ALPHA AND OMEGA

The emergence and disappearance of Middle Palaeolithic lifeways

65TH CONFERENCE OF
THE HUGO OBERMAIER SOCIETY

2nd – 6th of April 2024
Weimar

HYBRID CONFERENCE

Layout: Nicolas Engele, TLDA

Freistaat Thüringen
Landesamt für Denkmalpflege und Archäologie

HUGO OBERMAIER-GESELLSCHAFT
für Erforschung des Eiszeitalters und der Steinzeit e.V.

Hugo Obermaier Society
for Quaternary Research and Archaeology of the Stone Age

65th Annual Meeting in Weimar

April 2nd – April 6th 2024

In cooperation with

Freistaat Thüringen
Landesamt für Denkmalpflege und Archäologie

Bibliographische Information der Deutschen Nationalbibliothek:
Die Deutsche Nationalbibliothek verzeichnet diese Publikation in der Deutschen Nationalbibliographie, detaillierte bibliographische Angaben sind im Internet über http://dnb.d-nb.de abrufbar.

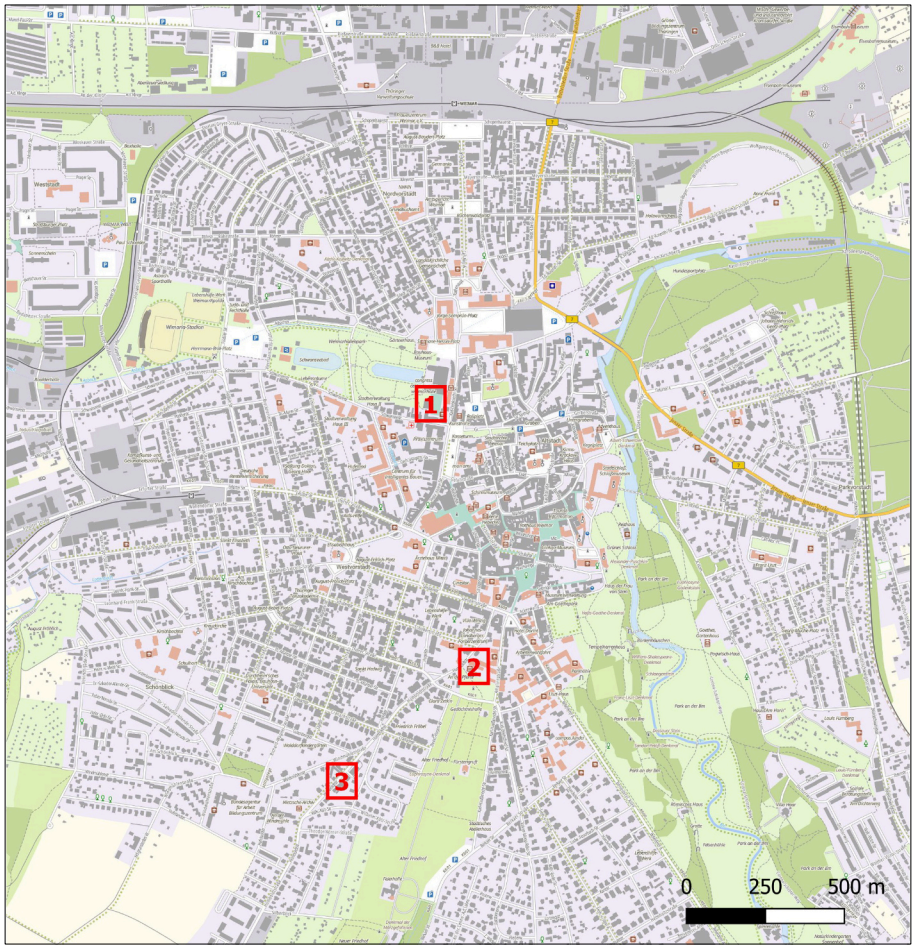
Für den Inhalt und die Abbildungen der Texte sind die Autoren selbst verantwortlich.
The authors are responsible for the content and the images of the abstracts.

Hugo Obermaier-Gesellschaft
für Erforschung des Eiszeitalters und der Steinzeit e.V.
c/o Institut für Ur- und Frühgeschichte
der Universität Erlangen-Nürnberg
Kochstr. 4/18
D-91054 Erlangen

Redaktion:	Harald Floss, Yvonne Tafelmaier, Amira Adaileh, Florent Rivals, Mara Weber & Marcel Weiß (Vorstand der HOG)
Satz & Layout:	Marcel Weiß (Schriftführer der HOG)
Herstellung:	Ulrich Pfauth (Verlag Dr. Faustus, D-91186 Büchenbach) – www.Verlag-dr-faustus.de
Druck:	Inprint GmbH, 91058 Erlangen
Cover:	Nicolas Engele

ISBN: 978-3-946387-56-5

Content



Map for the conference: 1 - Conference venue „Weimarhalle“, 2 - TLDA: evening reception and starting and end point for the excursions, 3 - Conference dinner „Felsenkeller“.

Program Overview

Tue, April 2nd, 2024

Weimarhalle/ Seminargebäude (Congress Centrum), Unesco-Platz 1, 99423 Weimar

12:00	Opening of the conference office at Weimarhalle/ Congress Centrum
13:30	Beginning of the meeting, welcome by our hosts and the president of the Hugo Obermaier Society
14:00 – 17:30	Presentations (Coffee break: 15:45 – 16:15)
18:00 – 19:00	Poster session I
19:30	Evening reception at Museum für Ur- und Frühgeschichte Thüringens, Humboldtstraße 11, 99423 Weimar

Wed, April 3rd, 2024

Weimarhalle/ Seminargebäude (Congress Centrum), Unesco-Platz 1, 99423 Weimar

09:00 – 12:30	Presentations (Coffee break: 10:40 – 11:10)
12:30 – 14:00	Lunch break
14:00 – 17:30	Presentations (Coffee break: 15:20 – 15:50)
18:00	Announcement of the HOGwardee 2024
18:15	Evening lecture by Tim Schüler and Marcel Weiss: "From Ehringsdorf to Ranis – the beginning and end of Middle Paleolithic lifeways in Thuringia"
20:00	Conference Dinner at Gasthausbrauerei Felsenkeller, Humboldtstraße 37, 99423 Weimar

Thu, April 4th, 2024

Weimarhalle/ Seminargebäude (Congress Centrum), Unesco-Platz 1, 99423 Weimar

09:00 – 10:30	Presentations
10:30 – 11:30	Poster session II
11:30 – 12:30	Presentations
12:30 – 14:15	Lunch break
14:15 – 18:00	Presentations (Coffee break: 16:30 – 17:00)
18:30	General Assembly
20:30	Get-together

Fri, April 5th, 2024, Excursion A:

(09:00 – 18:00)

Ilsenhöhle Ranis, Döbritz (Kniegrotte, Urdhöhle) and Teufelsbrücke in Saalfeld

Sat, April 6th, 2024, Excursion B:

(09:00 – 16:00)

Weimar-Ehringsdorf, Weimar-Parkhöhle and Gräfentonna (Travertine-Complex Burgtonna)

Detailed Program

Tuesday, April 2nd, 2024

12:00 Opening of the conference office at Weimarhalle / Congress Centrum
13:30 Beginning of the meeting, welcome by our hosts and the president of the Hugo Obermaier Society

14:00 – 15:45 **Presentations on the Neolithic, Mesolithic, Final and Upper Palaeolithic**

14:00 – 14:15 *Hannah Huber, Flavia Venditti, Claus-Joachim Kind & Yvonne Tafelmaier*
Drilling down – techno-functional analysis of Neolithic Dickenbännli-drills at Kohlhau Abri, Southwest Germany

14:15 – 14:30 *Clemens Bock*
Current research on Mesolithic stone artifacts in Thuringia

14:30 – 14:45 *Jesper Borre Pedersen, Isobel Wisher, Ester Oras, Thomas Birndorfer, Tim Kinnaird, Rasmus Andreasen, Tom Birch & Felix Riede*
The Final Palaeolithic site of Mühlheim-Dietesheim (Hessen, Germany): new excavations, new analyses, new insights

14:45 – 15:00 *Tom Noack, Wolfgang Heuschen, Jörg Orschiedt, Lutz Schubert & Andreas Maier*
Three-dimensional reconstruction of the stratigraphy at the Blätterhöhle entrance area using PyVista

15:00 – 15:15 *Michael Baales, Wolfgang Heuschen, Andreas Maier & Jörg Orschiedt*
Blätterhöhle Cave and Vorplatz: current state of research – with special regard to the Final Palaeolithic

15:15 – 15:30 *Shumon T. Hussain, David Matzig & Felix Riede*
Lithic techno-cultural evolution and taxonomy of the Last Glacial-Interglacial Transition in Europe: A new expert-sourced macro-archaeological dataset and some first results

15:30 – 15:45 *Robin John, Shumon T. Hussain, Georg Roth & Andreas Maier*
A well-feathered nest – Investigating pan-European cultural evolutionary trends in tanged and shouldered lithic points between c. 15 and 11 ka BP

15:45 – 16:15 **Coffee break**

16:15 – 17:30 **Presentations on art and osseous industries**

16:15 – 16:30 *Sebastian J. Pfeifer, Petr Neruda & Zdeňka Nerudová*
Humps and bumps. Particular ornaments on osseous artefacts as indicators of human presence in Central Europe during the earlier Magdalenian?

16:30 – 16:45 *Cornelia Lechner, Andreas Pastoors, Thorsten Uthmeier & Robert Bégouën*
Glätter? Smoother? Lissoir? A technological and typological analysis of a widespread Upper Paleolithic bone tool in Enlène (Département Ariège)

16:45 – 17:00 *Ria Litzenberg & Fabian Haack*
The lion's head from Vogelherd-cave: new insights from a recently reassembled ivory statuette

17:00 – 17:15 *Sibylle Wolf, Robin Andrews, Svenja Schray, Eva Schreiber & Fabian Haack*
Reassessment of the Aurignacian Lochstab of Geißenklösterle Cave and its Find Context

17:15 – 17:30 *Marieluise Hahn, Harald Floss & Sibylle Wolf*
Definition and depictions of Males in the Paleolithic

18:00 – 19:00 **Poster session I**

19:30 **Evening reception** at Museum für Ur- und Frühgeschichte Thüringens, Humboldtstraße 11, 99423 Weimar

Wednesday, April 3rd, 2024

09:00 – 12:30 **Presentations on "Alpha and Omega: The emergence and disappearance of Middle Palaeolithic lifeways"**

09:00 – 09:20 *Clemens Pasda*
Current research on lithic artefacts in the Middle and Upper Pleistocene travertine deposits of Thuringia (Germany)

09:20 – 09:40 *Juan Marín, David M. Martín-Perea, Adrián Álvarez, Martina Demuro, Lee J. Arnold, Irene Solano-Megías, Natalia Abellán & José Manuel Maíllo-Fernández*
Where Obermaier left off: excavating the unknown sequence of the early Middle Palaeolithic at El Castillo

09:40 – 10:00 *Lutz Kindler, Sabine Gaudzinski-Windheuser, Fulco Scherjon & Wil Roebroeks*
Neumark-Nord: A review

10:00 – 10:20 *Tjaark Siemssen, Katherine Hearne, Sonja Rigterink & Matthias Bierenstiel*
Midges, Disease, and the Materiality of Birch Tar Production in a Wetland Environment

10:20 – 10:40 *Audrey Vincent-Pennec*
Exploring Mousterian Cultural Dynamics in the Northwestern Technocomplex: A Techno-functional Approach

10:40 – 11:10 **Coffee break**

11:10 – 11:30 *Witold Grużdź, Katarzyna Pyżewicz, Andrzej Wiśniewski, Adam Kobyłka & Claudio Berto*
A look back at the Kill-Butchery-Site in Zwoleń

11:30 – 11:50 *Miriam Noël Haidle*
A Neanderthal meal: Complex resource exploitation in a community of practice

11:50 – 12:10 *Sara Elizabeth Rhodes, Thorsten Uthmeier & Alvise Barbieri*
A Rockshelter with a View: preliminary results from a re-examination of the Middle Paleolithic small mammal record of Sesselfelsgrotte (Altmühl Valley, SE Germany)

12:10 – 12:30 *Tamara Dogandžić*
Trail of breadcrumbs: The Middle Palaeolithic of the Balkans

12:30 – 14:00 **Lunch break**

14:00 – 17:30 **Presentations on "Alpha and Omega: The emergence and disappearance of Middle Palaeolithic lifeways"**

14:00 – 14:20 *Michael Hein, Marcel Weiss, Nik Usmar, Neda Rahimzadeh, Andreas Pastoors, Jens Lehmann, Kay Gödecke, Tobias Lauer, David Colin Tanner, Sumiko Tsukamoto & Brigitte Urban*
New wine in old skins: The application of modern chronometric and geochemical methods on the Middle Palaeolithic find sequence in Salzgitter-Lebenstedt

14:20 – 14:40 *Phoebe Heddell-Stevens, Sarah Barakat, Mary Lucas, Erin Scott, Petrus Le Roux & Patrick Roberts*
Multi-isotope reconstructions of large herbivore spatial ecology at the Neanderthal hunting site of Salzgitter-Lebenstedt, Northern Germany

14:40 – 15:00 *Małgorzata Kot, Mateusz Baca, Greta Brancaleoni, Helen Fewlass, Aleksandra Kropczyk, Anna Lemanik, Magdalena Moskal-del Hoyo, Adam Nadachowski, Oliwia Oszczepalińska, Andrea Pereswiet-Soltan & Claudio Berto*
Did Neanderthals go to heaven? Reinvestigation of Raj Cave, Poland

15:00 – 15:20 *Florian Gumboldt, Andreas Maier, Jürgen Richter & Carsten Münker*
Strontium isotope analyses and uranium thorium dating of prey species from Neanderthal sites in central and southern Germany

15:20 – 15:50 **Coffee break**

15:50 – 16:10 *Tullio Abruzzese & Alexander Verpoorte*
Quina along the edge: A Technological Assessment of Colmont-Ponderosa (South Limburg, The Netherlands) shows Middle Palaeolithic Variability in Northern Europe

16:10 – 16:30 *Marco Peresani, Ursula Thun Hohenstein, Davide Delpiano, Gianluca Arnetta, Lavinia Caffarelli, Vittoriana Espedito, Stefano Gialanella, Juan Manuel López-García, Alessandro Potì, Paolo Pozzobon, Florent Rivals & Davide Visentin*
Foliate tools from the Middle Palaeolithic in the Italian Alps. A summary of the current evidence from of the Vajo Salsone site

16:30 – 16:50 *Carlos Mazo, Cristina López-Tascón, Luis Miguel García-Simón & Marta Alcolea*
The last of them: late Neanderthals from AGP5 cave (Zaragoza, NE Spain)

16:50 – 17:10 *Jacopo Gennai, Tom Higham, Maddalena Giannì, Laura van der Sluis, Marco Romboni & Elisabetta Starnini*
Reinvestigation of Buca della Iena and Grotta del Capriolo shed light onto late Neanderthals in northwestern Tuscany (Italy)

17:10 – 17:30 *Robin Andrews*
A critical evaluation of the Châtelperronian osseous industry

18:00 **Announcement of the HOGwardee 2024**

18:15 **Evening lecture by Tim Schüler (TLDA, Weimar) and Marcel Weiss (FAU Erlangen-Nürnberg):**
"From Ehringsdorf to Ranis – the beginning and end of Middle Paleolithic lifeways in Thuringia"

20:00 **Conference Dinner** at Gasthausbrauerei Felsenkeller, Humboldtstraße 37, 99423 Weimar

Thursday, April 4th, 2024

09:00 – 12:30 **Presentations on Zooarchaeology and Palaeoecology**

09:00 – 09:15 *Shana Wernado, Samantha Brown & Raiko Krauß*
Who and what we wear – Using peptide mass fingerprinting to reveal the animals behind Late Neolithic - Copper Age jewelry from Movila lui Deciov, Banat

09:15 – 09:30 *Robert Sommer, Charlotte Hegge, Martin Theuerkauf, Ulrich Schmölcke & Thomas Terberger*
Alternately effects of climate, landscape, fauna and man in the Holocene primeval landscape of the European Lowlands

09:30 – 09:45 *Giovanni Manzella, Alex Fontana, Ana B. Marín-Arroyo, Lucía Agudo Pérez, Marco Peresani & Rossella Duches*
Paleoecology of mid-mountain Alps (Trentino, Italy) between Greenland Interstadial 1 and Early Holocene. Carbon and Nitrogen stable isotope analysis of ibex and red deer

09:45 – 10:00 *Janos Puschmann, Viktoria Fries, Phoebe Heddell-Stevens, Jürgen Richter, Andreas Maier & Patrick Roberts*
Stable carbon ($\delta^{13}C$) and oxygen ($\delta^{18}O$) isotope analysis of animal teeth from the Magdalenian site of Bad Kösen-Lengefeld

