
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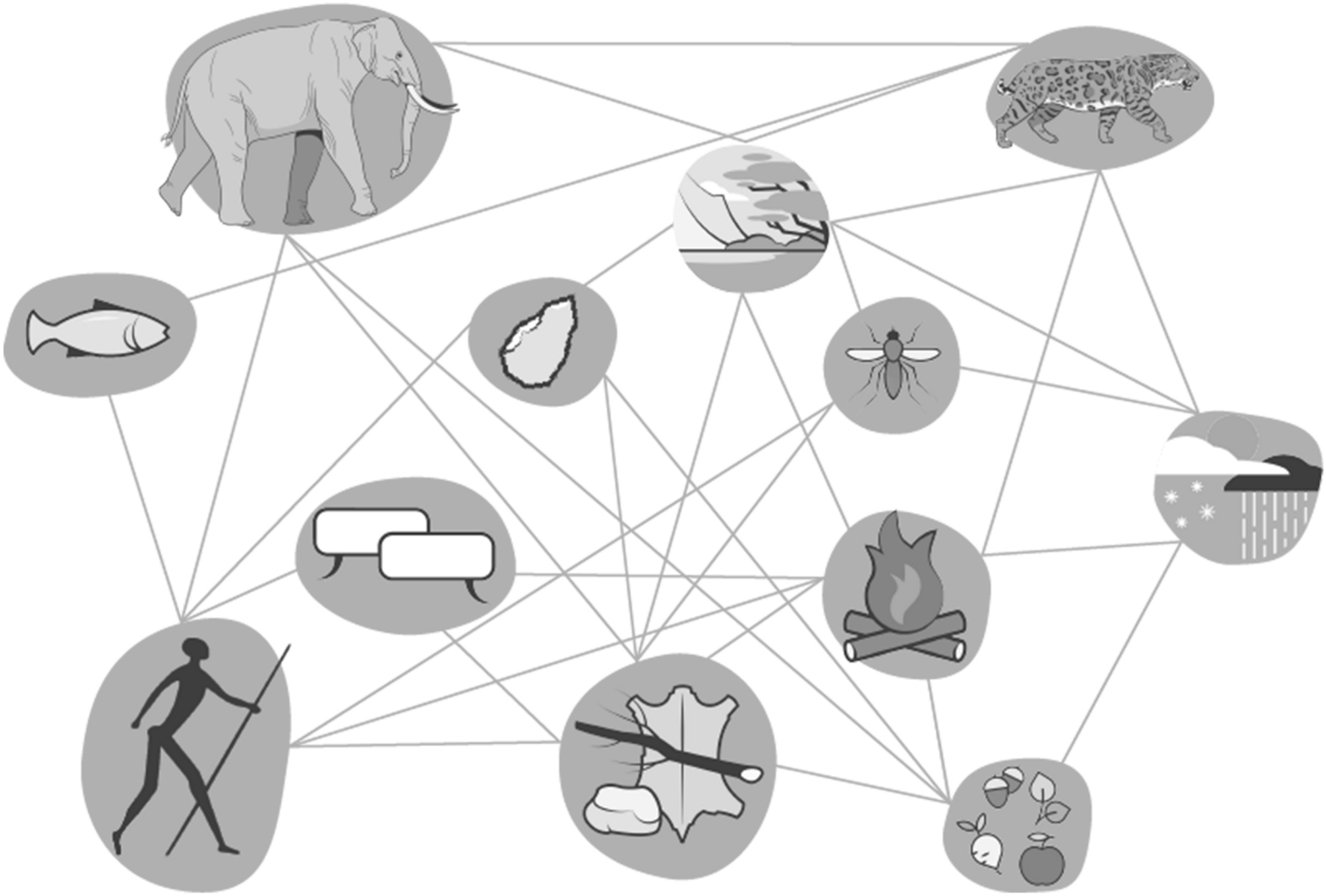