10:00 – 10:15 *Jeanne Marie Geiling, Ana B. Marín-Arroyo, Manuel R. González Morales & Lawrence G. Straus*
Multifactorial analysis for reconstructing human subsistence during the Lower Magdalenian at the montane site of El Mirón (Cantabria, Spain)

10:15 – 10:30 *Angel Blanco-Lapaz, Małgorzata Kot & Claudio Berto*
The Ice Wall and Palaeolithic fish assemblages in the Polish Jura: the cases of Pod Oknem and Łabajowa caves

10:30 – 11:30 **Poster session II**

11:30 – 11:45 *Elisa Luzi & Nicholas J. Conard*
Cave or rock shelter? Landscape evolution in the Lone Valley of the Swabian Jura as seen from the perspective of small mammals

11:45 – 12:00 *Michaela Ecker, Inèz Faul, Taylor Grandfield, Stefan Dreibrodt, Chris Green, Abenicia Henderson, Rowena Winterhalder, Marine Frouin, Phillip Segadika & Sarah Mothulatshipi*
Dust, dunes and stone tools: Results from recent archaeological fieldwork near Tsabong, Botswana

12:00 – 12:15 *Jordi Serangeli, Flavio Altamura & Nicholas J. Conard*
Animal and hominin fossil footprints on the ancient shores of the 300 ka paleolake of Schöningen

12:15 – 12:30 *Iván Ramírez-Pedraza, Florent Rivals, Carlos Tornero, Camille Daujeard, Denis Geraads, Rosalia Gallotti, Jean Paul Raynal, David Lefèvre, Abderrahim Mohib*
Palaeoecological reconstruction of the early Middle Pleistocene sites of Grotte à Hominidés and Grotte des Rhinocéros (Casablanca, Morocco) based on tooth wear

12:30 – 14:15 **Lunch Break**

14:15 – 16:30 **Presentations on the Upper Palaeolithic**

14:15 – 14:30 *Tilman Böckenförde, Thomas Terberger & Dirk Leder*
Long-distance travelers – raw materials provide insights into mobility patterns of Magdalenian groups

14:30 – 14:45 *Katarína Kapustka & Kristýna Budilová*
Interpretation of the use of ground stone artifacts from the site of Hostim: preliminary report

14:45 – 15:00 *Johanna Jeschke*
The early Upper Paleolithic in Thuringia and the site of Gera-Zoitzberg

15:00 – 15:15 *Hannah Parow-Souchon, Georg Roth & Anna Belfer-Cohen*
Carinated technology in the Levantine Aurignacian

15:15 – 15:30 *Guido Bataille, Thomas Beutelspacher, Marcel Schemmel, Giulia Toniato & Yvonne Tafelmaier*
Recent field campaigns in Palaeolithic sites of the Ach Valley in the Swabian Jura (Southwestern Germany)

15:30 – 15:45 *Natasha T. Singh, Rudolf Walter, Sibylle Wolf & Nicholas J. Conard*
Beads, burins, bladelets – A functional investigation of burin spalls from Hohle Fels Cave in the Swabian Aurignacian

15:45 – 16:00 *Olaf Jöris, Laura Centi, Peter Fischer, Phoebe Heddell-Stevens & Tim Matthies*
At the northern edge of the Aurignacian oikumene. The open-air site of Breitenbach in context of the modern human peopling of Europe

16:00 – 16:15 *Armando Falcucci, Simona Arrighi, Vincenzo Spagnolo, Matteo Rossini, Owen Higgins, Brunella Muttillo, Ivan Martini, Jacopo Crezzini, Francesco Boschin, Annamaria Ronchitelli & Adriana Moroni*
Beneath the volcanic ashes: New insights from the Aurignacian layers of Grotta di Castelcivita in Southern Italy

16:15 – 16:30 *Youssef Djellal, João Marreiros, Nuno Bicho & Abdeljalil Bouzouggar*
Untangling the onset of *Homo sapiens* complex behavior in North Africa: stone tool use during the Middle Stone Age in Morocco

16:30 – 17:00 **Coffee Break**

17:00 – 18:00 **Presentations on Mixed Topics**

17:00 – 17:15 *Martin Moník, Petr Hamrozi, Zdeňka Nerudová, Filip Gregar, Tomás Pluháček & Jitka Součková*
An online application for the provenancing of radiolarite artefacts

17:15 – 17:30 *Dries Cnuts & Veerle Rots*
Demonstrating the Potential of Stone Tool Residues in Reconstructing Palaeolithic Stone Tool Technologies

17:30 – 17:45 *Sonja Tomasso & Veerle Rots*
The role of comprehensive functional studies in understanding Palaeolithic technological systems

17:45 – 18:00 *Andrew W. Kandel, Miriam Haidle, Volker Hochschild, Zara Kanaeva & Nicholas J. Conard*
Using the ROAD Database: Recent Advances in Querying the Database

18:30 **General Assembly**

20:30 **Get-together**

Poster session I

Peyton Carroll, Christian A. Tryon, Iris Querenet Onfroy de Breville & Ilaria Patania
Lithic Technology and Human Adaptation in the Sicilian Upper Paleolithic

Gloria Cattabriga, Amelia Bargalló Ferrerons & Marco Peresani
Dissecting knapping learning through lithics, experimental knapping and kinematics. An overview of the project

Levin Cavak, Marlon Transfeld, Andreas Maier & Martin Heinen
Final Palaeolithic settlement patterns in the Niers valley. The case of Bresgespark – northern area

Marlon Transfeld, Levin Cavak, Andreas Maier & Martin Heinen
Final Palaeolithic settlement patterns in the Niers valley. The case of Bresgespark – southern area

M. Gema Chacón, Juan Ignacio Morales & Antoni Canals-Salamó
Arch·e10 system: complete toolbox for recording archaeological and paleontological data during the fieldworks

M. Gema Chacón, Bruno Gómez de Soler, Mourad Farkouch, Alfredo Suesta, Javier Cámara, Ethel Allué, Bàrbara Mas, Celia Díez-Canseco & Josep Vallverdú
New data from Cal Sitjo site: a Mesolithic to Neolithic sequence in Northeastern Iberian Peninsula (Sant Martí de Tous, Barcelona, Spain)

Tamara Dogandžić, Vesna Dimitrijević, Sofija Dragosavac, Tobias Lauer, Jovana Janković, Shannon P. McPherron, Senka Plavšić-Gogić, Mareike Stahlschmidt, Sahra Talamo & Dušan Mihailović
The Upper Palaeolithic occupations in the central Balkans: New Data from Bukovac and Orlovača caves, Serbia

Paulo Duñó-Iglesias, Iván Ramírez-Pedraza, Florent Rivals, Ionuț-Cornel Mirea, Luchiana-Maria Faur, Silviu Constantin & Marius Robu
The similar omnivorous diet of MIS 3 cave bears and extant brown bears in the Carpathians: Implications for a broadleaf-forest bear glacial refugia

Thomas Einwögerer & Hannah Parow-Souchon
Spatial patterns of a LGM kill site – Reassessment of the GIS data from Saladorf, Lower Austria

Mourad Farkouch, Juan Ignacio Morales, Hassan Aouraghe, María Soto, Diego Lombao, Antoni Canals, Alfonso Benito-Calvo, Mohamed Souhir, Raül Bartrolí, Hamid Haddoumi, Hicham Mhamdi, Abdelkhalk Lemjidi, Aïcha Oujaa, Robert Sala-Ramos & M. Gema Chacón
Core-reduction strategies from the open-air sites of Sahb El Ghar 1 & 2.1 during the Middle Stone Age (MSA) (Aïn Beni Mathar, Eastern Morocco)

Liane Giemsch, Dennis Hoffmann, Johann Tinnes & Elaine Turner
Examination of notched giant deer antlers (*Megaloceros giganteus*, Blumenbach 1799) from Frankfurt am Main-Höchst

Rebecca Gnau, Naira Khachatryan & Florian Linsel
Layer by Layer: Combining Profile Data in 3D
Florian Gumboldt, Andreas Maier & Jürgen Richter
The Middle Palaeolithic assemblage from Martinshöhle in Iserlohn

Shuqin Guo, Natasha T. Singh, Marian Vanhaeren, Sibylle Wolf, Rudolf Walter & Nicholas J. Conard
Examining the social context of double perforated ivory beads from the Swabian Aurignacian

Tamrat Habtu, Tamara Dogandzic & João Marreiros
The Use and Function of Early Stone age Tools: An integrative Approach to Edge Damage Analysis Through Experimental Archaeology

Shumon T. Hussain, Roman Bartosch & Kate Rigby
How does cultural perception shape human responses to large-scale Earth-system changes in the past?

Shumon T. Hussain, William Mills, Klaus Hirsch, Jesper Borre Pedersen, Tobias Reuter & Felix Riede
Unexpected Technological Variability in the Terminal Pleistocene of North-Western Europe: Skrup V and Dybvadbro Syd, Southern Jutland

Shumon T. Hussain, Dirk Leder, Florian Sauer & Jürgen Richter
Unity and Diversity of the Initial Upper Palaeolithic in Western Eurasia: The Lithic Technology of Al-Ansab 2, southern Jordan

Poster session II

Anna Krahl
Chronology and chorology of late Pleistocene hunter-gatherer groups in the Lower Rhine Region – From sites in the opencast lignite mines to the regional scale

Martyna Lech & Nicholas J. Conard
The Blattspitzen assemblage of AH X from Hohle Fels Cave in the Ach Valley of southwestern Germany

Josh London, Natasha T. Singh, Marian Vanhaeren, Nicholas J. Conard, Rudolf Walter & Sibylle Wolf
A Stag-gering Proposal: Perforated Cervid Tooth Ornaments for Band-Level Identity and Network Tracking in the Upper Paleolithic of the Swabian Jura

Valentina Lubrano, Ruth Blasco, Florent Rivals, Jordi Rosell & Anna Rufà
Late Neanderthals Updated: New Insights into Duration of Occupations

João Marreiros, Lisa Schunk, Andreas Hildebrandt, Ivan Calandra & Walter Gneisinger
NeanderCloud: New and old technologies to understand past human tool technology, design, and use

Cristian Micó, Ruth Blasco & Florent Rivals
An in vitro simulation of sediment pressure on teeth for identifying abrasion marks within dental microwear patterns

Martin Moník, Yonatan Sahle, Seid Ahmed, Hynek Hadraba, Zdeněk Chlup, Lukáš Kučera, Steven A. Brandt & Kathryn W. Arthur
Ethnographic toolstone heat treatment among Konso hideworkers (Ethiopia)

Elena T. Moos & Nicholas J. Conard
What´s the point? Gravettian projectile technology in the Ach Valley of the Swabian Jura

Götz Ossendorf, Tjaark Siemssen, Silviane Scharl & Andreas Maier
HESCOR WP7: Multiregional cultural evolution in Africa

Andreas Pastoors, Thorsten Uthmeier, Robert Bégouën & Eric Bégouën
The Volp Caves – Contextualising Palaeolithic Rock Art

Abstracts of Reports and Posters

Tullio Abruzzese[1] & Alexander Verpoorte[1]

Quina along the edge: A Technological Assessment of Colmont-Ponderosa (South Limburg, The Netherlands) shows Middle Palaeolithic Variability in Northern Europe

The Quina Mousterian is a Late Middle Palaeolithic technocomplex recognized mainly in Southern and Western France (Bourguignon, 1997). It has been argued that this technology was developed by Neanderthal groups to cope with the decreasing global temperatures and the environmental changes of the last glaciation. The Quina system is so far largely unattested in North Europe, where the climatic fluctuations derived from the Weichselian glaciation were arguably more pronounced and quicker (Wohlfarth, 2013).
We present the preliminary results of the technological study of the lithic assemblage from the open-air, surface site of Colmont-Ponderosa (South Limburg, The Netherlands). We demonstrate that some Middle Palaeolithic groups of the region were users of versatile and less prepared technologies, with short flaking sequences to produce blanks with a long use-life potential. The tool typology is dominated by denticulates and notches rather than "Quina" scrapers, and the lithics from the site show a high degree of reduction and ramification. This is evident in the characteristics of the flakes, modified pieces as well as the cores. Our preliminary analysis depicts a strong presence of Quina technology over Discoid and Levallois flaking systems, which are virtually absent in the assemblage of Colmont-Ponderosa. We argue that the adoption of a Quina-like system was part of a mobile and economic lifestyle, probably related to the environmental changes of the Weichselian. We illustrate that, at some point in time, some Middle Palaeolithic groups in Northern Europe were indeed users of the Quina technological system, adding more diversity to the studies that link Northern Europe to a Levallois-based technology, Discoid flaking systems, and bifacial shaping (e.g., Banks et al., 2021; Di Modica et al., 2016). The presence of the Quina technology in the northern fringes of the Neanderthals' ecological niche shows the diversity and adaptive flexibility of Neanderthal behaviour at the time of the Weichselian glaciation.

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Robin Andrews[1]

A critical evaluation of the Châtelperronian osseous industry

At the interface of the Middle and Upper Palaeolithic, several lithic industries have been identified in Europe, that differ significantly both from preceding Middle Palaeolithic industries and the succeeding Upper Palaeolithic complexes. The questions of whether these industries are autochthonous independent developments or the results of exogenous influence or migration are as debated as and entangled with the question of their authorship: Neanderthals or Modern Humans. Perhaps the most emblematic of these industries is the Châtelperronian. This technocomplex, dating to ca. 45 – 40 ka cal BP, primarily occurs in northern Spain and southwestern France, with rarer, but important sites stretching to northern and eastern France. Its lithic component is defined by the specialized production of laminar blanks which afford the production of distinctive unilaterally backed Châtelperron type points or knives. In addition, the association of this industry with osseous tools and personal ornaments is often noted. This occurrence of osseous tools has traditionally been seen as an indicator of 'modern' behavior in the Châtelperronian. Recent work on the Châtelperronian has produced the picture of a fully Upper Palaeolithic industry, with most Middle Palaeolithic forms being the result of taphonomic mixing. At the same time, however, recent work on Middle Palaeolithic osseous tools has called into question the significance of some of the technological shifts at the transition. Neanderthals, it is now known, manufactured and used a broad spectrum of osseous tools. This begs the question, if in its osseous industry the Châtelperronian as a whole more resembles the Middle Palaeolithic, with minimally modified tools made exclusively on bone, or the Upper Palaeolithic, with extensively modified tools of different forms made from diverse raw materials. In the past, however, any discussion of the Châtelperronian osseous industry was conducted in reference to primarily one site with unusually impressive osseous assemblages, the Grotte du Renne.

Here we present a comprehensive review of the entire Châtelperronian osseous industry. This revealed that osseous industry is present in only some of the examined assemblages while controlling for the confounding factors of preservation, site use and assemblage integrity. Most of the sites for which osseous tools have been reported suffer from serious problems, such as post-depositional reworking, biased excavation or taphonomic damage to osseous material, that cast doubt on the definite association of osseous tools with the Châtelperronian at those sites. However two definite instances of Châtelperronian osseous industry could be identified, that also appear anomalous in the quality and quantity of their osseous assemblages. The possible implications of the anomalous status of the Grotte du Renne and Quinçay are discussed and it is cautioned against using such anomalous assemblages to make arguments about contentious technocomplexes pars pro toto.

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Michael Baales[1,2], Wolfgang Heuschen[3], Andreas Maier[4] & Jörg Orschiedt[5,6]

Blätterhöhle Cave and Vorplatz: current state of research – with special regard to the Final Palaeolithic

Following the discovery of the Blätterhöhle cave (Hagen, southern Westphalia, western Germany) as a Stone Age site in 2004, archaeological excavations have taken place almost every year since both in the cave and on its entrance area, a now collapsed rock shelter (Vorplatz). Since 2015, these investigations have been intensified thanks to the involvement of the State Office for Archaeology Westphalia (LWL-Archäologie für Westfalen). The involvement of the University of Cologne in 2021 will hopefully open up further positive prospects for the near future.

A special feature of the Blätterhöhle site are human finds from three Stone Age periods, some of which provided further insights into past dietary habits and their genetic history. The youngest human remains (MNI = 7) date to the transition from the late Upper to the Late Neolithic (approx. 3.9 - 2.9 kyr cal BC), followed by individuals from the Early Mesolithic (MNI = 5), dated to the Preboreal (approx. 9.2 - 8.7 kyr cal BC). Unexpectedly, human remains were also recovered from the Final Pleistocene sediments of the collapsed rock shelter between 2018 and 2020. Most of these finds were dental remains of a child of about 7 years of age. In addition, a premolar of an adult individual was found. Attempts are currently being made to extract aDNA from these remains (a first attempt failed due to the limited preservation conditions) and to directly date a microsample.

The Final Pleistocene human remains originate from the conspicuous sediment 6c, which stands out due to its clear grey colouring and indicates the proximity of a former combustion area. In 2023, this sediment transitioned into a significantly darker section, i.e. probably much richer in charcoal particles. Here, three flat and presumably intentionally split river pebbles lay on top of each other in a slightly offset position representing the first evident find situation of the Final Palaeolithic layer. This area will be investigated in more detail in 2024.

The stratigraphic position of sediment 6c below a sequence of Mesolithic settlement horizons (dating from the initial to the Late Mesolithic) with significant stone artefacts and features (several combustion zones) strongly suggests a dating of the Final Palaeolithic assemblage to the Younger Dryas. However, this cannot be verified either on the basis of the stone artefacts (no Ahrensburgian), the large animal remains (no reindeer) or the majority of radiocarbon dates. So far, only one date on bone and one on floated charcoal spangles from sediment 6c with an age around 10.1 kyr cal BC date to the Younger Dryas, whereas 24 samples were dated to GI 1 or even late GS 2, but do not form consistent clusters. In-depth studies of the taphonomic history of the site are required to resolve this problem.

Final Palaeolithic stone artefacts from sediment 6c and its immediate surroundings are characterised by a varied series of backed projectiles and knives. There are also Zonhoven points and an atypical tanged point. This 'Blätterhöhle inventory type' is currently unique in NW Europe, as so far only finds from the Ahrensburgian reindeer hunters have been known from this period; instead of reindeer remains, only those of red deer were found in front of the Blätterhöhle.

Interestingly, about only 90 km east of the Blätterhöhle a rich Ahrensburgian assemblage including numerous reindeer remains (Hohler Stein near Kallenhardt) was found. Two reindeer bones were also dated to 10.1 kyr cal BC. This suggests that the Younger Dryas in NW Europe, previously understood as a "cultural block" with a rather uniform climate and environment, was indeed much more heterogeneous. As of now, the observations at the Blätterhöhle might point towards a more variable climatic and environmental setting in the region, obviously also encouraging people with a 'backed points tradition' from the neighbouring regions to the south and west to temporarily extend their roaming areas to the northern edge of the Central European uplands.

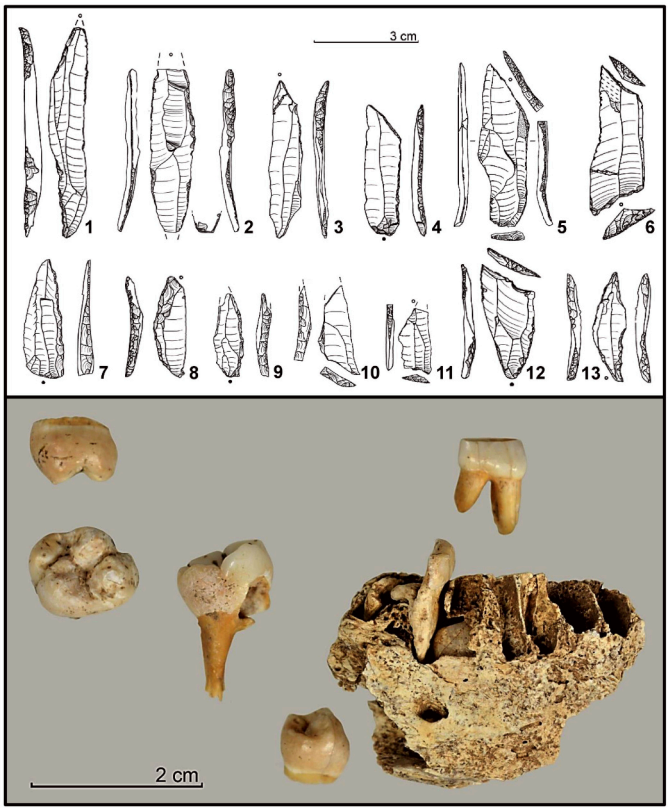

Fig. 1. Blätterhöhle, Vorplatz. Final Palaeolithic (ca. 11.1 kyr cal BC) remains of a seven year old child and lithic implements of erratic flint and lydite. 1-3 large and slender partially backed points, 4-6 backed "knives", 7-9 Federmesser-like backed points, 10 fragment of a backed point with oblique basal retouch (Malaurie point-like), 11-12 Zonhoven points, 13 atypical tanged point (for reference see: Baales et al. 2023).

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Guido Bataille[1], Thomas Beutelspacher[1], Marcel Schemmel[2], Giulia Toniato[1] & Yvonne Tafelmaier[1]
Recent field campaigns in Palaeolithic sites of the Ach Valley in the Swabian Jura (Southwestern Germany)

Since 2020 the State Office for Cultural Heritage of Baden-Württemberg conducts archaeological surveys and excavations inside and in the surrounding of the UNESCO World Heritage site „Caves and Ice Age Art in the Swabian Jura". During the last years we investigated the archaeological potential and the related conservational needs of already known and new sites in the Ach Valley between Schelklingen and Blaubeuren (Alb-Donau-Kreis).
The cave site Brillenhöhle (Blaubeuren-Seißen), originally excavated by G. Riek between 1955 and 1963 (Riek 1973), is famous for its rich Gravettian and Magdalenian horizons including a burial of the latter epoch. Aurignacian organic artefacts were solely reported from the northern deep sondage, while reported Middle Palaeolithic stone artefacts in the same trench might rather be geofacts (Tafelmaier et al. 2024). While the complete upper part of the sequence has been removed by Riek, the question was whether sediments of the early Upper and the Middle Palaeolithic might still be present. Recent excavations conducted in 2020, 2021, and 2023 revealed undisturbed Pleistocene sediments below two meters of backdirt of Gustav Riek's field campaigns (Tafelmaier et al. 2021 & 2022). We successfully attested the edge of Riek's northern deep sondage (Tafelmaier et al. 2021). The investigated geological composition and the faunal spectrum is in accordance with horizon XIV, which Riek associated with the Aurignacian.
In autumn 2020 and 2023 the State Office conducted archaeological investigations in the Untere Köhnenbuchhöhle (Blaubeuren). The cave is located approximately fifteen meters above today's valley ground at the right slope of the Ach valley. Single finds of stone artefacts and bones of cold-adapted species with anthropogenic modifications indicate human presence at the small forecourt and in the entrance area during the late Pleistocene and early Holocene. Reindeer bones with impact marks and a probable reindeer antler point with a regular half-round and rectangular cross-section prove human occupations most likely during the Magdalenian (Bataille et al. 2024). For the first time since the discovery of the archaeological value of Geißenklösterle by G. Riek and the documentation of its stratigraphy by J. Hahn (Hahn 1988), we unearthed a previously unknown Palaeolithic site in the Ach valley. These examples demonstrate the potential to detect archaeological remains by minimal-invasive excavations even in well-studied regions.

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Angel Blanco-Lapaz[1,2], Małgorzata Kot[3] & Claudio Berto[3]

The Ice Wall and Palaeolithic fish assemblages in the Polish Jura: the cases of Pod Oknem and Łabajowa caves

During the Last Glacial Maximum (LGM), the Baltic Basin and a large part of northern Europe were covered by ice and glaciers, making it impossible for fish to spread into newly formed freshwater sources. Moreover, researchers observed the scarcity of archaeological sites in general and laying fish assemblages in particular during the Paleolithic in these regions. In this context, southern Poland plays an essential role since it would be a possible refuge water body near the glacier's border (Lõugas et al., 2013; Kot et al., 2021).
To reconstruct the past distribution outside the LGM range of cold-adapted fish species, we analyzed fish remains from two Paleolithic sites located in the Polish Jura (southern Poland): Pod Oknem and Łabajowa caves, both containing a sequence of Pleistocene and Holocene layers, including the transition between MIS 3 and MIS 2 in Pod Oknem Cave. Previously, archaeologists analyzed the lithic assemblage in Pod Oknem Cave, indicating the presence of microlithic lunates, typical of the Epiaurignacian (?) (25-26ky cal BP; Kot et al., 2023). In Łabajowa Cave, archaeologists described the presence of a leaf point, typical of the Jerzmanowician (Middle/Upper Palaeolithic transitional industry), found in the XIX century collection (Gryczewska et al., 2023). The sediment from the 2020 and 2022 fieldwork campaigns was water-screened and sorted in both cases.
At Pod Oknem Cave, we analyzed the fish remains from layers 6 (end of MIS 3) and 11 to 14 (MIS 3). The studied fish record in Łabajowa Cave comes from layers H9 (MIS3/4?) and H3/H3+H4 (post-LGM). In both fish assemblages, we observed the presence of grayling (*Thymallus*

thymallus) and burbot (*Lota lota*). In Łabajowa Cave, we also recovered remains of northern pike (*Esox lucius)* and cyprinids. The identified fish are still present in the rivers and lakes of Poland and are typical of well-oxygenated and cold waters. Previous studies also described these species and cyprinids in other Late Pleistocene sites in southern Poland, such as Obłazowa, Borsuka, Nad Tunelem, and Biśnik caves (Lõugas et al., 2013). In addition, we conducted a preliminary taphonomical analysis, suggesting that a non-anthropogenic accumulator, such as a bird of prey, was the primary agent of the fish accumulation in both localities.

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Clemens Bock[1]

Current research on Mesolithic stone artifacts in Thuringia

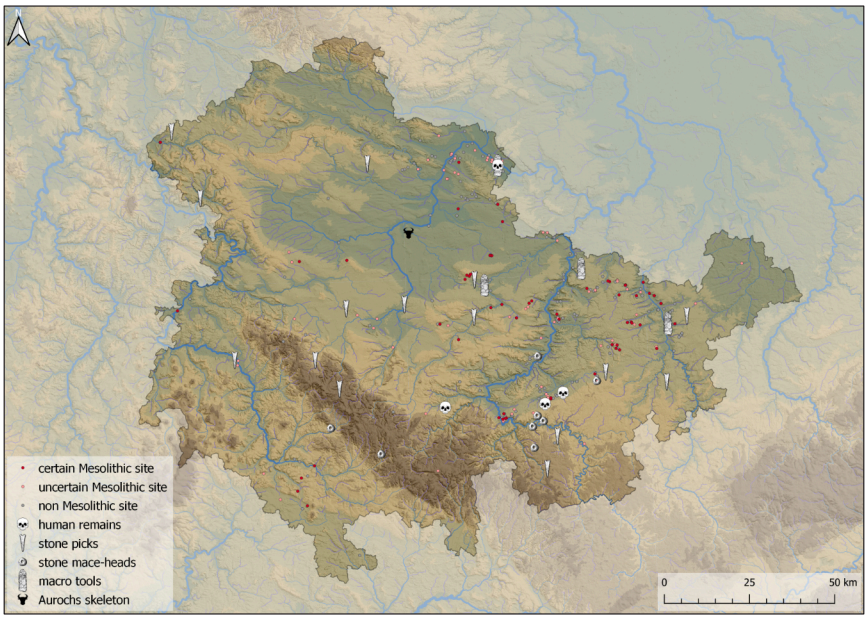
Mesolithic research in Thuringia is still in its early stages and has a considerable need for research. Due to the limited level of knowledge, it is essential to review the extensive material. Research began with Rudolf Feustel´s dissertation (Feustel 1957; 1961), relying on Mesolithic surface material. Today, the literature reveals around 200 sites. Additionally, there are also c. 150 other sites which are listed at the Thuringian State Office for the Preservation of Monuments and Archaeology (TLDA) as potential Mesolithic sites. The vast majority of these sites is only known by surveys, whereas mesolithic artefacts were rarely encountered during regular excavations. An exception are Mesolithic burials and human remains from Bottendorf, Allendorf, Ranis and Döbritz (Grünberg 2016; Küßner 2016) which confirm human presence since the late Preboreal till a time when Linear Pottery culture settlements had already spread in other regions of Thuringia. Given sedimentological reasons, predominantly stone artifacts are preserved. These are the basis of the current dissertation project.

This investigation is focused on the detailed presentation of the artifacts (by a catalogue with drawings) while taking into account the known problems with survey material. Previously

unknown, elementary information such as the number of artifacts, tool types, current publication status and the research history are listed. So far, the critical analysis of nearly 50.000 lithics shows that only around 80 sites have yielded reliably Mesolithic material such as microliths and microburins. The sites are concentrated in eastern and northern Thuringia, where they appear to be linked to the river systems of the Weiße Elster, Saale, Ilm, Orla and Unstrut as well as to the plateaus in between. Unfortunately, these assemblages are mostly mixed with younger material.

To enable comparisons with neighboring regions, microlith types were recorded using the system of University of Cologne (Gehlen et al. 2020). Approximately 1200 microliths and 120 microburins were documented. Beside, some assemblages were suitable for more detailed investigations by recording with an attribute analysis. The main criterion was low mixing with non-mesolithic artefacts.

One result indicates that Baltic flint was almost exclusively used all over Thuringia, but there is also evidence of increased use of local raw materials south of the Thuringian Forest and in North-western Thuringia. A second result is that the southern Thuringian Forest aligns with the Beuronian/Se-Sa-Rhe Traditions-Region during the early and middle Mesolithic. Evidence of heat-treated artifacts from Jurassic chert transported from the adjacent southern region further supports this. Dorsal-ventral base-retouched micro-points could also only be identified here.



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Long-distance travelers – raw materials provide insights into mobility patterns of Magdalenian groups

During the Upper Paleolithic, the mobility of hunter-gatherer groups led to the expansion to all ice-free habitats in Central Europe. In the past, mobility was primarily associated with the development of food sources and subsistence. Based on ethnographic comparisons, river courses are considered to be the most frequently used Paleolithic transportation routes.
Here we present new evidence for mobility routes of Magdalenian groups along the rivers Rhine, Danube and Neckar. We analyzed the lithic raw material of the Magdalenian site Dreieich-Götzenhain Ost, Lk. Offenbach to disentangle transportations routes based on raw material origin and artefact typology. It was possible to pinpoint the exact location of raw material deposits and thus reconstruct the group's previous locations. A movement pattern could be identified based on the raw material determination of sites in Baden-Württemberg on the Neckar and Rhine. More precisely, we suggest an exact direction of movement of the Götzenhain group by comparing the metric values and the chaîne opératoire of the stone artifacts from several sites along these rivers. We argue that the Götzenhain group moved in a triangular movement between the Swabian Alb, the Markgräfler Land and the Rhine-Main area. This is based on the findings of Tertiary chert from the Randecker Maar, Jurassic chert from the Isteiner Klotz and chalcedony from the Hanau area. Additionally, there were contacts in the Middle Rhine region, as evidenced by artifacts of Tertiary quartzite, Maas flint and chalcedony from Bonn-Muffendorf. As Jurassic chert from the Isteiner Klotz makes up the majority of the raw material in the inventory, it seems reasonable to assume that the group last left there and moved north along the Rhine. Finds of Jurassic chert artifacts from the Isteiner Klotz and Tertiary chert from the Randecker Maar on the Neckar suggest a southward movement from Dreieich-Götzenhain towards the Swabian Jura along the Neckar. Our analyses from Götzenhain-Ost show that Magdalenian groups traveled greater distances than previously assumed and indicate previously unknown movement routes. Comparative sites like Teufelsküche have shown that the same stations were frequently visited on the long-distance journeys, thus revealing recurring movement patterns. Furthermore, contacts between the group from Dreieich-Götzenhain and the Middle Rhine region could also be demonstrated.

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Lithic Technology and Human Adaptation in the Sicilian Upper Paleolithic

This poster reports the findings of a systematic petrographic sampling of Siracusa and Ragusa, the first attempt at raw material sourcing in southeastern Sicily, and a technological reanalysis of the site of Pedagaggi's previously excavated stone tool assemblage. These analyses contribute to understanding how Sicily's first human occupants interacted with the island's ecosystems. This research has implications for understanding the deeply rooted relationships between human behavior and fragile island ecosystems.
As the largest island in the Mediterranean (25,711 km^2) and with land bridge connections to the Italian mainland during periods of lowered sea levels (Antonioli et al. 2016), Sicily is the most likely candidate for hosting the first human populations entering the Mediterranean islands ~16 thousand years ago (Di Maida 2022). However, despite much research focused on the later occupations of Sicily, the prehistoric archaeological record and early environmental context of the island are largely unexplored. The Pedagaggi cave (southeastern Sicily) was first excavated in the 1980s, where archaeologists recovered a lithic assemblage dominated by flint and typologically consistent with the Epigravettian of southern Italy. Thus far, study of the Pedagaggi assemblage has been minimal and limited to a typological analysis (Di Geronimo et al. 1981 – 1992), and as is the case for most of the Sicilian stone tools, raw material sourcing has not been attempted. Current evidence suggests that there are no local (< 5 km) sources of flint near the site. As such, all raw material was transported to the cave.
The results of the technological analysis of the Pedagaggi lithic assemblage and geochemical sourcing of the flint raw material used at the site provide key insights into understanding how Sicily's first human occupants interacted with the island's ecosystems by tracing their use of past landscapes as measured through their use, transport, and discard of stone tools, either as part of daily subsistence activities or perhaps exchange with neighboring groups.