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SENCKENBERG CONFERENCE

Adresses

Venue

Senckenberg Research Institute
Senckenberganlage 25
60325 Frankfurt am Main

Venue Entrance
Robert-Mayer-Str. 2
60325 Frankfurt am Main

Hotels

Hotel Beethoven
Beethovenstr. 46
60325 Frankfurt am Main

Hotel-Pension Gölz
Beethovenstr. 44
60325 Frankfurt am Main

Art-Hotel Robert Mayer
Robert-Mayer-Str. 44
60486 Frankfurt am Main

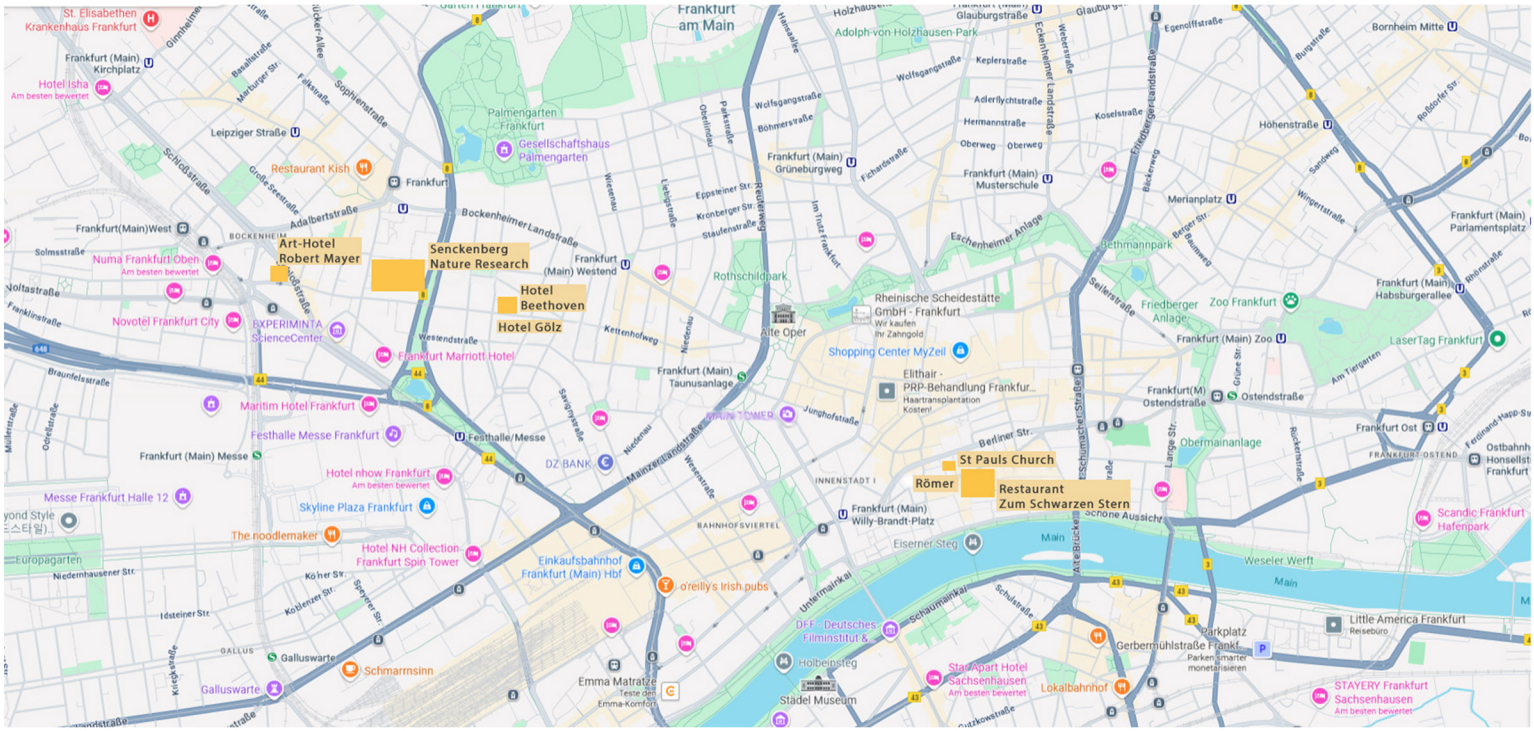
Conference Dinner

Zum Schwarzen Stern
Römerberg 6
60311 Frankfurt am Main

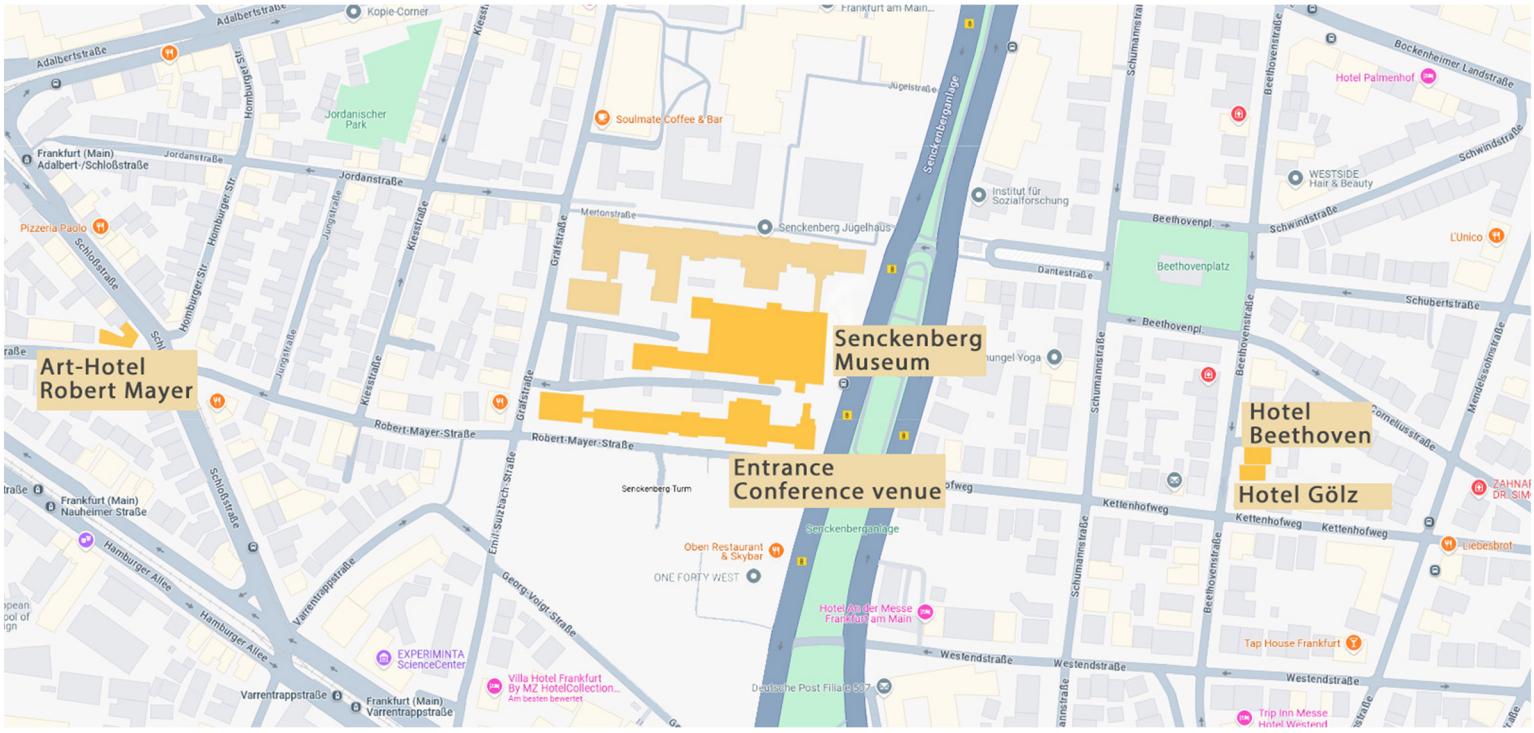
City Tour

Meeting Point
St Pauls Church, in front of the main entrance Paulsplatz
Paulsplatz 11
60311 Frankfurt am Main

Maps



Frankfurt City overview Map



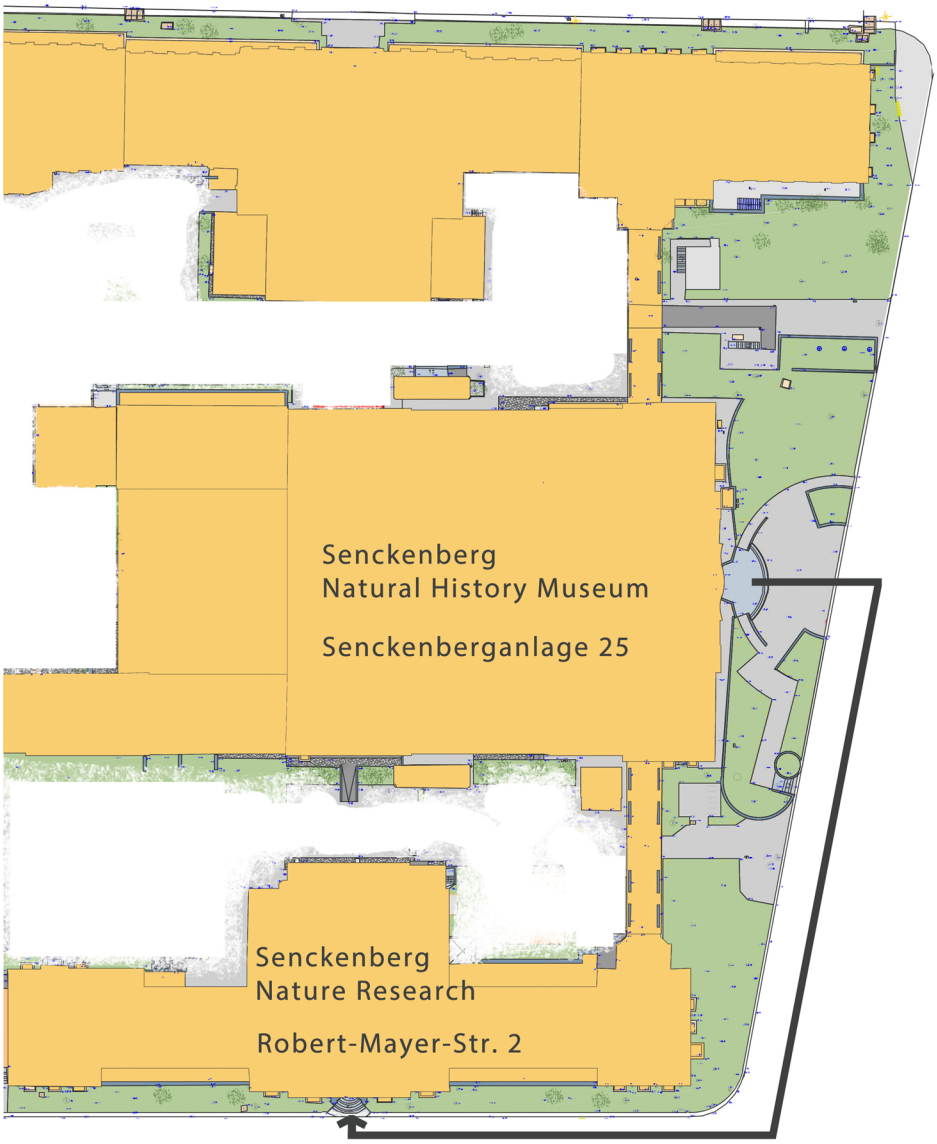
Senckenberg Nature Research Institute

Hotel Beethoven

Hotel Gölz

Art-Hotel Robert Mayer

Maps



Venue

Senckenberg Research Institute
Senckenberganlage 25
60325 Frankfurt am Main

Venue Entrance
Robert-Mayer-Str. 2
60325 Frankfurt am Main

Diversifying Networks. How Culture Infuses the Environment

International Symposium 8-10 October 2025, Frankfurt/Main

Programm

Wednesday, 8 October 2025

16:00-17:00	Arrival and Registration

INTRODUCTION – Diversifying Networks. How Culture Infuses the Environment

17:00-17:15	Friedemann Schrenk, Nicholas J. Conard: Opening of the symposium and welcome address
17:15-17:45	Miriam N. Haidle: Introduction