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Dissecting knapping learning through lithics, experimental knapping and kinematics. An overview of the project

Investigating the ways of Palaeolithic knapping learning offers a special opportunity to gain a closer look at our ancestors' interactions and behavior. In recent years, several studies have explored the topics of knapping skills and learning through lithic assemblages to shed light on the degree of cognition and learning processes of Lower Palaeolithic hominins. This type of research typically involves the analysis of lithic assemblages, and often includes experimental knapping sessions with participants characterized by different degrees of knapping expertise.
Considering this, we chose to integrate archaeological lithics assemblages, experimental knapping, and modern knappers' kinematics to gain insight into Neanderthal and Sapiens' methods of learning how to knap. This project aims to conduct an in-depth analysis of Middle and Upper Palaeolithic learning methods in relation to lithic exploitation. Our primary goal is, to better understand Middle and Upper Palaeolithic knapping learning and cognition through the lens of complex knapping methods. Regarding the first approach, we selected lithic assemblages from Middle and Upper Palaeolithic Italian sites with potential evidence of inter-generational hunter-gatherer groups. We conducted an analysis on these lithic assemblages, selecting the most influential technological attributes to determine knapping skill levels. This type of study coupled with lithic refits and statistical analysis, can help to isolate core reduction patterns, define groups of knapping dexterity and understand prehistoric social dynamics.
The second approach focuses on experimental knapping sessions. These involved four individuals with different backgrounds in lithic production, ranging from none to twenty-years knapping practice. For this pilot experiment, participants first imitated and then interacted with an expert knapper to obtain the same kind of lithic blanks found in the selected archaeological assemblages, which were produced using Levallois, Quina and Laminar methods. Participants had to reduce cores following these three kinds of lithic exploitation and employing two learning strategies. To study the lithic assemblages resulting from the experiment, we applied the same methodology used for the archaeological ones – i.e. technological analysis, refits, and statistics.
Finally, the third approach is focused on kinematics through the analysis of videos recorded during the knapping experiment. The aim was to track knappers' hand movements throughout the stage of full production. We chose this stage because it is assumed to be when knappers perform the highest number of motions and obtain more useful flakes. To select the right time frame, we compared videos with refits and dataset.
We expect that the study of the experimental lithic assemblages and motion analysis will enable us to explore modern knappers' strategies, patterns of exploitation and behavior under predetermined conditions. By analyzing assemblages in light of the outcomes derived from experimental knapping sessions and kinematics, we hope to gain new insights into the cognition and learning processes of *H. neanderthal* and *H. sapiens'* groups. Aware of the limits of

experimental knapping in tracing parallelisms with prehistoric behaviors, we nonetheless believe that these approaches can help narrow the distance between us and our ancestors, enriching our knowledge about Middle and Upper Palaeolithic lifeways.

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Final Palaeolithic settlement patterns in the Niers valley. The case of Bresgespark – northern area

In the framework of renaturation measures along the Niers River in 2021, a cluster of Final Palaeolithic sites was excavated in Bresgespark (Mönchengladbach-Rheydt, Germany) under the direction of Martin Heinen. In nine archaeological test trenches, more than 300 stone artefacts, several charcoal fragments and a few faunal remains were excavated. Here, several smaller concentrations could be identified and distinguished in a northern and a southern area. This paper presents the analysis of the northern area, while the southern area is presented by Transfeld et al. (this volume). The northern area comprises a concentration of finds that were deposited in the shallow water zone of an old branch of the Niers-River that still contained water during the settlement period. The lithic assemblage of the northern area exclusively consists of two raw materials – presumably a variant of Rijckholt flint and Maas gravel flint – probably gathered at a distance of about 70 km to the southwest of the site. Given the homogeneity in structure and colour of the two raw material classes, it seems likely that all artefacts were produced from just one nodule of each raw material. The inventory mainly consists of blades, flakes, chunks and other unmodified artefacts, thus pointing towards blank production as the main aim of the knapping event. However, retouched artefacts are also present and comprise burins, an endscraper, backed points and a notched piece. The northern area thus seems to be directed towards the knapping of two nodules for the production of blanks. The deposits in the formerly shallow water zone may be part of longer occupation in the area. As such, it displays a partially complementary situation to the one observed in the southern area. However, the relation between the northern and the southern area is still unclear and currently investigated.

In addition to a comparison of the raw materials as well as the technological and morphological characteristics, refittings within and between the two areas are currently underway to determine whether the different concentrations were connected to one other or show signs of contemporaneity.

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Arch·e10 system: complete toolbox for recording archaeological and paleontological data during the fieldworks

The suite of modern tools known as the "Arch·e system" (https://arche.iphes.cat) offers a versatile and user-friendly solution for archaeological fieldwork. It highlights automation, precision in data collection, technological integration, adaptability to various excavation settings, and a dedication to simplicity, data integrity, and multilingual support. The range of tools within this suite is designed to meet a variety of archaeological needs, ensuring streamlined data management, and recording of topographical coordinates. Our concern is to reduce as much as possible the intervention of the operator (manual systems) and integrate automated mechanisms to eliminate, whenever possible, subjectivity and error. The Arch·e system was born with the idea of computerizing, mechanizing and standardizing data registration, especially regarding the automatic taking of the topographic coordinates (XYZ) of each object. The Arch·e family are organized in different levels of complexity and services.

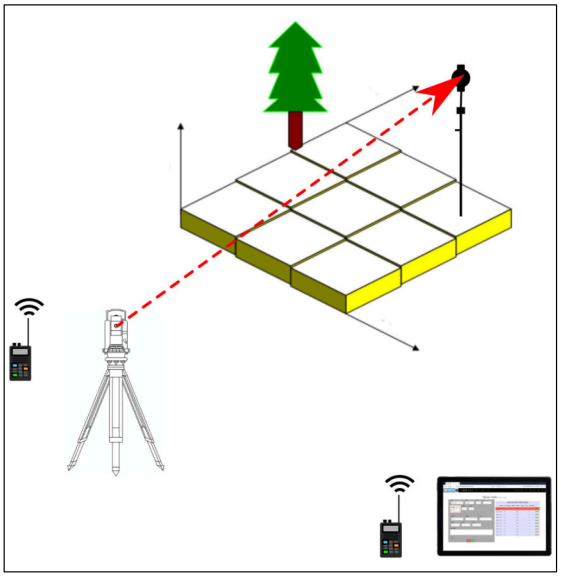

Fig. 3. Implementing the 3D3P protocol involves capturing coordinates of an archaeological object using a total station and recording its field data through the ARCHE10 application installed on a tablet. At the end of the day, the total station data will be synchronized with the ARCHE10 database.

The basic system, Arche10, intended for small and medium excavations. Arche20, the initial multi-user system (now considered obsolete), and Arche30, a multi-user system that integrates cutting-edge technologies. Each of these software options offers specific solutions for data management and the intensive use of a total station, whether robotic or not, for precise topographical coordinates acquisition and is adapted to the multiple realities of field archaeology and the teams of archaeologists who carry out the excavations.

In this paper, we focus on the basic system of the Arch·e family, the Arche10 system. It is a fast and a single-user data record system, for personal use or for small groups of archaeologists. It is specially designed for small excavations, surveys, test pits and all types of archaeological activities that do not require a permanent demand for the registration system. In its design, the use of the total station as a coordinating system has been prioritized. That is why the Arche10 system has the necessary tools to facilitate the integration of data: total station, laptop and/or tablet and the database, merging coordinates and records with a simple and easy way.

Regardless, with Arche10 the most traditional work with archaeological grid and local coordinates, is still possible. This system has the basic tools for efficient use of field data logging and XYZ coordinates with a total station on the field: (1) 3D3P protocol for the combined use of a total station, (2) specific registration forms, (3) automatic numbering and label printing and later in the lab: (1) necessary tools to export and import of data, (2) statistical analysis, (3) graphical representation and (4) preliminary spatial pattern analysis (horizontal and vertical). These modules operate as a web application, ensuring compatibility with various hardware and operating systems.

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New data from Cal Sitjo site: a Mesolithic to Neolithic sequence in Northeastern Iberian Peninsula (Sant Martí de Tous, Barcelona, Spain)

Cal Sitjo is a new archaeological sequence located in the NE Iberian Peninsula, in the town of Sant Martí de Tous (Barcelona, Spain). It was discovered in 2019, and since then, annual excavation campaigns have been conducted.
The dates obtained from the around 8 m sequence have provided a chronological framework that ranges from the Mesolithic to the Middle Neolithic (Gómez de Soler et al. 2023). From bottom to top, the Mesolithic level 8 and 5 was dated at 9326-9134 cal BP (Beta-546393) and 8815-8640 cal BP (Beta – 653844) respectively, and the Neolithic ones were obtained from Level 4 with a chronology of 4071-3971 cal BCE (Beta-614554) followed by two dates for level 3 with 3879-3801 cal BCE (Beta-614553) for the lower part and 3816-3706 cal BCE (Beta-578355) for the top of the level.
The initial findings have revealed lithics, ceramics, fauna and charcoals in the Neolithic layers (Levels 3 and 4), while faunal, lithic, and charcoal remains from the Mesolithic levels (5 and 8). The region has suffered a strong anthropisation, corroborated by the numerous documented archaeological sites (e.g., Vilars de Tous site, Clop et al. 2005), quarries, and workshops dedicated to the exploitation of chert as a lithic raw material throughout prehistoric and modern times (e.g., La Guinardera, Gómez de Soler et al. 2021). The abundance of chert has rendered this area as a passage for hunter-gatherer communities since the Middle Paleolithic (Gómez de Soler et al. 2020). Furthermore, it has served as an optimal habitat for subsequent agricultural communities, benefiting from abundant biotic and abiotic resources, a favorable environment, and topography conducive to plant cultivation.
In this paper, we present the new results obtained from the 2023 field season from the Mesolithic and Neolithic levels, and for the first-time fauna and constructions anthropic structures associated to this Neolithic levels. Moreover, the number of archeological remains increased (specially lithics and fauna) allowing us to begin to propose the use of this site during this two chronocultural periods. Both, previous and new results confirm that this archaeological sequence is an ideal for a diachronic study of the evolution from the last hunter-gatherers to the first farmers, periods which are also not very well known in this region.

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Fig. 4. (A) Localization of the Cal Sitjo site and general overview. (B) Stratigraphic sequence of the site. (C) Neolithic level: 2023 excavation view of an anthropic structure and some of the archaeological remains. (D) Mesolithic level: Excavation view and some lithics and faunal remains. (Photos B. Gómez de Soler, G. Campeny & M. D. Guillén/IPHES-CERCA).

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Demonstrating the Potential of Stone Tool Residues in Reconstructing Palaeolithic Stone Tool Technologies

The detailed study of Palaeolithic stone tool technologies provides invaluable insights into the cultural development of early hominin societies. Recent advances in functional analysis have unlocked new possibilities for understanding these ancient technologies. This presentation aims to discuss the opportunities that residue analysis offers for reconstructing Palaeolithic stone tool technologies, addressing both the challenges and potential breakthroughs in this field.

Stone tool residue analysis entails the microscopic examination of tools for traces of materials that were transferred during their use or manufacture. These residues, which can include plant fibers, starch grains, bone particles, or remnants of plant glue, provide direct evidence of the tool's function and design. Consequently, they offer valuable insights into how early hominins behaved and interacted with their environment. The specificity of residues yields highly detailed information regarding stone tool technology, often challenging to attain through other methods.

Residue analysis in archaeology, especially for Palaeolithic sites, involves three primary challenges: identification, preservation, and interpretation of residues, with causality being a crucial aspect of the latter. The identification challenge involves detecting and precisely determining the composition of often minuscule residue traces on artifacts, benefiting from advanced techniques like Scanning Electron Microscopy (SEM) in conjunction with Energy

Dispersive X-ray Spectroscopy (EDS). Preservation concerns arise due to varying site conditions, the resilience of residue types, and post-excavation handling, which can significantly impact residue survival and introduce preservation biases. The third challenge, interpretation, particularly involves establishing causality between observed residues and past human activities, as well as distinguishing between residues resulting from cultural activities and those originating from post-depositional processes. Additionally, differentiating between various cultural processes such as knapping, hafting, and tool maintenance can also be challenging. This necessitates an interdisciplinary approach, involving close collaboration with use-wear specialists, lithic analysts, chemists, and geoarchaeologists to comprehensively interpret the findings.

The work conducted over the past decade has laid a solid foundation for addressing these challenges, and case studies from key Paleolithic sites demonstrate how residue analysis contributes to our understanding of tool use, hafting, and production, offering a more nuanced perspective on Palaeolithic stone tool technologies. Based on these recent results, it is argued that the study of stone tool residues is a rapidly evolving field with the potential to significantly refine our understanding of Palaeolithic stone tool technologies. It emphasizes the necessity for continuous methodological advancements and interdisciplinary collaboration to overcome current challenges and fully exploit the potential of residue analysis in deciphering the complex narrative of early human technological development.

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Untangling the onset of *Homo sapiens* complex behavior in North Africa: stone tool use during the Middle Stone Age in Morocco

Recent discoveries have shown that *Homo sapiens* has a Pan-African origin, which highlights North Africa as an important scenario for the development and expansion of its biological and cultural traits (Hublin et al., 2017). Early manifestations reflecting a complex cognition of *Homo sapiens* in North Africa are tied to the emergence of the Aterian culture around 150 ka BP (Sehasseh et al., 2021). These include bone and ivory tools, the exploitation of different animal, vegetal and marine resources, as well as the use of pigment and perforated shells for symbolic expressions (Campmas et al., 2016; Bouzouggar et al., 2018).

Within this cultural repertoire, by focusing on aspects such as ecological adaptations and technological transmission, stone tools represent crucial evidence to infer the emergence and development of behaviors over time. The study of the Aterian stone tool industries from different regions in North Africa is argued to display significant variability and technological flexibility (Bouzouggar and Barton, 2012). However, the significance of such variability and organization in the evolution of human behavioral traits is still unknown. Functional studies of stone tools will help to better understand the techno-economy of the Aterian. Any scope for discussing the Aterian industries is still limited by the paucity of detailed lithic studies related to use-wear analysis.

This work aims to bridge this gap of knowledge by providing new functional studies on the MSA-Aterian context which can now be extended back well to MIS 5 or even earlier. In this project, an experimental approach is adjusted to the use-wear analysis of lithic tools from four key MSA sites in Morocco (Taforal, Rhafas, Bizmoune, and Jorf Al Hamam) (**Figure 1**). Our methodology includes (1) fieldwork in which the same lithic raw material present in the four sites has been procured from different sources, (2) experiments including stone tools manufacture and use for different tasks, and (3) laboratory work that includes the microscopic

study of both the experimental and the archaeological lithics to determine the function of the latter. This work aims to shed light on how stone tools were used, and how these reflect human behavioral decision-making processes, associated with different environments, including coastal adaptations and landscape resource use. It will also make a significant contribution to the debate on the *Homo sapiens* origins and the emergence of the Human complex behavior in Africa. In this talk, we will present the first results of this project, focusing on the preliminary results come from Rhafas cave in Northeastern Morocco (~130-85 ka) and show a high presence, and technological diversity within the Aterian coarse-grained stone tools. The use-wear analysis showed the first evidence of quartzite use for processing varied worked materials with different hardness degrees.

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Trail of breadcrumbs: The Middle Palaeolithic of the Balkans

The Balkan peninsula, despite its vast territory, exhibits a disproportionately sparse Palaeolithic record compared to other regions in Europe. Except for a few well-known sites, the scarcity of Palaeolithic locations, particularly those with long sequences and a high density of remains, hampers comprehensive interpretations of Neanderthal adaptations in this region. Consequently, the Balkans often remain absent from debates on Neanderthal adaptations and industrial variability, leaving numerous questions unanswered. Does the meager record reflect the demographic picture of low population density? Do the occupation patterns suggest refugial character of the peninsula for Neanderthals in harsh climatic phases? What is the chronological

and spatial variability of lithic industries, and how does this variability compare to the known variability in the well-studied regions? Although the data are scarce to adequately address these issues, some patterns can be observed concerning the Neanderthal biogeography and variability of their lithic technologies (Dogandžić 2023, Karavanić & Banda 2023, Mihailović 2014).
This presentation reviews the Middle Palaeolithic record of the Balkans, examining the biogeography of Neanderthals in this region and the temporal and spatial trends in the variability of Middle Palaeolithic industries. It relies primarily on a literature review and the published data on sites, their chronologies, and occurrences and frequencies of techno-typological elements. The earliest phases of the Middle Palaeolithic, around the MIS 6, are represented by only a small number of sites, with Neanderthal occupations increasing in MIS 5, dropping in MIS 4, and raising in MIS 3, aligning with the broader European pattern of Neanderthal occupational densities. Furthermore, the distribution of stratified and rich sites evidencing continuous human habitation along the Mediterranean coast of the peninsula, suggest that the refugial areas may be primarily located in the south of peninsula. Regarding lithic industries, the earliest Middle Palaeolithic phenomenon is related to the Quina method, recognized in both technology and typology, occurring even in MIS 7 or earlier. This is followed by the introduction of Levallois technology in MIS 6. Assemblages in MIS 5 exhibit a high presence of scrapers, with the shifting strategies between Levallois or Quina-like systems. This trend gives way to more expedient methods and less reliance on scrapers and heavy resharpening and more opportunistic technological behavior in the final Middle Palaeolithic. Given the heterogeneity of the published record and low resolution of data and chronologies, the observed patterns are considered preliminary models of Neanderthal behavior in the Balkans. They have the potential to guide further in-depth research in this region.