KEYNOTE

18:00-19:00	Annette Kehnel: Why Study Diversifying Networks? How concepts about human past infuse the present
19:00	Ice breaker

Thursday, 9 October 2025

SESSION 1 - How Humans Shape Themselves and Their Environment

9:00-9:30	Karen Hardy: Stringing It All Together. The Social, Technological and Functional Roles of Plants as Key Drivers in Human Evolution
9:30-10:00	Ramiro J. March: Reconstructing the History of Fire, Control and Application of Thermal Energy and Its Technical, Social, Symbolic and Environmental Consequences
10:00-10:30	Sabine Gaudzinski-Windheuser, Lutz Kindler, Fulco Scherjon and Will Roebroeks: Neanderthal Ecology at the Middle Palaeolithic Site of Neumark-Nord (Germany): New Results

BREAK 10:30-11:00

11:00-11:30	Jessica C. Thompson: The Coevolution of Foragers and Landscapes in the Woodland Belt of Southern-Central Africa
11:30-11:45	Discussion (Chair: Angela A. Bruch)

SESSION 2 - Cultural Environments as Niches for Other Species

11:45-12:15	Shumon T. Hussain: Deep Histories of Biocultural Diversity
12:00-12:45	Charles Stépanoff: The socio-ecological networks of an empathic predator

LUNCH 12:45-14:00

14:00-14:30	Anaïs Vignoles: The Influence of Climate Variability on the Gravettian Cultural Diversity and Evolution
14:30-14:45	Discussion (Chair: Jesper Borre Pedersen)

SESSION 3 - Adaptations in Sociality Changed the Rules for Interaction

14:45-15:15	Nataša Djurdjevac Conrad: Agent-based modeling of Human Mobility and Cultural Dynamics of African hunter-gatherers over the past 120 000 years

BREAK 15:15-15:45

15:45-16:15	Fiona Coward: New Materialism Meets Niche Construction: Exploring Complementarities Between Evolutionary Theory and Traditional Ontologies
16:15-16:45	Miriam N. Haidle: Communities of Practice as Resource Space
16:45-17:00	Discussion (Chair: Andrew W. Kandel)
18:00 – 19:00	City Tour
19:30	Conference Dinner

Friday, 10 October 2025

SESSION 4 - Opening New Spaces: Hominin Mobility

9:00-9:30	Matt Grove: Structured populations and the shifting balance of cultural evolution
9:30-10:00	Miriam García Capín: Taming the Darkness. The Earliest Visual Culture in Cantabrian Caves
10:00-10:30	Iwona Sobkowiak-Tabaka and Aleksandr Diachenko: Scaling Late Palaeolithic Mobility in the North European Plain

BREAK 10:30-11:00

11:00-11:30	Jesper Borre Pedersen, Peter Yaworsky, and Felix Riede: Cultural Packages and Landscape Memory – Discussing the Divergent Fates of LRJ and Aurignacian Expansions
11:30-11:45	Discussion (Chair: Christine Hertler)

SESSION 5 – Modeling Diversifying Networks

11:45-12:15	Christine Hertler, Miriam N. Haidle, Ana Mateos, and Jesús Rodríguez: Cut&Run – Measuring the Advantages of Tool-Supported Scavenging
12:15-12:45	Jesús Rodríguez: Hominins as facultative scavengers - Biotic Interactions and Ecological Constraints

LUNCH 12:45-14:00

14:00-14:30	Ana Mateos: Are Hominins Equipped to Be Efficient Scavengers?
14:30-15:00	Jan-Olaf Reschke, Carolina Cucart-Mora, Kamilla Lomborg, Matt Grove, Christine Hertler, and Marie-Hélène Moncel: Surviving in the Pleistocene Guadix-Baza Basin – From Small-Scale Models to Large-Scale Insights
15:00-15:15	Discussion (Chair: Christian Sommer)

BREAK 15:15-15:45

PUTTING THE PIECES TOGETHER

15:45-16:30	Final Discussion (Chair: Andrew W.Kandel)

Abstracts

in alphabetical order

New materialism, meet niche construction: exploring complementarities between evolutionary theory and traditional ontologies

Coward, Fiona

Bournemouth University, Christchurch House C116, Talbot Campus, Fern Barrow, Poole, BH12 5BB, United Kingdom

Evolutionary approaches to human origins have all too often started from the premise that culture and environment are both distinct and opposed. However, more recent approaches, particularly those incorporating perspectives emphasising niche construction and dual/triple inheritance, recognise the extent to which all culture, including human, and the cognitive processes which underpin it, are not simply a discrete, specialised 'trait' or even set of traits determined by genotype and natural selection and passively reflected in the archaeological data set. Instead, 'culture' itself comprises a fundamental element of the environments to which hominins and humans adapted. Thus cognitive evolution is now recognised as simultaneously ecological, social and cultural, fundamentally entangled with such network variables as adaptive changes in group size, population density and effective population size, and the interactions and connectivity among individuals and groups - including beyond conspecifics, to encompass other species and aspects of the landscape. Interestingly, these cutting-edge scientific evolutionary perspectives increasingly have a great deal in common with social and cultural anthropological theory drawing from 'new materialist' perspectives aiming to take seriously the 'alterity' of ontologies from beyond the global North which have not previously been considered by traditional evolutionary science.

In this paper I will attempt to sketch out some of the ways in which complementary elements of evolutionary and new materialist perspectives might be combined to better understand the process by which we became human.

Agent-based modeling of Human Mobility and Cultural Dynamics of African hunter-gatherers over the past 120 000 years

Djurdjevac Conrad, Nataša

Zuse Institute Berlin (ZIB), Research group "Computational Humanities", Department of Modeling and Simulation of Complex Processes, Takustraße 7, 14195 Berlin, Germany

Human mobility and cultural exchange were fundamental to the development of prehistoric societies, but the mechanisms that drove these processes are often difficult to uncover just from the archaeological record. To address this challenge, I will present a new mathematical agent-based model (ABM) designed to explore these dynamics quantitatively. Our ABM simulates the movements of individuals across landscapes that change in response to environmental factors, where agents interact with one another and exchange cultural traits. With this model, we study how micro-level behaviors of individual agents give rise to macro-level phenomena of the whole system, such as the emergence of distinct cultural clusters that change over time. We applied our model to 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

Sources

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): 10230495. http://doi.org/10.1098/rsos.230495).

Taming the Darkness: The Earliest Visual Culture in Cantabrian Caves

García Capín, Miriam

Centro UNED Asturias | National University of Distance Education, Department of Prehistory and Archaeology, Av. del Jardín Botánico, 1345, 33203, Gijón, Asturias, Spain

Since prehistoric times, deep caves have been visited despite being hostile and even dangerous environments. Nevertheless, hominins explored them extensively, taking risks and leaving behind archaeological traces such as red paintings.

From a cognitive perspective, we attempt to understand the motivations behind this behaviour, which appears unrelated to immediate survival needs. By using cognigrams, we can reconstruct a chain of actions that begins with a need and leads to its fulfilment.

Our hypothesis suggests that this behaviour is driven by the activation of basic and universal neural circuits of seeking and fear, as described by J. Panksepp. During the process of exploration, visual culture plays a key role in 'taming' these wild spaces through the psychological processes it enables.

Neanderthal Ecology at the Middle Palaeolithic Site of Neumark-Nord (Germany): New Results

Gaudzinski-Windheuser, S.[1, 2], Kindler, L.[2, 1], Scherjon, F.[3, 2] & Roebroeks, W. [3, 2]

[1]Institute of Ancient Studies, Pre- and Protohistoric Archaeology, Johannes Gutenberg Universität, Mainz, Germany

[2]MONREPOS Archaeological Research Center and Museum for Human Behavioral Evolution, Germany

[3]Faculty of Archaeology, Leiden University, Netherlands

Reconstructing the ecological impact of Pleistocene hunter-gatherer groups on their environments is a formidable challenge in studying past hominin ecology. The Last Interglacial (Eemian, approximately 125,000 years ago) lake landscape of Neumark-Nord (Germany) presents an exceptional opportunity to explore the interactions between Neanderthals and their floral and faunal surroundings. This open-air locality preserves an exceptionally rich archaeological and palaeontological record within deeply stratified lake sediments and offers a remarkably rich paleoenvironmental, archaeological, and faunal archive accumulated in water holding basins during the Eemian Interglacial.

The Neumark-Nord sediments were exposed in the open-cast lignite mine Mücheln, in the Geiseltal valley near Merseburg, Saxony-Anhalt, Germany (51°19’28”N, 11°53’56”E). After its 1985 discovery, the Neumark-Nord 1 basin was investigated by Dietrich Mania and his team in a continuous rescue-archaeology operation until the end of mining activities in the mid-1990s. Their work provided detailed insights into the geology, palaeoecology, and archaeology of the, at its maximum extension, ~24-hectare Neumark-Nord 1 palaeobasin. The basin has become well-known for the discoveries of numerous virtually complete skeletons of large mammals, e.g., straight-tusked elephants, rhinos, fallow deer, and aurochs, and an abundance of faunal remains in general, interspersed with a wide range of archaeological traces of Neanderthal activities around its shores (Meller 2010).

The remains of the substantially smaller (~1.6 hectares) Neumark-Nord 2 basin were discovered by Mania’s team during reclamation works in the abandoned mine complex in the late 1990s. Situated about 100 m northeast of Neumark-Nord 1, the Neumark-Nord 2 basin was subjected to a series of multidisciplinary investigations and long-term archaeological excavations between 2004 and 2008 (see Gaudzinski-Windheuser and Roebroeks (2014) for a review).

The Neumark-Nord 1 and 2 pollen records and the known duration of individual Pollen Assemblage Zones (PAZ) of the Last Interglacial provide great temporal control for finds made in both basin deposits, as well as the means to correlate the deposits of both basins on the scale of specific vegetation zones (Gaudzinski-Windheuser et al. 2018).

Together with archaeological and charcoal evidence from Neumark-Nord studies demonstrated a clear ecological footprint left by hominin activities, including the use of fire,

which resulted in a long-lasting period of open vegetation in the lake landscape (Roebroeks et al. 2021). The widespread occurrence of butchery marks and hunting lesions (Gaudzinski Windheuser et al. 2018) on faunal remains, including those of straight-tusked elephants (Palaeoloxodon antiquus, with a minimum of 57 individuals documented over a period of ~ 2,000 years), provides compelling evidence of the extensive and long-term exploitation of faunal resources by Neanderthal groups (Gaudzinski-Windheuser et al. 2023; Kindler et al. 2025).

This site offers a unique opportunity to study the impact that Neanderthal hunter-gatherers had on their ecosystems through their activities, which included repetitive burning, intensive hunting practices and resource exploitation, and a semi-permanent presence around the water bodies, thus modifying the landscapes they inhabited during the Last Interglacial there. Ongoing isotope and genetic studies of a wide range of prey animals allow us to study their impact in more detail.

Sources

Gaudzinski-Windheuer, S., Kindler, L., MacDonald, K., Roebroeks, W., 2023. Hunting and processing of straight-tusked elephants, 125.000 years ago – implications for Neanderthal behaviour. Science Advances 9, eadd8186. doi.org/10.1126/sciadv.add8186

Gaudzinski-Windheuser, S., Noack, E.S., Pop, E., Herbst, C., Pfleging, J., Buchli, J., Jacob, A., Enzmann, F., Kindler, L., Iovita, R., Street, M., Roebroeks, W., 2018. Evidence for close-range hunting by last interglacial Neanderthals. Nature Ecology & Evolution 2,1087–1092. doi.org/10.1038/s41559-018-0596-1.

Gaudzinski-Windheuser, S., Roebroeks, W. (Eds.), 2014. Multidisciplinary Studies of the Middle Palaeolithic record from Neumark-Nord (Germany). Volume 1. Veröffentlichungen des Landesamtes für Denkmalpflege und Archäologie 68, Halle.

Kindler, L., Gaudzinski-Windheuser, S., Scherjon, F., Moreno-Garcia, A., Smith, G., Pop, E., Speth, J., Roebroeks, W., 2025. Large-scale Processing of Within-Bone Nutrients by Neanderthals, 125,000 years ago. Science Advances 11,eadv1257(2025). DOI:10.1126/sciadv.adv1257

Meller, H. (Ed.), 2010. Elefantenreich. Eine Fossilwelt in Europa. Begleitband zur Sonderausstellung im Landesmuseum für Vorgeschichte in Halle.

Roebroeks, W., MacDonald, K., Scherjon, F., Bakels, C., Kindler, L., Nikulina, A., Pop, E., Gaudzinski-Windheuser, S., 2021. Landscape modification by last-interglacial Neanderthals. Science Advances 7, 51. https://doi.org/10.1126/sciadv.abj5567

Structured populations and the shifting balance of cultural evolution

Grove, Matt

University of Liverpool, Department of Archaeology, Classics and Egyptology, 18-14 Abercromby Square, Liverpool L69 7WZ, United Kingdom

Current archaeological, morphological, and genetic evidence suggests a structured African metapopulation model of human origins. The distinction between panmictic and structured populations parallels an early debate in evolutionary theory between Fisher and Wright. Wright's Shifting Balance theory provides a model easily adapted for the study of cultural evolution in structured populations. An agent-based model adapting Wright's theory to cultural innovation and transmission demonstrates that structured populations rapidly attain optima that panmictic populations are often unable to find. Results are discussed in relation to the dynamics of extant hunter-gatherer networks and archaeologically documented patterns of cultural transmission.

Communities of practice as resource space

Haidle, Miriam N.

Heidelberg Academy of Sciences and Humanities, University of Tübingen and
Senckenberg Research Institute and Natural History Museum Frankfurt/M
The Role of Culture in Early Expansions of Humans (ROCEEH), Senckenberganlage 25, 60325 Frankfurt am Main, Germany

The concept of Communities of Practice (CoP) originates from anthropological literature and deals with the social and situated dimensions of learning. It emphasizes communities as learning bodies, participation in practices as part of the learning process, the role of material culture in mediating knowledge, and the reciprocal and dynamic relationships between experts and novices, as well as practices and practitioners. In animal species, we observe CoPs with limited scope in terms of the number and complexity of practices, e.g. in the migratory behavior of ungulates, and in terms of the roles that members of the communities assume, e.g. in the use of tools by chimpanzees. With the modularization of practices – promoted by the secondary use of tools already in the early stages of human cultural evolution – the roles within the CoP and the contributions to them diversified, and their heterogeneity increased. Complementary cooperation in the procurement of raw materials and the manufacture and use of tools is a starting point for expanding the CoP and enable an increase in learning situations, the differentiation of knowledge, know-how and skills, and the distribution of the workload. An early CoP is modeled in the Cut&Run hypothesis for meat procurement in early Homo, while a much more complex CoP is reconstructed for the preparation of a Neanderthal meal, which is based on several practices, raw materials and tools and requires long individual development. A modern example from the Wodaabe bow hunters illustrates the importance of play and the changing roles of young children to adults within a CoP. CoPs are a reservoir of additional hands (with specific skills) and brains (with knowledge, procedural know-how and memories), materials and tools. They enable participation in relationships and the experience of increasing temporal depth. They function as learning and innovation environments. Extended CoPs stabilize cultural systems against the simple loss of practices and support deep entanglement with diversifying networks.