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The Upper Palaeolithic occupations in the central Balkans: New Data from Bukovac and Orlovača caves, Serbia

The Balkan peninsula played a crucial role in the Upper Palaeolithic, acting as a corridor for the dispersal of early *Homo sapiens* into Europe; subsequently, during the Last Glacial Maximum (LGM), specific areas within the Balkans emerged as potential refugia for both fauna and human populations. Its diverse landscape provided a background for a complex demographic dynamics of retreats and expansions. This underlies the region's important role in population movements between SW Asia, eastern, central and western Europe (et al. 2023). Despite the significance of the Balkans in this period, the scarcity of known Upper Palaeolithic

sites has hindered a full understanding of human adaptations during this period of human evolution. New research in the last decade produced a series of new sites and sequences that help us fill in many of the gaps. One of these projects resulted in the discovery of two Palaeolithic sequences (cave sites Orlovača and Bukovac) that have been excavated intermittently since 2013 (Dogandžić et al. 2014) and that contain a series of Aurignacian and Gravettian occupations.
Here, we will present the results obtained thus far in this ongoing project; data on site chronologies with optically-stimulated luminescence and radiocarbon dating, site taphonomy, and the nature of the sites' use by addressing subsistence activities and stone tool technology. Orlovača's early Upper Palaeolithic levels are consistent with Proto- and Early Aurignacian. The density and the nature of the finds suggest a short-term occupation of this site during these times, which, together with the fact that these are found in a hilly and higher elevation area, unusual for the Aurignacian in this region (Hauck et al. 2017), adds to the value of this region for understand land-use strategies of early *Homo sapiens* in the region. Bukovac cave sequence revealed Gravettian occupations around 25ka ± 120 ^{14}C BP, with a distinctive richness of bones and combustion features/products, as well as lithic industry consistent with Middle/Late Aurignacian that was discovered on a small area. We will further place these findings in the broader context of the dispersal dynamics and settlement patterns of early *Homo sapiens* and the subsistence of populations carrying Gravettian techno-complex around the LGM during the re-settlement of the mountainous interior of the peninsula.

Acknowledgements:
This project has been funded by the Max Planck Society, Leibniz-Zentrum für Archäologie (LEIZA), NEEMO project of the Science Fund of the Republic of Serbia (7746827), and the Leakey Foundation.

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The similar omnivorous diet of MIS 3 cave bears and extant brown bears in the Carpathians: Implications for a broadleaf-forest bear glacial refugia

The cave bear (*Ursus spelaeus*) went extinct at about 28 kyr B.P. in western Europe. A well-established theory suggests that their extinction can be attributed to the declining availability of plant-based resources (Pacher and Stuart, 2009; Bocherens, 2019). The brown bear (*U. arctos*), smaller-sized and with broad dietary habits, prevailed and occupied the ecological niche of the *U. spelaeus* (Sommer and Benecke, 2005; Croitor and Brugal, 2010).
In this work, we analysed 97 lower first molars of *U. spelaeus* and contemporaneous *U. arctos* from different sites in the Romanian Carpathian region, using dental microwear analysis to reconstruct their pre-dormancy diets during MIS 3. The short-term diet, i.e. the last days or weeks, of both *U. spelaeus* and *U. arctos* populations was identified as omnivorous. Although, micro-scratches of different width between the Carpathian cave bears and brown bears may suggest divergent dietary niches, with the brown bears displaying a propensity towards a more specialized carnivorous diet. Furthermore, two Holocene *U. arctos* individuals from the Carpathians dated to 1007 cal yr B.P., displayed a scratch width pattern more similar to that of the Pleistocene *U. spelaeus*. Moreover, the presence of puncture pits on *U. spelaeus* populations suggested the intake of seeded and hard-shelled fruits from temperate broadleaf trees (Xafis et al., 2017). Hence, the dietary patterns of Carpathian cave bears exhibit similarities to those of present-day brown bears inhabiting the same region, an omnivorous diet mainly composed of plant-based resources with sporadic meat consumption, to store enough energy before hibernation. These dietary similarities, together with an early 27.1 cal kyr B.P. date, suggest that the Carpathians served as an ecological refuge for cave bear population until their extinction. Moreover, differences in the width of scratches between MIS 3 brown bears and Holocene brown bears in the Carpathians could support the hypothesis of a shift towards a more omnivorous diet for the post-Last Glacial Maximum (LGM) *U. arctos*. This change might be attributed to the species occupying the empty ecological niche left due the extinction of cave bear. Finally, the highly omnivorous diet of cave bears from the Carpathians during the pre-dormancy period represents a dietary profile endemic to this region, which served as a refugium of fauna and flora, reflecting the dietary adaptability of cave bear populations to specific ecological conditions.

Acknowledgements:
This research of the "Emil Racoviță" Institute of Speleology (ERIS) benefited from two sources of funding: grants PN-III-P1-1.1-TE-2021-0187 (to MR) and PN-III-P1-1.1-PD-2021-0262 (to ICM).

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Dust, dunes and stone tools: Results from recent archaeological fieldwork near Tsabong, Botswana

The study of the emergence and development of Middle Stone Age lifeways in the arid interior of southern Africa is intimately linked to the emergence *Homo sapiens*. It is now evident that the Kalahari Basin area does not lack in cultural innovations initially identified at South African coastal sites (e.g. Chazan et al. 2020, Wilkins et al. 2021, Burrough et al. 2022). However, the current distribution of published excavated archaeological sites in the Kalahari Basin area is limited and uneven.

With striking differences in lithic technology and raw material selection between southern and northern Kalahari sites, the aim of our project is to determine the extent of these industries and potential contact zones in between. We developed a mobile Geographical Information System (GIS) setup that allows us to record the archaeological potential of the south-western Kgalagadi district in present day Botswana in a rapid and standardised manner (Ecker et al. 2023).

Our results show a pattern of concentrations of sites with surface archaeology on or near quartzite outcrops that are located next to pans. The local quartzite was used to manufacture an enormous amount of lithics. This talk describes in detail the site of Maralaleng Pan, one of five new sites identified through our survey. Over two field seasons we have transected Maralaleng Pan by survey on foot, identifying lithic clusters and potential lake margins. In addition, transects of geotrenches, sand auger coring and archaeological excavation help us to explore the

depositional context and age of the various pan features above and below the surface. First results of radiocarbon dating and optically stimulated luminescence (OSL) dating shows Holocene dune accumulations and Late Pleistocene sediments below the pan floor. In contrast, the lithic artefacts analysed so far include forms from the Early and Middle Stone Age, but not from more recent phases.
The talk will discuss this discrepancy in the light of new results from our interdisciplinary landscape approach, including indicators of the past environment. This research highlights the high potential for further archaeological investigations in this under researched area not only for the emergence, but also the disappearance of Middle Stone Age lifeways.
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Spatial patterns of a LGM kill site – Reassessment of the GIS data from Saladorf, Lower Austria

In 2002 the construction of a train track connecting St. Pölten with Vienna necessitated the archaeological excavation of a Neolithic settlement in the valley of the Danube-tributary Perschling. During these excavations Palaeolithic finds were discovered, mainly in the form of reindeer and horse bones, which lead to the notification of the – then – Prehistoric Commission of the Austrian Academy of Sciences. It was subsequently discovered that the location preserved an intact Palaeolithic occupation site with – most likely – two clearly separated stratigraphical layers. The site was excavated within two months by a joint team of the Austrian Academy of Sciences and the Archäologischer Dienst Ges.mbH (ARDIG) excavation company. It soon proved to be an exceptionally rare case of a kill site, in this case of reindeer and horses, with in-situ activity zones, hearths and evidence for butchering activities.
Kill sites are exceptionally rare finds due to their ephemeral nature and therefore decreased visibility in comparison to the find rich basecamps. Several ^{14}C dates place the occupation in Saladorf into the LGM, similarly to the well-known site of Langmannersdorf in the

neighbouring town as well as the famous site of Kammern-Grubgraben several kilometers to the north at the foothills of the Bohemian massif, north of the Danube. Due to technical issues, the spatial data gained during the excavation was never analysed in detail and remained unpublished for about 20 years. Recently the authors have begun a re-assessment of this important site. The presented poster shall highlight this process and the issues that arose during this assessment. It shall also present the composition and spatial relations of the different activity zones of the areas designated for flint-knapping or for animal processing. Especially in comparison with the larger, longer-term occupied basecamps like Grubgraben or Langmannersdorf, the site of Saladorf provides the opportunity to evaluate the distribution of flints and bones as a result of short-term and focused activities. It can therefore complete the picture of the LGM settlement pattern and on-site activity organisation.

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Beneath the volcanic ashes: New insights from the Aurignacian layers of Grotta di Castelcivita in Southern Italy

The Aurignacian is the first European Upper Paleolithic technocomplex identified across a vast geographical extent. While archaeologists have discerned significant chrono-cultural shifts within this cultural unit, primarily through the examination of techno-typological variations in stone tools, unraveling the underlying processes driving these modifications remains a substantial scientific challenge. Some of the most pivotal sites for understanding the early stages of the Aurignacian are situated to the south of the Alps and along the Italian Peninsula. In this region, the earliest manifestations of this cultural unit are attributed to the Protoaurignacian, characterized primarily by the production and modification of bladelets, often employing marginal retouching. While recent technological assessments have focused on northern Italian sites, southern Italian sites have in most cases been analyzed several decades ago using a typological approach.

Southern Italy, however, holds extreme importance for several reasons. Firstly, the Protoaurignacian begins later than in northern Italy, supporting the idea of a north to south spread. Notably, foraging groups continued to produce Uluzzian industries until approximately 41,000 years ago (Douka et al., 2014; Moroni et al., 2018). Secondly, significant sites such as Castelcivita and Serino were covered by the eruptive units of the Campanian Ignimbrite super-eruption, dated to ca. 40,000 years ago (Giaccio et al., 2017). This feature is particularly crucial as scholars have hypothesized that the combined effects of the Campanian Ignimbrite and the climatic deterioration associated with the onset of Heinrich Event 4 had a substantial impact on the lifeways of Protoaurignacian foraging groups (e.g., Banks et al., 2013). The technological shift from the Protoaurignacian to the Early Aurignacian is regarded as an archaeologically visible adaptation to changing environments.

In this presentation, we will focus on a critical yet often overlooked sequence for testing this hypothesis: Grotta di Castelcivita (Salerno, Campania). Here, the high-resolution stratigraphic sequence comprises Mousterian, Uluzzian, and Aurignacian layers, sealed by the Campanian Ignimbrite marker. We have reevaluated the lithic assemblages initially studied by Gambassini (1997) and revised the available environmental data. Specifically, we have utilized a range of quantitative methods to detect mechanisms of cultural change and its relationship to current chrono-cultural models for the development of the Aurignacian on a European scale. Intriguingly, we demonstrate that the Protoaurignacian is followed by two assemblages that appear highly comparable to the Early Aurignacian, albeit being characterized by a strong regional signal. This finding suggests that the Campanian Ignimbrite super-eruption played no role in this cultural process. Additionally, available local and regional environmental data indicate that cold and arid conditions are also not correlated to the detected variability. Therefore, we will discuss the need for future research to move beyond monocausal explanations of chrono-cultural change, emphasizing the role of investigating sites on neglected regions of Europe to better contextualize the development of the Aurignacian.

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Core-reduction strategies from the open-air sites of Sahb El Ghar 1 & 2.1 during the Middle Stone Age (MSA) (Aïn Beni Mathar, Eastern Morocco)

The Aïn Beni Mathar-Guefaït basin stands as a crucial zone for archaeological and paleontological studies in the eastern of Morocco, where systematic surveys and excavations have been underway since 2006. This work is part of a collaborative research project between Mohammed Premier University in Oujda, Morocco, and IPHES-CERCA in Tarragona (Spain). This research has unveiled over 30 sites, spanning from the Pleistocene to the Holocene (Sala-Ramos et al. 2022). Sahb El Ghar 1 & 2.1 (SBG 1 & SBG 2.1) sites, were excavated during the 2018 and 2019 field seasons. A total of 2804 lithic artifacts were found (SBG 1=1051 & SBG 2.1=1753), associated to the Middle Stone Age (MSA) by their technical attributes. No other type of associated archaeological remains were discovered. These stratified open-air sites, located in the Swiwina plain about 15 km from the Aïn Beni Mathar village, cover an 8 km² area on the river's alluvial deposits. The Swiwina plain, known for its Neogene chalcedony quarries, was extensively used by human groups as main chert raw material procurement area during the Pleistocene (Soto et al. 2023). SBG 1 and SBG 2.1 are situated 1.5 km apart, with excavation areas of 9m² and 7m² respectively. SBG 1 revealed one archaeological level, while SBG 2.1 uncovered three.

This study presents the preliminary technological analysis, focusing on the core-reduction strategies of 101 cores (SBG 1=60 & SBG 2.1=41). The first phase of the analysis concentrates on examining the taphonomical attributes, which shed light on both the formation processes and the influences of post-depositional processes on these assemblages. The second one, is focused on the technological examination of the cores, employing the chaîne opératoire approach (Andrefsky, 2005). Finally, a comparison of the core analysis results with the broader lithic assemblage data are done to reconstruct of the reduction sequences.

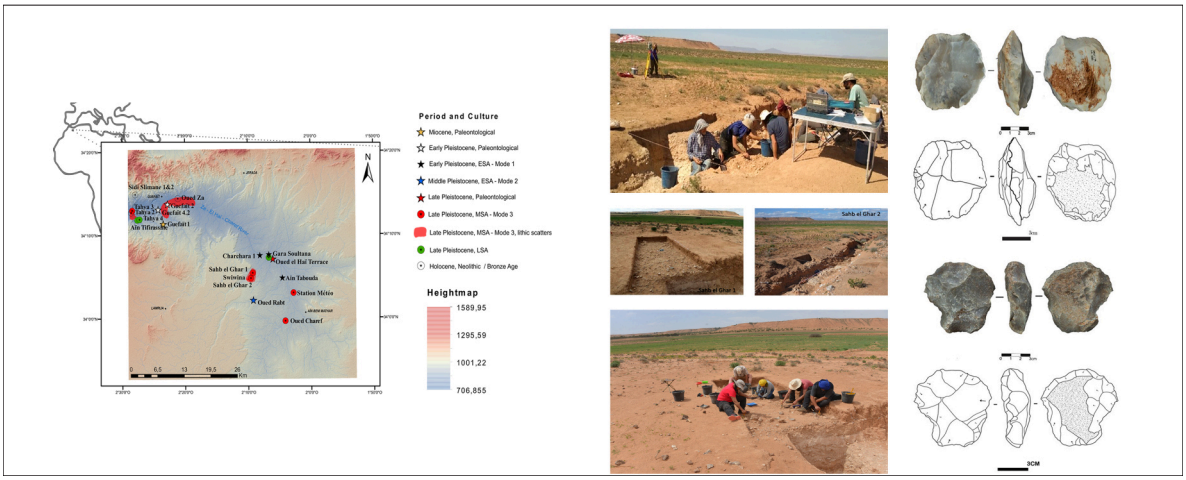

Fig. 5. The location of Sahb El Ghar 1 & 2.1 are open-air sites with examples of Levallois cores analyzed.

The preliminary findings reveal a similarity in core reduction strategies, particularly between SBG 1 and SBG 2.1 level 1. The predominant core-reduction strategies identified are the bifacial bipolar centripetal methods, often linked with discoidal and Levallois knapping methods. Within the Levallois techniques, the recurrent centripetal and preferential flake modalities are prevalent. Additionally, the study documents (1) opportunistic knapping strategies linked to unipolar longitudinal and/or orthogonal with minimal removals, and (2) laminar strategies. The knapping byproducts align closely with the identified strategies, including typical retouched pieces and tanged tools. These technological behaviors are consistent with the MSA

assemblages, particularly the Aterian and Mousterian, previously documented in other sites of the region (Nami & Moser, 2010; Mercier et al. 2007).
This research contributes new technological data on the MSA technological behaviors in the region and establishes a comparative framework with the contemporaneous MSA lithic assemblages observed in caves and rock-shelters in Eastern Morocco.