Stringing it all together. The social, technological and functional roles of plants as key drivers in human evolution

Hardy, Karen

University of Glasgow, Department of Archaeology, School of Humanities, 1 University Gardens, Glasgow G12 8QQ, United Kingdom

Plants are essential as raw materials, medicines and food today. The POWERFUL PLANTS project is based on the premise that complex use of plants, as food, medicine and raw materials were not only essential but were defining in social, cultural, behavioural and technological development in later human evolution. Plants are indispensable to our physical, psychological and physiological wellbeing providing us with energy, nutrients, medicines as well as raw materials. The depth of the human connection to plants and the integral nature of these suggests this has always been the case.

Cut&Run – Measuring the advantages of tool-supported scavenging

Hertler, Christine[1], Haidle, Miriam N.[1], Mateos, Ana[2] and Rodríguez, Jesús[2]

[1]ROCEEH, Heidelberg Academy of Sciences and Humanities, Senckenberg Research Institute, Senckenberganlage 25, 60325 Frankfurt am Main, Germany

[2]CENIEH | National Research Center on Human Evolution, Paseo Sierra de Atapuerca, 3, 09002 Burgos, Spain

Organisms interact with their environment to obtain food and other resources. Such interactions may involve the use of tools. Humans have managed to amplify tool-dependent strategies to an extent that opened entirely new perspectives. Scavenging often occurs among carnivores as a fallback strategy, which does not require advanced hunting strategies. When hominins started to consume carrion, thereby expanding their spectrum of food resources, competition with other scavengers became one of the critical challenges. The use of stone tools may have given them a competitive edge, but in what way and how great was this advantage actually?

To examine the effects of scavenging strategies, the SCAVCOMP ABM simulates the process of scavenging in a carnivore guild. Hunting carnivores leave carcasses behind, which are then further consumed by scavengers. When two of them target the same carcass, they compete for access to and extraction of the resources. Hominins are also part of this guild, but in SCAVCOMP their behaviour does not differ fundamentally from that of other carnivores. The modified Cut&Run version now allows for testing alternative scenarios of human behaviour. Instead of immediate consumption, the Cut&Run ABM allows hominins with cutting tools to extract larger pieces of meat from a carcass and transport them to a location where they can avoid confrontation. However, such improvements in the scavenging process come at a cost. Hominins must spend time and energy procuring raw materials and manufacturing tools. This requires the establishment of new time regimes and enables task-sharing within a group of hominins.

Cut&Run enables the quantification of the effects of new behavioural strategies on the success of carrion consumption, energy balance and survival. In our presentation, we introduce the model and explain its main features. Sensitivity studies illustrate the model design and mechanisms, and show how we evaluate the resulting data.

Deep Histories of Biocultural Diversity

Hussain, Shumon T.

University of Cologne, Center for Multidisciplinary Environmental Studies in the Humanities (MESH), Department for Prehistoric Archaeology, Palaeolithic Research Unit (FAST), Faculty of Arts and Humanities, Aachener Straße 217, 50931 Köln, Germany

The interdependence and co-constitution of biological and cultural diversity is long recognized by a range of fields including historical ecology and Indigenous studies. Responding to the Anthropocene polycrisis, palaeoscientists now increasingly forward questions on the evolution of biodiversity in the Earth system but have so far largely neglected its manifold human dimensions. I here argue that a substantial concept of *biocultural diversity* is presently lacking in such debates and explore how different forms of human life have shaped biological diversity patterns throughout early human evolution, repositioning the deep history of biocultural diversity in relation to how coupled human-animal-environment systems assemble and co-evolve over millennia.

Why Study Diversifying Networks? How concepts about human past infuse the present

Kehnel, Annette

University of Mannheim, Chair of Medieval History, L 7, 7, 68161 Mannheim, Germany

At a time when systems across the globe are increasingly shaped by uniformity and monoculture, the concept of diversification takes on renewed urgency. We start from the assumption that throughout history expanding networks—social, ecological, material, symbolic etc.— created new conditions for individual and collective development, for social learning, and for evolutionary processes. However, what happens to diversifying networks under threat? In the anthropocene, or – as Donna Haraway suggested – in the plantationocene, meaning a world that radically simplifies the number of players and sets up situations for the vast proliferation of some and the removal of others? This keynote

reflects on the historical dimensions of cultural-environmental interplay, arguing that understanding past patterns of diversification is essential — not only for interpreting the archaeological record, but for navigating the challenges of our present and future.

Reconstructing the history of fire, control and application of thermal energy and its technical, social, symbolic and environmental consequences

March, Ramiro J.

Université de Rennes 1 - Campus de Beaulieu, Bâtiment 24-25 Campus de Beaulieu 263, Avenue du général Leclerc Campus de Beaulieu CS 74205 – 35042 RENNES CEDEX, France

The reconstruction of the history of the control and application of thermal energy to the transformation of matter opens a window on the relationship between this cultural resource and the dynamics of production and social reproduction and human and nature relation in the history of humanity from societies from hunter gatherers to state societies including our actual circumstances

This talk will be a presentation about the history of fire through archaeology reconstruction and its social and anthropological significance in human history discussing about theoretical, epistemological and methodological aspects. and we are going to deal also with this relationship between man and fire from archaeological examples of different human societies from the past of South America and other continents and their relationship with our current global situation exploring the importance of this thematic for our future and the interdisciplinary research way.

Are hominins equipped to be efficient scavengers?

Mateos, Ana

CENIEH | National Research Center on Human Evolution, Paseo Sierra de Atapuerca, 3, 09002 Burgos, Spain

Despite the popular view of scavenging as a marginal activity, all carnivorous animals, and even some herbivores, eat carrion. This valuable, high-quality resource was exploited by all hominin species, especially during periods of food shortage in seasonal environments. Hominins exhibit several anatomical, physical, and behavioural adaptations that enable them to detect carcasses from a long distance, reach them relatively quickly and at low energetic costs, confront other scavengers and competitors, and process the carcasses to obtain meat, fat, and bone marrow efficiently thanks to technology, cooperation and language. These behaviours allowed hominins to avoid additional risks and high energetic costs during the acquisition of carrion.

Cultural Packages and Landscape Memory – Discussing the Divergent Fates of LRJ and Aurignacian Expansions

Pedersen, Jesper Borre[1], Yaworsky, Peter[2] & Riede, Felix [2]

[1]Heidelberg Academy of Sciences and Humanities, University of Tübingen, The Role of Culture in Early Expansions of Humans (ROCEEH), Hölderlinstraße 12, 72074, Tübingen, Germany

[2]Aarhus University, Department of Archaeology and Heritage Studies, School of Culture and Society, Moesgård Allé 20, Building 4216, 8270 Højbjerg, Denmark