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Multifactorial analysis for reconstructing human subsistence during the Lower Magdalenian at the montane site of El Mirón (Cantabria, Spain)

We reconstruct Cantabrian Lower Magdalenian (c. 19-18 ka cal BP) subsistence strategies from El Mirón Cave (Cantabria, Spain), a site on the northern edge of the Cantabrian Cordillera with well–preserved faunal assemblages (Marín-Arroyo, 2010). This large, strategically located cave contains a long stratigraphic sequence from the late Middle Paleolithic to the Bronze Age. Since 1996, annual campaigns of excavation directed by Straus and González-Morales have revealed a rich, diverse, abundantly C14-dated Paleolithic and post-Paleolithic record.

Magdalenian hunter-gatherer occupations of this cave in the inland, montane sector of the Asón valley, occurred soon after the Late Glacial Maximum. During much of this period, the cave was used as a residential base camp with evidence of multifunctional activities. The Cantabrian Lower Magdalenian is represented by a thick, spatially extensive, and extraordinarily rich occupational horizon.

An exhaustive study of the abundant faunal assemblages allows us to reconstruct the origin of the accumulation and the human subsistence strategies. To do so, we studied faunal skeletal elements larger than 2 cm using a LEICA Binocular S8APO with 10x eyepieces and categorized smaller fragments. We differentiated carnivore gnaw-marks and traces of digestion. We further categorized taphonomic modifications, such as cut-marks, into skinning, dismembering, and filleting. We also classified percussion-marks on bones, including conchoidal positive or negative notches, thermo-alterations, and fracturing types, as fresh-green or old-dry. We used BaskePro, a Bayesian Model available in R code (Marín-Arroyo et al., 2024), to analyse the skeletal profiles by distinguishing the human transport decisions and the site attrition. We correlated patterns of bird-of-prey bone-accumulating behavior with identified ungulate skeletal profiles to further differentiate accumulating agents. Through Correspondence Analysis, we distinguished human activities related to skinning, raw material use, filleting, and filleting/disarticulation by analyzing the distributions of cut- marks along the prey body parts. We also identified evidence of thermo-alterations and osseous industry production during the Lower Magdalenian. To observe temporal subsistence changes, different sublevels are compared through time. Whenever possible, we identified ungulate sex and age to determine seasonal occupations and hunting preferences.

The study reveals that hunters used a fundamental strategy of exploiting two different game species during the year (Geiling, 2020). In winter and spring, they primarily targeted Spanish ibex (*Capra pyrenaica*), while in late summer and autumn, they focused on hunting red deer (*Cervus elaphus)*. The exploitation of animals was intense, with abundant signs of skinning, disarticulation, and defleshing, in addition to impact marks and smashing of spongious bones. Thus we determined that humans regularly extracted skin, meat, marrow, and grease from the hunted ungulates. Our findings attest to human settlement in even the cold, mountainous region of Cantabria during the Lower Magdalenian, about 30 km from the glacial shore. It is important to note that there was a transition in the seasonal use of the cave, shifting towards mainly warmer months during the Middle and Upper Magdalenian and Azilian periods (Marín-Arroyo et al., 2023). This new evidence partially disproves the prevailing models of Upper Paleolithic forager settlement-subsistence systems for the Cantabrian region of Spain proposed four decades ago by K.W. Butzer (1986) and L.G. Straus (1986), who argued cold season, residential occupations were mainly restricted to sites in the coastal zone. This study supports the idea that Lower Magdalenian band territories had major base camps in the montane interior, which were as crucial for logistical and residential purposes as contemporaneous lowland coastal plain sites as Altamira and El Juyo. The faunal assemblages at El Mirón are exceptionally well preserved. Other studies, such as osteological, stable isotopic, dental microwear, and genetic analyses, of the Lower Magdalenian "Red Lady" human burial,

known, provide detailed evidence of adaptations during this period (Straus et al., 2015). All these factors make the present study relevant for understanding the economic behavior of hunter-gatherers in this important region of human settlement during the late Last Glacial, and beyond.

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Reinvestigation of Buca della Iena and Grotta del Capriolo shed light onto late Neanderthals in northwestern Tuscany (Italy)

Buca della Iena and Grotta del Capriolo are two small karst caves in northwestern Tuscany (Italy). At both sites, the deposits were completely excavated between 1966 and 1972 and revealed Mousterian lithic assemblages associated with Pleistocene fauna (Pitti and Tozzi, 1971). The archaeological sequence at Buca della Iena rests upon a flowstone dividing spit 14 from spit 15. No artefact was reported from underneath the flowstone and spit 15 is considered a carnivore den. The flowstone's TH230/U238 date from 1968 is <41 ka and <51 ka, therefore aligning with those obtained from a flowstone in the neighbouring Grotta all'Onda site (39.3 ± 3.2 ka - Fornaca-Rinaldi and Radmilli, 1968). This suggests the presence of Neanderthals in northern Tuscany at the very end of their history (41.1–39.3 ka cal - Higham et al., 2014). Unfortunately, the flowstones were destroyed, with no samples preserved, and subsequent investigations at Grotta all'Onda failed to replicate the original date (Berton et al., 2003).

Consequently, together with a stratigraphical and artefact reassessment, a decision was made to conduct new radiocarbon dating on bones from Buca della Iena and Grotta del Capriolo. Bone samples, selected to represent the entirety of the archaeological sequence, underwent scrutiny for nitrogen content. Ten samples were processed for AMS radiocarbon dating: five Buca della Iena samples treated with ultrafiltration pretreatment, one Buca della Iena sample and four Grotta del Capriolo samples treated without ultrafiltration due to lower collagen yields.
The resulting dates indicate that the associated lithic assemblages can be confidently attributed to the mid-MIS 3 period (54 – 40 ka cal BP at Grotta del Capriolo, 50 – 40 ka cal BP at Buca della Iena). These new results provide a reliable chronology for the late Mousterian sites in northwestern Tuscany and stimulate hypotheses concerning the fate of Neanderthal groups living along the western coast of the Italian peninsula.

Acknowledgements:
This project has received funding from European Union's Horizon 2020 research and innovation programme under grant agreement No. 101061427 (Raw material provisioning and mobility patterns throughout the Middle-to-Upper Palaeolithic Transition in NW Tuscany (MobiliTy)).

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Examination of notched giant deer antlers (*Megaloceros giganteus*, Blumenbach 1799) from Frankfurt am Main-Höchst

As early as 1897, three (formerly four) antlers of giant deer were donated by a building contractor to the collection of the Verein für Geschichte und Altertumskunde Frankfurt am Main Höchst e.V. The pieces are said to originate from the vicinity of the Main at the Schöne Aussicht

in Frankfurt-Höchst and may have come to light during the course of construction activities. It was not until the 1970s that various notch marks observed on the pieces were published, without any further investigation, as traces of human modification.
In addition to a chronological classification, a new examination of the antler pieces is to be carried out, focussing particularly on whether the notch marks are human modifications and, if so, what was the purpose of these marks and which tools were used to make them. Following the method of exclusion, archaeozoological investigations were carried out first of all, where various marks on the antler were compared with known examples of animal gnawing. In this way, all the traces on two pieces of antler could be attributed to animal gnawing. However, some traces on the third antler cannot be attributed to a natural or animal origin and suggest a human source of modification. The focus here is on whether these originate from the Palaeolithic period or from historical times and are possibly connected with the history of the salvage of the finds. With this objective in mind, modern red deer antlers were first modified experimentally with various Palaeolithic tools. The resulting marks were scanned in 3D and compared in detail with the marks on the finds. We are also currently researching into the types of tools employed in construction activities at the end of the 19th century, which could also be the source of the notch-like marks.

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Layer by Layer: Combining Profile Data in 3D

Although excavations are increasingly digitised and produce more 3D data, much information is still recorded manually on paper. In the case of stratigraphic profiles, part of the documentation is often done through the creation of 3D models using the photogrammetric method Structure from Motion (SfM) complemented by manual drawings with additional information, such as colour, texture, features, or artefacts, to name but a few. These are further supplemented by text-based descriptions. This information is commonly digitised in the form of text files or scanned documents and in many cases it is not linked to the 3D data. As a result, data can become disorganised and difficult to access and interpret. Also, a large number of different programs has to be used and mastered at different levels of expertise.
The aim of our poster is hence to present a simple workflow that allows the combination of the aforementioned profile data using the 3D software frameworks Blender and GigaMesh. Similar work has already been carried out in relation to artefacts and excavation plans but does not

allow the complete processing of data relevant to stratigraphic profiles (Harris 2020; Koenig et. al. 2017). The primary goal is to demonstrate what aspects can be explored and visualized, and what opportunities arise from a combined approach of 3D data and their manual companions. Not only does this enrich the SFM data, but it also allows for an easier access and better management of stratigraphic data. For the development of the workflow, a test dataset from the Magdalenian site of Bad Kösen-Lengefeld was used to adapt it to real excavation data, which includes information of features and artefacts. This allows to adapt the approach, and therefore the data management, to a wider range of data.

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A look back at the Kill-Butchery-Site in Zwoleń

In season 2023, we excavated the Middle Palaeolithic site in Zwoleń (10), which is located in Central Poland where plain transit to the upland. Our field work is carried out by joint venture of the State Archaeological Museum in Warsaw, Faculty of Archaeology, University of Warsaw and Institute of Archaeology, University of Wrocław.
The site was excavated between 1983 and 1990. The outcome of these studies has already been published and gives good insight into the site. Zwoleń site 10 is located within Zwolenka river valley. During previous excavations, artefacts and faunal remains were found primarily in fluvial sedimentary deposits, which were further modified by periglacial structures. Three levels of the Middle Palaeolithic finds were distinguished. Based on thermoluminescence dating, it was suggested that the finds were associated with MIS 5a and the beginning of MIS 4. The lithic inventory of 331 artifacts consists of a few bifaces, cores, flakes, and chips. The faunal remains were attributed among others to horses, mammoths, wisents, and woolly rhinoceros (Schild, Sulgostowska 1998; Schild et al. 2000; Schild 2005).
We decided to carry out an excavation to obtain new data regarding chronology, site formation processes and site function. In season 2023, we managed to open two trenches (number X and XI). Since the shooting range was closed, we decided to excavate on the bank of its wall, which made it easier to access the Middle Palaeolithic layer. The obtained materials consist of 29 lithics and bone fragments. The distinctive part of the assemblage can clearly be linked with bifacial reduction, most probably with its final stages, such as edge shaping or reshaping. This assumption can be supported by reinvestigation of lithics from previous studies, which yield a few bifacial flakes that were previously assigned to Levallois technology. In this season, we also collected more data on the stratigraphy of the site. Our project is planned to be continuous in the upcoming years.

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The Middle Palaeolithic assemblage from Martinshöhle in Iserlohn

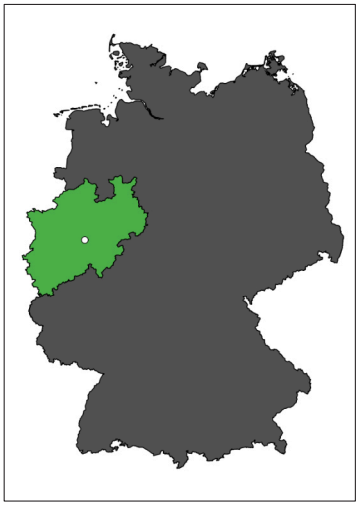

Fig. 6. Geographic position of the Martinshöhle in North Rhine-Westphalia, Germany.

In Westphalia, the Middle Palaeolithic is well represented by several archaeological sites as well as single finds. Here, we present a 'new' old lithic assemblage from the Martinshöhle cave site in Iserlohn.
The Martinshöhle is located at the southeastern slope of the Burgberg in Iserlohn-Letmathe in North Rhine-Westphalia, Germany. It was destroyed by limestone quarrying in 1912. Today, only an appendix of a few meters in length remains. Originally, the cave had two branches of a length between 35 and 40 meters. Its sediments were excavated in several campaigns between 1869 and 1910. A first excavation in the entrance area of the cave was carried out by Johann Carl Fuhlrott in 1869, during which he discovered cave bear remains. The main excavations in both branches of the cave were carried out by Hermann Schaaffhausen between 1875 and 1877, financed by the German Society for Anthropology, Ethnology and Prehistory (Deutsche Gesellschaft für Anthropologie, Ethnologie und Urgeschichte). It was then when the main part of the initial assemblage was found. During a final excavation by Benno Wolf in 1910, nothing but remains of disturbed sediments was documented (Hammerschmidt et al., 1995). In 1932, Julius Andree performed a typological analysis on the lithic assemblage and tried to reconstruct the stratigraphy of the cave sediments considering Schaaffhausen's observations (Andree, 1932). Throughout the years, different parts of the assemblage have been examined and the Martinshöhle was mentioned in various publications, e.g. Baales et al. (2013). Unfortunately, an unknown part of the initial assemblage went missing over the years. Today, the assemblage comprises 401 lithic artefacts from different periods as well as some faunal remains and ceramics.
Between 2021 and 2022, the Late Palaeolithic part of the lithic assemblage was reanalysed in two undergraduate dissertations at the Institute for Prehistoric Archaeology of the University of

Cologne (Gumboldt, 2021; Riemenschneider, 2022). Furthermore, the lithic assemblage was assigned to the stratigraphy of the cave sediments reconstructed for the Dechenhöhle – German Cave Museum Iserlohn (Dechenhöhle – Deutsches Höhlenmuseum Iserlohn) based on Schaaffhausen's explanations. As of early 2024, the Middle Palaeolithic part of the lithic assemblage is analysed in preparation for a publication. It comprises 37 artefacts. The raw material consists of lydite, often in the form of flat plaquettes, quartzite, and patinated flint nodules of potentially northern origin. Most of the artefacts are made using a discoid knapping concept. Some pieces are reminiscent of Levallois production, but true Levallois cores or flakes are absent. Among the tools, a scraper of Keilmesser-like morphology on a lyddite plaquette deserves mentioning Although it cannot be decided with certainty whether the artefacts belong to a single or multiple occupations, the assemblage gives a rather homogeneous impression and shows distinct similarities to the Middle Palaeolithic assemblage of Balver Höhle in the nearby Hönne river valley.

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Strontium isotope analyses and uranium thorium dating of prey species from Neanderthal sites in central and southern Germany

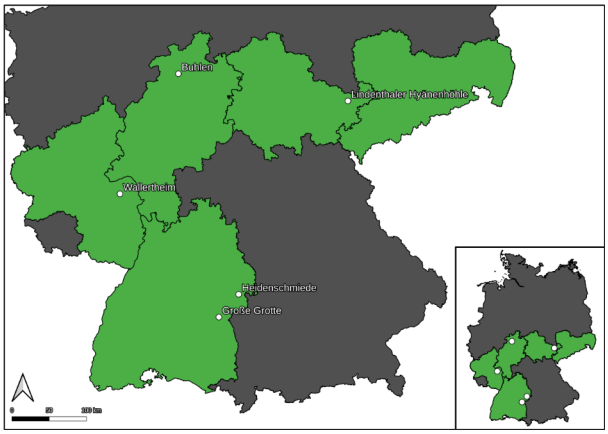

Fig. 7. Geographic position of the sampled late Neanderthal sites in central and southern Germany.

As part of a study on Neanderthal prey species, initiated in 2017 under the umbrella of CRC 806 "Our way to Europe", strontium isotope analyses were recently performed on faunal remains from late Middle Palaeolithic sites in central and southern Germany, dated between MIS 5 and MIS 3, at the Institute of Geology and Mineralogy of the University of Cologne. We expect our analyses to contribute to the question which conditions late Neanderthals had to encounter in following their hunting game. Which kind of pasture was preferred by the ungulates hunted?
Here, faunal remains from Buhlen in Hesse, Wallertheim in Rhineland-Palatinate,

Lindenthaler Hyänenhöhle in Thuringia as well as Heidenschmiede and Große Grotte in Baden-Württemberg have been analysed. The samples were provided by Landesmuseum Kassel, Naturhistorisches Museum Mainz/Landessammlung für Naturkunde Rheinland-Pfalz (Magazin Hechtsheim), Museum für Naturkunde Gera, Historische Museen und Archiv Heidenheim, and Staatliches Museum für Naturkunde Stuttgart – Museum am Löwentor (Sammlung Quartär). They comprise of teeth and bones from frequently hunted animals, such as horse, reindeer, and bison. As control group, woolly rhino was included as a rarely hunted species. Some of these samples were radiocarbon dated to around 43,000 cal. BP or older at the CEZA in Mannheim. The main goal of the project was to analyse the biographic mobility of Neanderthal prey species to aid a more comprehensive understanding of Neanderthal living conditions in the investigated area. In addition, uranium thorium dating was performed on the samples.
Within each site, the measured strontium values are remarkably consistent and the majority falls in the range of Pleistocene deposits in central and southern Germany obtained from literature (e.g. Bentley and Knipper, 2005). For some sites, it cannot be ruled out that the faunal remains were also accumulated by carnivores, e.g. Lindenthaler Hyänenhöhle (Diedrich, 2015). According to these results, it seems that the strontium values reflect the environmental signals around the sites, indicating that the hunted animals also lived in the wider surroundings. Furthermore, similarities between the strontium values within species of different sites lead to the assumption of common habitats, e.g. for the horses of Buhlen and Wallertheim. The calculated uranium thorium ages for most of the samples are younger than expected. A possible explanation could be a post-mortem uranium upkeep. However, when compared to the radiocarbon ages, most uranium thorium ages show a systematic offset across the different sites, thus indicating the potential for developing a method for calibration in the future.

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Examining the social context of double perforated ivory beads from the Swabian Aurignacian

Ivory artifacts represent a hallmark of the Aurignacian phase of the early Upper Paleolithic in the Swabian Jura. Double perforated beads, the most numerous type of personal ornaments found in the assemblages from the Swabian caves, provide us with useful insights into the handicrafts, social identity, and artistic expression of the populations who lived in this region between ca. 43 and 35 ka BP (Conard, 2009; Higham et al., 2012; Wolf and Heckel, 2018). Despite decades of investigation into the chaîne opératoire of these iconic artifacts, the many techniques to achieve the perforations as well as the gestures used to make them remain to be determined

in detail (Hahn, 1992). Use wear studies of double perforated ivory beads have yet to establish their precise use and manner of display (Wolf, 2015).
Here we present 62 double perforated beads from Archaeological Horizon IV at Hohle Fels Cave, representing multiple stages in the manufacturing process. We apply use-wear analysis, experimental archaeology and ethnoarchaeological comparisons to establish possible production techniques and modes of perforation. We use replicated Aurignacian stone tools to make a collection of double perforated ivory beads. We then use these artifacts to test competing functional hypotheses. The specific production technique, the potential use, and the manner of display of such beads represent the focus of the current study. We examine these artifacts to gain information about the lives of the Aurignacian inhabitants of Hohle Fels, and to consider what kind of tools and gestures they used to perforate the beads. The study also considers whether individuals or groups of craftspeople worked together to make these artifacts. We then engage with the question of the nature of mutual obligations and reciprocity that results from group labor, while searching for signatures of individual people. The study examines potential indicators of group affiliation, aesthetic preferences, and even social differentiation within the groups who contributed to the archaeological assemblages preserved at Hohle Fels. Finally, this research will yield a valuable reference collection for the study of ivory working technology and personal ornaments in the future.

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The Use and Function of Early Stone age Tools: An integrative Approach to Edge Damage Analysis Through Experimental Archaeology

Stone tools are the oldest and most enduring evidence of our ancestors. They provide valuable insights into human behaviour and their ability to adapt to the environment. Clark (1988) emphasises the importance of stone tools in understanding the evolution of hominid behaviour. The presence of these tools at a particular site offers a wealth of information on past cultural advancements. However, it can be challenging to establish a direct connection between stone tools use and specific hominin behaviours. Examining the edges of these artefacts can help determine the presence or absence of damage and shed light on the interactions between hominids and material cultures (McPherron, 2014).

This study aims to explore the evolution of human behaviour and technology from the Early Pleistocene Acheulean lithic assemblages in Ethiopia (Eastern Africa). The study focuses on analysing stone tools, focusing on edge damage through use-wear analysis. The main research question covers the origin of tool use, the role of raw materials in prehistoric technology, adaptability in tool design, and methodologically the value of edge damage analysis over microwear. Utilising experimental archaeology, diverse analytical techniques, and rigorous data analysis and fieldwork, the study aims to elucidate the significance of edge damage in the functional analysis of stone tools and the impact of raw material variability on tool use. Ultimately, this research will contribute to a more nuanced understanding of edge damage patterns, offering insights into the diverse variables and reasons underlying such occurrences, which can help to determine if there were any behavioural differences among the early human tool technology and function as well as how early humans modified their tool use.

Therefore, the study aims to advance current methodologies by applying macroscopic observation and different scales of image analysis for the function of prehistoric stone tools. A comprehensive reference collection comprising replicas of stone tools from the Early Stone Age sites in the Ethiopian highlands (Melka Kunture and Melka Wakena ~ 1.7 to 0.6 Mya) (de la Torre, 2011; Gallotti et al., 2014) will be constructed. The investigation will explore the influence of raw material variability at these sites (including, obsidian, ignimbrite, dacite basalt, flint, and quartzite) and different types of tools (LCT, flakes, cleavers etc) on edge damage frequencies, seeking to discern patterns and reasons for its occurrences.

Therefore, this poster will present and focus mainly on the methodological part of the ongoing study, which involves different experiments on use and taphonomy. Also, raw material selection and characterisation, data collection (including imaging, scan, moulding etc); and experimentation, including manual and controlled experiments replicating prehistoric tool use, will provide controlled insights into tool production, use, and modification. On the other hand, data collection methods (which include 3D scans, EDF images, and different macro use-wear analyses), comparative analysis, and report preparations along with quantification analytical techniques to enhance analysis are what this poster will cover. Generally, this poster aims to present and discuss with colleagues the importance of understanding stone tools through a comprehensive analysis of edge damage, addressing key research questions, and the ongoing diverse methodologies that this study is applying which is a nuanced exploration of human tool use across different lithic assemblages.

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Marieluise Hahn[1], Harald Floss[1] & Sibylle Wolf[1,2]
Definition and depictions of Males in the Paleolithic

The topic of sex and gender remains a significant aspect of interpretations of Paleolithic art. The female figurines of the Upper Paleolithic have been extensively researched and especially their sex characteristics have caused a variety of interpretations. However, the corpus of male representations seems to get less attention, additionally their numbers vary depending on the previous publications from 73 (Duhard 1996) to 101 (Bourrillon 2009). From the literature review it seems that no agreement exists on which sexual characteristics should be taken into account, in order to classify an image as male and to what extent. This leads to varying and non-reproducible numbers of depictions, resulting in a more subjective approach to this crucial topic of sex (Hahn 2020).
The aim of this research is to create a comprehensive dataset of male depictions and to develop a practical methodology for categorising figurative representations by sex. However, the focus is not on categorising them as male or non-male, but on determining the probability of a representation being male. This approach considers the level of detail in biological sex characteristics, taking into account grades of abstraction and the possibility of factoring in uncertainties. The aim is to create a more reproducible and less subjective dataset, enabling patterns of male depictions to be recognised beyond the binary categories of male and non-male. Additionally, factors such as motive, type of representation, production technique, material, and temporal and regional contexts are also considered and analysed. Over 200 representations have already been identified, indicating that the number of male depictions may be significantly higher than previously published. Different clusters, such as the striking association of bâtons percés and phallic representations, are emerging. This research contributes to the discussion of sex and gender in Palaeolithic art and society by considering the theoretical implications of gender archaeology, and to lay the groundwork for further consideration of Palaeolithic sex and gender, including the prevalence of male representation.

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Miriam Noël Haidle[1]

A Neanderthal meal: Complex resource exploitation in a community of practice

Charred remains of pound and cooked pulses from a Mousterian context at Shanidar cave (Kabukcu et al. 2023) gives insight into a form of behavioral complexity that is based on combining diverse sets of behavioral units (modules) that were then integrated into multifaceted aggregates. By reverse engineering the production process (here: baking a patty of pulses in hot ashes) and the necessary tools, we can uncover an enormous variety of activities, knowledge, and skills behind the superficially unglamorous discovery.
The reconstruction builds on three distinct elements: a) direct evidence from Mousterian contexts, b) necessary and probable elements that are not preserved in the archaeological record, and c) hypothetical assumptions and possible alternative pathways, for example, instead of baking the patty, it was roasted on stones or cooked as a mash in hides.
Beside the actions directly related to the processing of the pulses such as collecting, shelling, pounding, soaking, and cooking, other performances are needed to create conditions for successful preparation and cooking. Raw materials and potentially tools have to be obtained to produce a container. A grindstone and anvil, perhaps of stone or hardwood, as well as a stick for digging and moving ashes and embers have to be acquired, and a water source exploited. A campfire has to be prepared and maintained, which requires the collection of fuel. If freshly ignited, the process entails the manufacture and use of a strike-alight or other equipment to produce fire. All of these elements could have been used several times and in different contexts.
From a Mousterian context in Israel, the use of pulses is known from Kebara, about 50-60,000 years ago (Lev et al. 2005). The evidence of soaking, coarse crushing or grinding, and cooking of the seeds comes from probably 70-75,000 old layers at Shanidar. Simple grinding or pounding stones used for plant food processing have been found at Riparo Bombrini, in a 41-43,000 old context (Lippi et al. 2023). The use of bifaces as parts of strike-a-lights is known from several sites in France such as Chez-Pinaud around ca. 50,000 years ago (Sorensen et al. 2018). Analog processes of material transformation through underground heating are inferred for Neanderthals from the analyses of the 80,000 year old birch tar lumps from Königsaue (Schmidt et al. 2023).
Behind each of the different reconstructed activities stand people who performed them. Each of the activities requires different kinds of knowledge, training, and experience. The preparation of a meal is an example of a performance within a community of practice with different levels of participation (Lave & Wenger 1991). Several persons with different capabilities and learning status can contribute to the process by selectively performing only some of the modules. Newcomers like children grow into the process and approach the central cooking activity, while experienced individuals may sometimes participate only peripherally. The whole process requires orchestration of the activities, their performers, and products; it has chronological, spatial, and social components that have to be adjusted for each iteration. Complex behaviors like this go far beyond a mere accumulation of behavioral modules and represent a variation of cumulative culture, performed and transmitted in a flexible community of practice.

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Multi-isotope reconstructions of large herbivore spatial ecology at the Neanderthal hunting site of Salzgitter-Lebenstedt, Northern Germany

The behaviour of large herbivore taxa has been integral to interpretations of hominin hunting decisions, subsistence adaptations and hominin-environmental interactions through time. Understanding of the spatial ecology of hunted prey species tend to rest heavily on the assumption that animal behaviour is largely consistent over archaeological timescales. However, high-resolution data from archaeofaunal remains have shown this assumption to be problematic, highlighting the importance of reconstructing animal behaviour on a site-by-site basis.
Isotopic analysis of herbivore tooth enamel is a powerful tool for reconstructing large herbivore palaeobiogeography and mobility patterns during the Late Pleistocene in Europe. In particular, sequential sampling of incrementally-forming enamel enables the reconstruction of diet, drinking behaviour, ranging and mobility patterns on sub-annual timescales.
The Middle Palaeolithic site of Salzgitter-Lebenstedt in Northern Germany, is one of the key examples of Neanderthal reindeer-focused hunting stations in Central Europe, although questions remain around the timing and spatial distribution of these animals in the site environment, hampering interpretations of Neanderthal hunting behaviour.
Here we apply strontium isotope ($^{87}Sr/^{86}Sr$) analysis in conjunction with stable oxygen isotope ($\delta^{18}O$) and carbon isotope ($\delta^{13}C$) analysis of sequentially sampled enamel of reindeer (*Rangifer tarandus*) and horses (*Equus ferus*) from the Lebenstedt I faunal assemblage to reconstruct the biogeography and seasonal mobility patterns of these two prey-taxa. We find that while there may be similarities in seasonal dietary ecology and timing of movements by reindeer, these individuals appear to have had different home ranges and mobility patterns, with a similar trend seen in the horses. We highlight the importance of multi-isotope analysis to obtain more robust datasets and discuss the challenges of working with strontium isotopes as a provenancing tool in this region, identifying areas for future research. Finally, we hint at potential implications of our data for interpretations of Neanderthal hunting strategies at the Salzgitter.

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New wine in old skins: The application of modern chronometric and geochemical methods on the Middle Palaeolithic find sequence in Salzgitter-Lebenstedt

The Middle Palaeolithic open-air site of Salzgitter-Lebenstedt (SZL) (Tode 1982; Pastoors 2001), excavated in 1952 and 1977, is famous for its rich record of lithic artefacts and the presence of modified faunal remains. The most prominent feature is arguably the unique preservation of Neanderthal (post-)cranial bones, which is an exceptional case for an open-air site. While various paleontological studies on the faunal material provided most valuable insights into hunting and butchery practices, the chronological setting of the occupation is still ambiguous. Radiocarbon dates on peat and bones initially implied an early MIS 3 age, but were concluded to likely be out of range in a very recent publication (Ruebens et al. 2023). The find sequence at SZL is associated with two humic beds, usually assigned to the Oerel and Glinde Interstadials, whose chronostratigraphic position is, however, equally unresolved. Our new investigations aim to establish a robust chronostratigraphy for both the occupation and these biostratigraphic units, using state of the art methods in palynology and luminescence dating. The latter has never been applied to SZL deposits before, due to the lack of suitable material from the previous archaeological campaigns in storage.
After the unforeseen challenge of localizing and georeferencing the former excavation extents, we freshly sampled the sediment sequence by vibracoring at a few metres distance from that area. In our sediment cores, the position, thickness and absolute elevation of the find sequence can consistently be correlated with the adjacent 1952 excavation. Our identification of the find

layer within the boreholes is decisively confirmed by a newly-found artificial flint flake in the respective section of a core. Therefore, the results of our ongoing analysis will help shed new light on the palaeoenvironmental situation as well as the timing of both the occupation itself and the humic beds, presumed to represent minor interstadial oscillations. In addition, the SZL sediment cores allow for an explorative methodological approach to be pursued, which might be of broader significance to archaeological research. In the course of the 1977 excavation, several lacquer-peel profiles (LPP) from the archaeological sequence were produced. We currently conduct a pilot study with the objective to evaluate whether geochemical information can be obtained from the LPP using a portable XRF (pXRF) scanner for element analysis. The results will be assessed against pXRF readings on the neighboring sediment core. If the two data sets compare well, the method can then possibly also be applied to LPPs from other sites, where the corresponding sediment sequence is not accessible any longer. With a multitude of LPPs from former archaeological excavations being stored in museum archives across Europe, this methodological approach might promote novel research avenues and advance our understanding of respective environmental settings, as well as e.g. (pre)historic pollution or nutrient cycles impacted by fertilization practices in early agricultural systems.
The high level of pre-existing knowledge already available for SZL, including comprehensive stratigraphic and archaeological information, as well as various results from palaeoenvironmental analyses, provides a sound foundation that allows for both, i.) the application of modern chronological and palynological methods to fill research gaps concerning the occupation itself, and ii.) test an explorative geochemical approach that has the potential for a wider application, once it has been feasibly validated here.

Acknowledgements:
The research is funded by the by the project "Climate Change and Early Humans in the North", financed and supported by Niedersächsisches Ministerium für Wissenschaft und Kultur with funds of the zukunft.niedersachsen der VolkswagenStiftung.

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Drilling down – techno-functional analysis of Neolithic Dickenbännli-drills at Kohlhau Abri, Southwest Germany

The limestone beads found in Middle and Late Neolithic graves and settlements in Southern Germany and Northern Switzerland have been connected to key topics of Neolithic economy such as specialization of labor, surplus production, and supra-regional trade. So-called "Dickenbännli"-drills – small lithic drills with pronounced retouched shoulders – are frequently found in association with limestone beads. Yet, most drill and limestone bead assemblages are not investigated in detail and the drills' use for the production of the beads is often rather assumed than demonstrated. Additionally, all available detailed studies investigate materials stemming from settlement contexts, although multiple bead workshops at cave and rock shelter sites have been proposed.

Kohlhau-Abri is one such potential "workshop" site. It is a rock shelter site near Bissingen, Baden-Württemberg, in the periphery of the Lone Valley in the Swabian Jura. The site was excavated by the State Office for Cultural Heritage Baden-Württemberg between 2015 and 2018; seven find horizons were defined, spanning from the Late Glacial to modern times. Horizons 3 and 4, dating to the Neolithic and the Mesolithic, are richest in finds. In the Neolithic horizon, numerous Dickenbännli-drills were found, along with three limestone bead fragments. As part of the ongoing analysis of the site's taphonomy and in-depth studies of various find categories, we conducted a detailed techno-functional analysis of the drills and the bead fragments in order to understand their production and use. A technological investigation of the drills was done to reconstruct the working steps undertaken in their manufacture. We then conducted a low- and high-power traceological analysis with an accompanying experimental series. In addition, Raman spectroscopy was applied to characterize the nature of microscopic residues on the drill tip.

Our results highlight the investigative potential of holistic lithic analyses on younger Stone Age materials regarding human behavior and site function. Further, we provide use wear evidence for the working of limestone, which may be useful for other traceological studies on materials from both Holocene and Pleistocene contexts.