Homo sapiens repeatedly entered unfamiliar regions of Western Eurasia during the Middle–Upper Palaeolithic transition. Early appearances such as the Bachokirian and the Lincombian–Ranisian–Jerzmanowician (LRJ) are now linked to anatomically modern humans (AMH), yet they show demographic fragility and limited cultural continuity. By contrast, the Proto- and Early Aurignacian represent the first widespread and sustained AMH settlement. This presentation examines why some pioneering dispersals failed while the Aurignacian expansion succeeded, and how such divergent outcomes can be detected archaeologically. Triple-inheritance theory emphasises that humans inherit not only genes and environments but also ecological knowledge: stories, place names, and symbolic practices that embed landscapes in cultural memory. These immaterial constructions shape how groups perceive, navigate, and exploit unfamiliar environments. In this way, culture “bleeds” into landscapes, infusing them with meaning and memory that guide movement, subsistence, and identity. Yet despite their importance, such intangible inheritances are difficult to trace archaeologically. To address this challenge, the concept of landscape learning is applied, highlighting the social acquisition of locational, limitational, and social knowledge required for long-term habitation. Harmonised records from the ROCEEH Out of Africa Database (ROAD) provide the basis for compiling LRJ, Proto-Aurignacian, and Early Aurignacian sites, which are evaluated using a comparative Landscape Familiarity Index (LFI). The LFI scores archaeologically visible domains on an ordinal scale, with normalised totals enabling cross-cultural comparison. Preliminary results indicate systematically lower LFI values for LRJ sites, consistent with limited environmental knowledge, and higher values for Aurignacian assemblages, reflecting well-learned landscapes. Aurignacian success appears to derive from cultural “packages” that combined efficient social transmission with robust provisioning and scheduling, accelerating the transformation of unknown terrains into socially mapped places. More broadly, the LFI offers a scalable metric for testing hypotheses about pioneer failure, replacement, and consolidation, and provides a methodological template for assessing landscape learning across prehistoric colonisation events.

Surviving in the Pleistocene Guadix-Baza Basin: From Small-Scale Models to Large-Scale Insights

Reschke, Jan-Olaf[1,2], Cucart-Mora, Carolina[1], Lomborg, Kamilla[1], Grove, Matt[3], Hertler, Christine[2] & Moncel, Marie-Hélène[1]

[1]CNRS UMR 7194 HNHP, National Museum of Natural History, Institut de Paleontologie Humaine, Rue René Panhard, 75013 Paris, France

[2]ROCEEH, Heidelberg Academy of Sciences and Humanities, Senckenberg Research Institute, Senckenberganlage 25, 60325 Frankfurt am Main, Germany

[3]Department of Archaeology, Classics and Egyptology, University of Liverpool, 8-14 Abercromby Square, Liverpool L69 7WZ, UK

The interaction between hunter-gatherers and their environment—specifically, how their behavior changes based on resource availability—has been extensively studied. Ethnographic research suggests that hunter-gatherers employ a variety of strategies to adapt to different or similar conditions. Their mobility pattern, whether foraging (logistical) or relocating the entire group (residential), depends on the density and distribution of resources, and group size or traditions. Additionally, they may switch to or develop new subsistence strategies as needed. In recent decades, an increasing number of models have been created to examine these aspects of hominin behavior on a local scale, contextualizing them within varying environmental conditions.

To investigate how hominin foragers might respond to varying environmental conditions, we developed and published an agent-based model (Reschke et al., 2024). This model simulates a group of foragers exploiting a detailed environment filled with both stationary and mobile resources over the course of one year. The foragers employ central place foraging strategies and various subsistence methods. While the model does not provide direct predictions about the long-term survival of a hominin group, it illustrates how lower resource availability leads to larger home ranges and consequently lower population densities when applied to the wider region. Therefore, when our results suggest that population density in a region would drops below a critical threshold, we could assume that the scenario becomes unviable for long-term habitation as groups will struggle to maintain essential social networks, leading to population collapse in the broader area (Mandryk, 1993).

The primary aim of this study is to explore differences in foraging success, resulting mobility patterns, and indirectly assess long-term survival prospects within the reconstructed environment of the early Pleistocene Guadix-Baza Basin (Granada Province, Spain), during both glacial and interglacial periods (Altolaguirre et al., 2021). We used the extensive environmental reconstruction data from the area to perform a case study and test our methodology. Given the limited evidence for hunting during the early Pleistocene, we tested how an increasing reliance on meat acquired by scavenging affects the foragers.

Our results show a drastic change in suitability of the Guadix-Baza Basin when comparing glacial and inter-glacial conditions. In our inter-glacial scenarios foragers can acquire sufficient resources independently of the chosen subsistence strategy while in glacial scenarios the foragers must rely on meat to compensate for the lack of plants. Our findings indicate that Mediterranean Europe may have been a challenging area to inhabit during glacial periods. This approach will further be used within the

framework of the Lateurope ERC project, to study the effect of the environmental variability upon populations inhabiting central and northern Western Europe. This will also involve evaluating how the role of meat may change depending on latitude or other factors.

Sources

Altolaguirre, Y., Schulz, M., Gibert, L., & Bruch, A. A. (2021). Mapping early pleistocene environments and the availability of plant food as a potential driver of early homo presence in the Guadix-Baza Basin (Spain). *Journal of Human Evolution, 155*, 102986. https://doi.org/10.1016/j.jhevol.2021.102986

Mandryk, C. A. S. (1993). Hunter-gatherer social costs and the nonviability of submarginal environments. *Journal of Anthropological Research, 49*(1), 39–71. https://doi.org/10.1086/jar.49.1.3630629

Reschke, J.-O., Krüger, S., & Hertler, C. (2024). Early hominins: Successful hunters, catchers, or scavengers? an agent-based model about hunting strategies in tropical grasslands. *Quaternary Environments and Humans, 2*(5), 100019. https://doi.org/10.1016/j.qeh.2024.100019

Hominins as facultative scavengers - Biotic interactions and ecological constraints

Rodríguez, Jesús

CENIEH | National Research Center on Human Evolution, Paseo Sierra de Atapuerca, 3, 09002 Burgos, Spain

Carrion is a ubiquitous and high-rank trophic resource that is opportunistically exploited by all predators. Humans are no exception to this, and may be classified as 'facultative scavengers', in contrast to 'obligate scavengers' (vultures). The prevailing wisdom that carrion is a scarce and unpredictable resource is not universally true. The low cost/benefit ratio of carrion consumption frequently results in high levels of competition among scavengers. However, when the resource is abundant as in the case of megacarcasses, competion is relaxed. Moreover, under certain conditions, competitors become facilitators. Kleptoparasitism (stealing the kill of a predator) is a specialized type of scavenging that entails additional costs and risks. However, hominins are specially skilled for this activity, which is practized nowadays by many hunter-gatherer and agro-pastoralist societies.

Scaling Late Palaeolithic Mobility in the North European Plain

Sobkowiak-Tabaka, Iwona[1] & Diachenko, Aleksandr[2]

[1] Adam Mickiewicz University, Faculty of Archaeology, Uniwersytetu Poznańskiego 7, 61-614 Poznań, Poland

[2] Institute of Archaeology, National Academy of Sciences of Ukraine, Kyiv, Ukraine

Climate and environmental conditions played a crucial role in shaping patterns of human mobility and settlement during the Palaeolithic. Fluctuating climatic regimes, dynamic ecosystems, and the availability of vital resources—such as water, game, and knappable raw materials—directly influenced decisions about movement, site selection, and land use. This paper investigates proxies for Palaeolithic mobility across multiple spatial scales. It aims to identify archaeological indicators of mobility strategies and synthesizes previous research on Late Palaeolithic lithic assemblages in the North European Plain. The methodological framework developed here is also applicable to analyzing assemblages from earlier periods.

Artifact and tool densities serve as proxies for population size and camp duration, allowing for the inference of regional mobility patterns. These variables are analyzed in relation to the spatial distribution of sites. At a micro-regional level, intra-site mobility and relocation are examined through the spatial organization of camps. Locational preferences are identified through repeated patterns in artifact distributions, particularly concentrations or clusters, which are commonly regarded as evidence of simultaneous activity episodes among hunter-gatherer groups. Such interpretations are often guided by ethnographic analogies, which tend to favor simplified, synchronic models of spatial behavior. However, relying on these models may limit interpretations of past behavioral variability by aligning them too closely with the lifeways of recent or current foraging populations. To overcome this limitation, we suggest a model for reconstructing the sequence of cluster formation within camps, aiming to offer a more detailed understanding of spatial dynamics and diachronic activity patterns.

The socio-ecological networks of an empathic predator

Stépanoff, Charles

L' École des Hautes Études en Sciences Sociales Laboratoire d'Anthropologie Sociale, 52 rue du cardinal Lemoine, 75005 Paris

Cognitive and emotional skills are central in the entanglement between Hominins and their environments. Humans have become the planet's primary predators despite lacking anatomical and physiological traits typically associated with predation (such as sharp canines, claws, or acute olfaction). Instead, they developed cunning and an ability to understand their prey, trapping them while ensuring their reproduction, even to the point of domesticating some of them. Humans are empathic predators, and this tension lies at the heart of their ecology and their social life.

Human communities adopt animals across the globe, sometimes even breastfeeding them. These communities shape their environments while simultaneously forming multiple layers of attachment to the beings that nourish them.

Human expansion across continents has occurred through the formation of dense networks combining metabolic and empathic connections. This presentation will examine the case of hunters-reindeer herders in Siberia, based on ethnographic fieldwork.

The coevolution of foragers and landscapes in the woodland belt of southern-central Africa

Thompson, Jessica C.

Yale University, Department of Anthropology, 10 Sachem Street, New Haven, Connecticut, 06511, USA

The Zambezian open woodland belt of southern-central Africa has been a key area of biogeographic exchange since at least the Early Pleistocene. Paired archaeological and lake core data show that in northern Malawi, humans actively used fire to modify vegetation in these environments over at least the last ~85 thousand years (ka). Detailed paleoenvironmental and zooarchaeological data from rock shelters shows that by ~20 ka, changing environmental conditions at the end of the Last Glacial Maximum (LGM) were accompanied by constriction of human foraging ranges. Ancient DNA from the Later Stone Age people themselves shows a pattern of more "regional" mating patterns also occurred after the LGM. Agent-based models demonstrate that all these things may be related, as increased anthropogenic disturbance leads to reduced mobility and smaller numbers of interactions with unfamiliar individuals. This body of research has uniquely revealed evidence of the entangled nature of climate change, human intervention in environmental processes, and human social and biological relationships.

The influence of climate variability on the Gravettian cultural diversity and evolution

Vignoles, Anaïs

University of Liège, Faculty of Philosophy and Letters, Department of Historical Sciences, Prehistoric Archaeology Art, Archaeology and Heritage (AAP), Place du Vingt Août 7, 4000 Liège, Belgique

University of Kansas, Biodiversity Institute, Strong Hall, 1450 Jayhawk Blvd., Lawrence, KS 66045, USA

Currently facing major climate and environmental changes due to global warming, a growing concern of modern societies is related to how we will be able to accommodate with these rapid changes to survive. This kind of preoccupation is probably not new: over the course of its history, the human species has been able to adapt to very different environmental conditions, thanks to a diversified set of cultural adaptations.

In my research, I develop an interdisciplinary approach at the crossroad of distributional ecology, climate science and prehistoric archaeology, termed eco-cultural niche modeling. This set of methods derived from the field of distributional ecology allows one to identify the environmental conditions associated with specific cultural traits. Through its application, I aim to understand the role of environmental change in the diversity and evolution of cultural adaptations at medium-to-large geographic and chronological scales. This research uses primarily the archaeological record of the Gravettian (34-24 000 years before present in Europe) as an example framework.

In this conference, I will present the preliminary results of an inter-regional eco-cultural niche dynamics model during the Middle and Recent Gravettian in Western and Central Europe. At this period, archaeologists have shown that these two neighboring regions exhibit very different cultural trajectories, without being able to understand the large-scale mechanism that influenced this pattern. This model in construction builds on carefully assessed archaeological data and takes into account different sources of variability such as climate simulations, model algorithm and replicates. The effort put into data quality and variability characterization allows for stronger results on which to build solid interpretations of the factors composing cultural evolutionary mechanisms.

List of Participants

Andújar-Pareja, Rocío **rocio.andujar-pareja@student.uni-tuebingen.de**
University of Tübingen
Archaeological Sciences and Human Evolution (ASHE)
Schloß Hohentübingen, Burgsteige 11
72070 Tübingen, Germany

Bruch, Angela A. **angela.bruch@senckenberg.de**
Heidelberg Academy of Sciences and Humanities
Senckenberg Research Institute and Natural History Museum Frankfurt/M
The Role of Culture in Early Expansions of Humans (ROCEEH)
Senckenberganlage 25
60325 Frankfurt am Main, Germany
https://orcid.org/0000-0002-4629-1507

Chavarro-Belafonte, Samir **samir.chavarro-belafonte@student.uni-tuebingen.de**
University of Tübingen,
Archaeological Sciences and Human Evolution (ASHE)
Hölderlinstraße 12
72070 Tübingen

Conard, Nicholas J. **nicholas.conard@uni-tuebingen.de**
University of Tübingen
Department Chair/ Early Prehistory and Quaternary Ecology
The Role of Culture in Early Expansions of Humans (ROCEEH)
Schloss Hohentübingen, Burgsteige 11
72070 Tübingen, Germany
https://orcid.org/0000-0002-4633-0385

Coward, Fiona **fcoward@bournemouth.ac.uk**
Bournemouth University
Christchurch House C116,
Talbot Campus, Fern Barrow,
Poole, BH12 5BB, United Kingdom

Djurdjevac Conrad, Natasa **natasa.conrad@zib.de**
Zuse Institute Berlin (ZIB)
Research group "Computational Humanities"
Department of Modeling and Simulation of Complex Processes
Takustraße 7
14195 Berlin, Germany
https://orcid.org/0000-0001-8422-4930

Dong, Hua **hua.dong@student.uni-tuebingen.de**
University of Tübingen
Archaeological Sciences and Human Evolution (ASHE)
Schloß Hohentübingen, Burgsteige 11
72070 Tübingen, Germany

García Capín, Miriam **miriamgcapin@geo.uned.es**
Centro UNED Asturias | National University of Distance Education
Department of Prehistory and Archaeology
Av. del Jardín Botánico, 134533203, Gijón, Asturias, Spain
https://orcid.org/0000-0001-6395-9591

Gaudzinski-Windheuser, Sabine **sabine.gaudzinski@leiza.de**
MONREPOS | Archaeological Research Centre and Museum **monrepos-forschung@leiza.de**
for Human Behavioural Evolution
56567 Neuwied, Germany
https://orcid.org/0000-0003-4770-311X

Grove, Matt **matt.grove@liverpool.ac.uk**
University of Liverpool
Department of Archaeology, Classics and Egyptology
18-14 Abercromby Square
Liverpool L69 7WZ, United Kingdom
https://orcid.org/0000-0002-2293-8732

Guo, Shuqin **shuqin.guo@ifu.uni-tuebingen.de**
University of Tübingen
Early Prehistory and Quaternary Ecology
Schloss Hohentübingen, Burgsteige 11,
72070 Tübingen, Germany

Haidle, Miriam N. **miriam.haidle@uni-tuebingen.de**
Heidelberg Academy of Sciences and Humanities
University of Tübingen and
Senckenberg Research Institute and Natural History Museum Frankfurt/M
The Role of Culture in Early Expansions of Humans (ROCEEH)
Senckenberganlage 25
60325 Frankfurt am Main, Germany
https://orcid.org/0000-0002-4923-7880

Hardy, Karen **karen.hardy@glasgow.ac.uk**
University of Glasgow
Department of Archaeology
School of Humanities
1 University Gardens
Glasgow G12 8QQ, United Kingdom
https://orcid.org/0000-0003-1127-2397

Heller, Cassidy **cassidyheller1@gmail.com**
University of Tübingen,
Archaeological Sciences and Human Evolution (ASHE)
Hölderlinstraße 12
72070 Tübingen

Hertler, Christine **christine.hertler@senckenberg.de**
Heidelberg Academy of Sciences and Humanities
Senckenberg Research Institute and Natural History Museum Frankfurt/M
The Role of Culture in Early Expansions of Humans (ROCEEH)
Senckenberganlage 25
60325 Frankfurt am Main, Germany
https://orcid.org/0000-0002-8252-9674

Hochschild, Volker **volker.hochschild@geographie.uni-tuebingen.de**
University of Tübingen
Institute of Geography
The Role of Culture in Early Expansions of Humans (ROCEEH)
Rümelinstraße 19-23
72070 Tübingen, Germany

Hussain, Shumon T. **s.t.hussain@uni-koeln.de**
University of Cologne
Center for Multidisciplinary Environmental Studies in the Humanities (MESH)
Department for Prehistoric Archaeology, Palaeolithic Research Unit (FAST)
Faculty of Arts and Humanities
Aachener Straße 217
50931 Köln, Germany
https://orcid.org/0000-0002-6215-393X

Kaiser, Armin **m.a.kaiser@t-online.de**
Drosselweg 13
70839 Gerlingen

Kanaeva, Zara **zara.kanaeva@geographie.uni-tuebingen.de**
Heidelberg Academy of Sciences and Humanities
University of Tübingen
The Role of Culture in Early Expansions of Humans (ROCEEH)
Hölderlinstraße 12
72074 Tübingen, Germany

Kandel, Andrew W. **andrew.kandel@uni-tuebingen.de**
Heidelberg Academy of Sciences and Humanities
University of Tübingen
The Role of Culture in Early Expansions of Humans (ROCEEH)
Hölderlinstraße 12
72074 Tübingen, Germany
https://orcid.org/0000-0002-9889-9418

Kehnel, Annette **annette.kehnel@uni-mannheim.de**
University of Mannheim
Chair of Medieval History
L 7, 7
68161 Mannheim, Germany
https://orcid.org/0009-0000-1775-1212

Kindler, Lutz **lutz.kindler@leiza.de**
MONREPOS | Archaeological Research Centre and Museum
for Human Behavioural Evolution
56567 Neuwied, Germany

Mateos, Ana **ana.mateos@cenieh.es**
National Research Center on Human Evolution, CENIEH
Paseo Sierra de Atapuerca, 3
09002 Burgos, Spain
https://orcid.org/0000-0002-0676-9836

March, Ramiro J. **ramiro.march@univ-rennes1.fr**
University of Rennes 1
Campus de Beaulieu
263 avenue Général Leclerc
CS 74205
35042 Renners Cedex, France
https://orcid.org/0000-0002-8125-930X

Mezza, Joseph **joemezza01@gmail.com**
University of Tübingen
Archaeological Sciences and Human Evolution (ASHE)
Schloß Hohentübingen, Burgsteige 11
72070 Tübingen, Germany

Moncef, Bakail **bakailmoncef10@gmail.com**
University of Algiers 2
Director of the African studies laboratory
2 Djamel Eddine el afghani
Bouzareah, Algérie
https://orcid.org/0000-0002-8726-4660

Nasir, Nisa **nisanasiraja@gmail.com**
University of Tübingen
Institute for Archaeological Science (INA)
Rümelinstraße 23
72070 Tübingen, Germany

Ölz, Marie-Estelle **marie.estelle.oelz@gmail.com**
University of Tübingen
Institute for Archaeological Sciences, Archaeobotany
Hölderlinstraße 12
72070 Tübingen, Germany

Patterson, Keegan **keegan.patterson@student.uni-tuebingen.de**
University of Tübingen,
Archaeological Sciences and Human Evolution (ASHE)
Rümelinstr. 23
72070 Tübingen, Gemany

Pedersen, Jesper Borre **jesper-borre.pedersen@ifu.uni-tuebingen.de**
Heidelberg Academy of Sciences and Humanities
University of Tübingen
The Role of Culture in Early Expansions of Humans (ROCEEH)
Hölderlinstraße 12
72074 Tübingen, Germany
https://orcid.org/0000-0002-3468-0986

Porr, Martin **martin.porr@uwa.edu.au**
University of Western Australia
Archaeology/Centre for Rock Art Research and
Management School of Social Sciences
Associate Professor of Archaeology
Australia (M257), 35 Stirling Highway
6009 Perth, Australia
https://orcid.org/0000-0002-6556-1007

Reschke, Jan-Olaf **jan.olafreschke_ext@mnhn.fr**
CNRS UMR 7194 HNHP, National Museum of Natural History **jan-olaf.reschke@senckenberg.de**
Institut de Paleontologie Humaine
Rue René Panhard, 75013 Paris, France

ROCEEH Research Center
Senckenberg Research Institute
Senckenberganlage 25
60325 Frankfurt am Main, Germany
https://orcid.org/0000-0003-0526-3267

Ripoll Amodia, Miguel **miguel.ripoll-amodia@student.uni-tuebingen.de**
University of Tübingen
Institute for Archaeological Science (INA)
Rümelinstraße 23
72070 Tübingen, Germany

Rodríguez Méndez, Jesús **jesus.rodriguez@cenieh.es**
National Research Center on Human Evolution, CENIEH
Paseo Sierra de Atapuerca, 3
09002 Burgos, Spain

Schiersch, Lisa **lisa.schiersch@senckenberg.de**
Heidelberg Academy of Sciences and Humanities
Senckenberg Research Institute and Natural History Museum Frankfurt/M
The Role of Culture in Early Expansions of Humans (ROCEEH)
Senckenberganlage 25
60325 Frankfurt am Main, Germany

Schrenk, Friedemann **fskaronga@gmail.com**
Cultural & Museum Centre **friedemann.schrenk@senckenerg.de**
P. Bag 16, Karonga, Malawi

Sobkowiak-Tabaka, Iwona **iwosob@amu.edu.pl**
Adam Mickiewicz University
Faculty of Archaeology
Uniwersytetu Poznańskiego 7
61-614 Poznań, Poland
https://orcid.org/0000-0001-5913-1177

Sommer, Christian **christian.sommer@uni-tuebingen.de**
Heidelberg Academy of Sciences and Humanities
University of Tübingen
The Role of Culture in Early Expansions of Humans (ROCEEH)
Hölderlinstraße 12
72074 Tübingen, Germany
https://orcid.org/0000-0001-9062-0876

Stépanoff, Charles **charles.stepanoff@ehess.fr**
L' École des Hautes Études en Sciences Sociales
Laboratoire d'Anthropologie Sociale
52 rue du cardinal Lemoine
75005 Paris, France
https://orcid.org/0000-0002-9850-3049

Tigre-Martins, Guilherme **guilherme.tigre-martins@student.uni-tuebingen.de**
University of Tübingen

Thompson, Jessica C. **jessica.thompson@yale.edu**
Yale University
Department of Anthropology
10 Sachem Street
New Haven, Connecticut, 06511, USA
https://orcid.org/0000-0003-1627-4949

Vignoles, Anaïs L. **anais.l.vignoles@gmail.com**
University of Liège
Department of Historical Sciences
Prehistoric Archaeology Art, Archaeology and Heritage (AAP)
Place du Vingt Août 7
4000 Liège, Belgique

University of Kansas
Biodiversity Institute
Strong Hall, 1450 Jayhawk Blvd.
Lawrence, KS 66045, USA
https://orcid.org/0000-0001-5027-2037

Zirlewagen, Timon **timon.zirlewagen@student.uni-tuebingen.de**
University of Tübingen

Convener

Research Centre ROCEEH
"The Role of Culture in Early Expansions of Humans"
Heidelberg Academy of Sciences and Humanities
Senckenberg Research Institute Frankfurt/Main
Eberhard Karls University of Tübingen
www.roceeh.net