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Lithic techno-cultural evolution and taxonomy of the Last Glacial-Interglacial Transition in Europe: A new expert-sourced macro-archaeological dataset and some first results

We here introduce a newly compiled dataset designed to revisit continental-scale questions of cultural taxonomy and lithic technological evolution between c. 15,000 and 11,000 years ago (Hussain et al., 2023a; Hussain et al., 2023b). This dataset presents the fruits of a collaborative effort undertaken in the framework of the ERC-CoG project CLIOARCH, pulling together expert-sourced state-of-the-art data on 16 macro-regions across Europe featuring a total of 86 unique entries of named archaeological cultures (NACs) spanning the Late Upper Palaeolithic, Final Palaeolithic, and earliest Mesolithic. Each NAC composes information on lithic technological organization (mainly blank production) and toolkit structure and hosts a large library of key 2D artefact shapes (mainly lithic armatures). The dataset in this way facilitates the pan-European investigation of taxon-level variability and consistency in naming practices and offers new insights into the nonlinear dynamics of lithic technological evolution across the Last Glacial-Interglacial transition.

The open-source, macro-archaeological dataset notably supports the quantification of modes and rates of lithic technological change across different technical domains (laminar reduction technology, toolkit structure and whole-outlines of tools) and so highlights previously underestimated asynchronies and decoupled rhythms of change as well as key moments of technological diversification with important inter-domain trade-offs.

The compiled data also demonstrate the complex landscape of cultural taxonomic denominations currently employed at the Last Glacial-Interglacial transition. While some NAC-groupings such as those related to the Magdalenian, the Tanged Point Complex and to some extent the Arch-Backed Complex (Azilian and Federmesser-related NACs) perform surprisingly well and exhibit higher within-group similarity than randomized similarity with other NACs in the dataset, other affinities as signaled by naming conventions are more difficult to recover.

These initial results are promising and showcase the profound potential of collaboratively collated pan-European datasets on lithic technological evolution. Such datasets can make an important contribution to nascent macro-archaeological efforts within archaeology (Perreault, 2019, 2023) and beyond, even though the quality of the included archaeological data requires ongoing attention.

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Shumon T. Hussain[1,2], Dirk Leder[3], Florian Sauer[2] & Jürgen Richter[2]
Unity and Diversity of the Initial Upper Palaeolithic in Western Eurasia: The Lithic Technology of Al-Ansab 2, southern Jordan

Understanding techno-economic dynamics and isolating regional signatures within the broader phenomenon of the Initial Upper Palaeolithic (IUP) has recently been identified as an important priority of research in Late Pleistocene archaeology, as such efforts are thought to inform on early *Homo sapiens* dispersals into Eurasia and thus possibly contacts with other indigenous hominins.
Here we present a new lithic assemblage from the site of Al-Ansab 2 located in the lower Wadi Sabra, southern Jordan. The assemblage can now be age-constrained to between c. 45 and 40 ka and falls within the broader techno-typological variability described for IUP assemblages in the Levant and elsewhere. Combining refitting and attribute-based analysis with a qualitative techno-economic approach to the recovered lithic artefacts, we argue that the Al-Ansab 2 assemblage features an original, integrated production system supporting a particular spectrum of diverse elongated pointed and convergent blanks. The lithic reduction process centres on two interacting and asymmetric exploitation surfaces within an obliquely retreating axis of reduction. Blank production is based on the alteration of longer laminar pointed and convergent products and smaller, often broad-based convergent and triangular products. It is primarily the latter products which are probably searched for and exported from the site, while formal tools such as endscrapers are made on larger and often early-stage blanks. The techno-economic system of Al-Ansab 2 thus differs in important ways from other IUP expressions in the wider Levant and appears to be more similar to IUP assemblages of the interior than the classic assemblages of the coastal-woodland strip in the region.

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Shumon T. Hussain[1,2], Roman Bartosch[1,3] & Kate Rigby[1,4]
How does cultural perception shape human responses to large-scale Earth-system changes in the past?

HESCOR (Human and Earth System Coupled Research: https://hescor.uni-koeln.de/) is a new collaborative research network funded by the "Profile Building 2022" initiative of North Rhine-Westphalia's Ministry for Culture and Science. The network brings together climate and Earth-system science, computational data science, archaeology, linguistics, and the environmental humanities in an effort to better understand the dynamic interaction between human societies and various Earth-system constellations from deep-time contexts to the contemporary era. The overarching aim is to re-map how human cultural evolution has interacted with ecosystem and climate evolution on varying spatiotemporal scales.

We here present HESCOR's work package (WP) 9 (Environmental perception through time), outlining the project's ambitions, comparative approach, and knowledge contribution. WP 9 deploys an interdisciplinary lens to review, analyse and synthesize insights from diverse research fields, including landscape archaeology, environmental history, multispecies studies, and anthropology, to illuminate to what extent and how cultural perceptions and broader conceptualizations of human-nonhuman relations have mediated human trajectories vis-à-vis environmental changes in different historical contexts. We are particularly interested in how such human mediations have played into larger societal transformations, and thus to what extent we can derive more general lessons as to the implicit normativity and sociocultural dimensions of human Earth-system responses. This knowledge is fundamental to inform current debates on how to forge a liveable and sustainable future in times of deepening ecological and climatic crises said to ultimately have "cultural" roots.

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Shumon T. Hussain[1,2], William Mills[3], Klaus Hirsch[4], Jesper Borre Pedersen[5], Tobias Reuter[6] & Felix Riede[5]

Unexpected Technological Variability in the Terminal Pleistocene of North-Western Europe: Skrup V and Dybvadbro Syd, Southern Jutland

Surprisingly little is currently known about the lifeways and techno-economic strategies of Late Glacial forager societies occupying north-western Europe beyond 55°. Given that new synthetic, regional, and site-oriented research increasingly point to hitherto underappreciated levels of behavioural and technological complexity on the North European plains and its adjacent landscapes and the notable division of northern Europe into an eastern and western contextual area broadly delineated by vastly different ecological zones, it is imperative to return to museum collections and unpublished excavation materials and to pay more attention to variability and diversity in lithic techno-economic expressions.
We here describe for the first time in detail the typological and techno-economic organization of two recently excavated Late Glacial assemblages from southern Jutland: Skrup V near Hostrup, and Dybvadbro Syd near Kolding. Based on extensive lithic refitting, quantitative attribute analysis and qualitative technological reading of a substantial sample of complete blanks from these sites, we document distinct lithic techno-economic strategies with only loose parallels to the main techno-complexes populating the Late Glacial-Holocene transition in the wider region. We suggest that this reflects behavioural adaptations to the resource conditions on both sides of the Older and Younger moraine areas as well as the ecotonal location of the sites at the intersection between the emerging boreal-lake-wetland zone in eastern Denmark and the open heathland ecosystem in the west extending into Doggerland. We argue that Late Glacial sites spanning the Allerød-incipient Holocene period in western Denmark are not necessarily comparable to the Danish reference sites in the east, illustrating the presently underrated diversity of technological behaviours in this pivotal timeframe of earliest North European prehistory.

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The early Upper Paleolithic in Thuringia and the site of Gera-Zoitzberg

Humans in the late Upper Palaeolithic intensively used the greater region of Thuringia: Numerous archaeological sites have been documented for this period (Küßner 2009). In contrast, the period before the LGM in and around Thuringia has only very few sites, but this assumed lack of finds still offers space for investigation. The sites found so far in this period are: The Ilsenhöhle in Ranis, one of the locations in the study area where the period before the maximum of the Würm-Weichsel glaciation was recorded. The stratigraphy of the site ranges from the Middle Palaeolithic to the late Upper Palaeolithic (Schüler/Weiß 2018). At the Bilzingsleben (Simsensee) site, a few Front-Robert points have been found (Küßner/Terberger 2006, 71). For the Magdalenian site of the Kniegrotte near Döbritz (Küßner/ Jäger 2015, 304; Höck 2000, 152), the question has been open for some time as to whether older finds can also be recorded. An old C14- date and mammoth ivory found at the site could indicate this (Pfeifer 2020, 201-203, 211). Within these early sites in central Germany, no strong and comprehensive connection to the cave sites of the same age in the Swabian Jura has yet been established. It can therefore be assumed that an independent or rather a kind of migration movement in a west-east direction can be recognised in this area. A significant influence from southern Germany is therefore less likely.
The aim of my research is to analyse the presence of people in this period between the Harz Mountains and the Thuringian Forest based on selected sites and to identify possible routes and connections in the region. However, we must start with the Gera-Zoitzberg site, the dating of which has been discussed since the middle of the 20th century: First interpreted as Magdalenian (Brause 1941), in the 1960s determined by Feustel as an Aurignacian (Feustel 1964/65) and most recently categorised as a Grubgrabien by Küßner and Terberger in 2006 (Küßner/Terberger 2006). A re-evaluation of the already analysed find material and other finds should provide results in this regard. Based on the results of this typological-statistical analysis as well as on possible leading forms, further investigations should be carried out at Zoitzberg. The first mention in the literature by Auerbach in 1930 (Auerbach 1930, 141), references the presence of undisturbed layers, big flint tools and a blade industry with massive flakes. Furthermore, there are mentions of two concentrations of finds with large raw nodules and the best raw material in the area. Newest research discovered some parts of the assemblage, which have not been examined since the 1960s. In my presentation, I want to speak about my research as outlined above and the status of the investigations and the analyses of the Zoitzberg assemblage.

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Robin John[1,2], Shumon T. Hussain[1,3], Georg Roth[4] & Andreas Maier[1]

A well-feathered nest – Investigating pan-European cultural evolutionary trends in tanged and shouldered lithic points between c. 15 and 11 ka BP

The new expert-sourced open-source dataset of the last glacial-interglacial transition 1511NAC (Hussain et al., 2023a; Hussain et al., 2023b) provides a well-feathered nest for the exploration and application of novel quantitative and geometric-morphometric methods.
In this presentation, we aim to share some first findings on the long-term evolutionary dynamics of lithic armature shapes between c. 15 and 11 ka BP based on an exploratory approach conducted in PyREnArA (Python-R-Environment for Artefact Analysis) – a semi-automatic system designed for recording and quantitatively analysing morphometric data of lithic tools (John et al., 2023; Maier et al., 2023). We filter out all registered tanged and shouldered stone implements (n=358) from the extensive library of 2D artefact shapes recorded in the original 1511NAC dataset from archaeological sites across central and northern Europe. We then examine their morphodynamics in relation to 1511NAC's four major timeslices (TS1-TS4), defined by millennial-scale discrete time bins.
Our initial results indicate two distinct patterns of point evolution through time, which we interpret as technological regimes of long-term change. In addition, we detect significant timeslice-dependent, geographically constrained changes in armature morphometry. Interestingly, these changes are most pronounced in relation to latitude and within the identified Late Glacial regime, raising the possibility that the metric design space of the respective points is modulated by human northward expansions after the Pleniglacial. Our findings also align with documented shifts in lithic blank production and throw new light on shifting projectile point requirements as well as the relationship between lithic point design and laminar débitage technology.

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At the northern edge of the Aurignacian oikumene. The open-air site of Breitenbach in context of the modern human peopling of Europe

The Aurignacian open-air site Breitenbach represents one of the northernmost sites in Europe attributed to the Early Upper Palaeolithic. The spatial extent of the site and its richness in material remains contradicts the zero hypothesis that human presence close to the limits of human dispersal would have been infrequent, thus resulting in only ephemeral archaeological signatures. Breitenbach on the other hand shows that the region was not a marginal, but integral part within Aurignacian subsistence systems. This insight allows reflection on the key-factors that made Early Upper Palaeolithic populations viable, especially in contrast with earlier attempts in the modern human peopling of Europe.

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Andrew W. Kandel[1], Miriam Haidle[1,2], Volker Hochschild[1,3], Zara Kanaeva[1] & Nicholas J. Conard[1,2,4]
Using the ROAD Database: Recent Advances in Querying the Database

The "ROCEEH Out of Africa Database" (ROAD) is the largest compilation of archaeological datasets covering Africa and Eurasia from three million to 20,000 years ago (Kandel et al. 2022, 2023). When the ROCEEH project began in 2008 (https://www.hadw-bw.de/en/research/research-center/roceeh/home), one of its core goals was to create an open-access, online, research database that could be used to answer large-scale questions about the expansions of early humans. ROAD gathers data from the fields of archaeology, paleoanthropology, paleontology and paleobotany in a geographic framework. Over the years, the team has integrated over 2,400 localities containing more than 24,000 assemblages from over 5,400 publications written in most major languages including English, French, German, Italian, Portuguese, Spanish, Russian and Chinese. Users of ROAD are welcome to explore its vast store of information, even in ways that its creators did not envision.

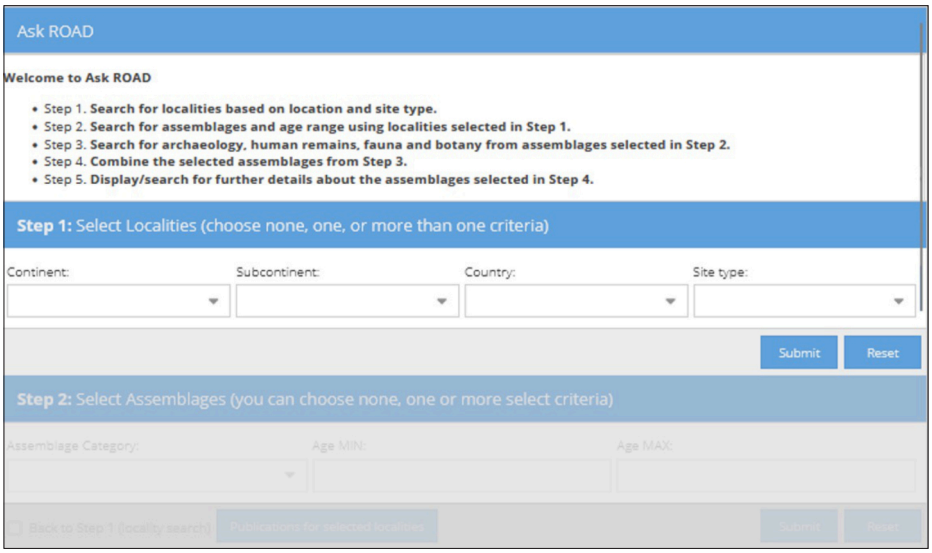

Fig. 8. View of the first part of the new query tool called "Ask ROAD". Use of the application is described in the abstract.

In this talk, we provide an update on recent advances with regard to how ROAD can be applied in research. We discuss how our team provides data to its users and describe some of the publications stemming from this effort. We focus on a new feature which facilitates querying in ROAD to make the database more user friendly and to accommodate the growing demand for its treasure trove of information. The new query interface embodies ROCEEH's philosophy of making the data it collects as FAIR (findable, accessible, interoperable, reusable) as possible.

Here are some basic features of ROAD:
- It is a relational database managed with a PostgreSQL management system;
- Users interact in ROADWeb, a web-based application written in php, javascript and html;
- A server at the University of Tübingen hosts the database and its applications;
- It runs using open-access software to increase its longevity without the need for proprietary software.

Queries in ROAD can be performed in various ways, depending on their complexity: for basic queries, a simple filter on a single table can provide the required results; for more involved queries, a built-in SQL query tool allows the joining of several tables and definition of specific conditions; to take advantage of Linked Open Data, a SPARQL endpoint is available; and finally,

for more complex queries with multiple components, direct contact with the research team offers users the prospect of creating tailored queries after consulting with our research team and its programmer. The resulting data can be viewed by logging into ROAD or directly through a URL, and exported in different interoperable formats, such as csv, html, xml, and json.

Based on our previous experience with users, we noticed that a similar pattern runs through many of the requested queries. This motivated us to create a new application called "Ask ROAD", so that users could intuitively retrieve data from ROAD. Furthermore, the new interface allows users to become acquainted with the general structure and content of ROAD. As its visibility and appeal have increased, ROAD attracts more requests than the research team can handle.

The query interface functions in a scaffolded way with five sequential steps. In the first step, the user selects a geographic region (e.g. continent, region, country) and type of site (e.g. cave, rock shelter, open air). Multiple selections are allowed; however, if fields are left blank, all data will be queried. After each step a resulting table pops up, allowing the user to download the data in their preferred format. Furthermore, a list of citations can be generated after the first step.

The second step involves choosing the types of assemblages (e.g. cultural, human, faunal, botanical remains) and defining the window of time. Once this step is executed, the third step allows the user to pick details about each assemblage of interest (e.g. Levallois points, Neanderthals, equids, pine trees). The fourth step performs a union of the data, for example, if the user wants assemblages with both Levallois points and Neanderthal remains. Finally, the fifth step allows the user to conduct further detailed searches of the database. The user may select which attributes to display in the resulting table at any time.

In the last part of the talk, we present three examples of how data gained from ROAD can be applied to research questions. Dapschauskas and colleagues (2022) used ROAD to examine the diachronic development of ochre use in Africa from 500,000 to 40,000 years ago. They determined that ochre use on the continent was minimal starting 500,000 years ago. However, an expansion began about 160,000 years ago; not only did ochre become more widespread, its frequency increased dramatically. At one third of sites, ochre was an important component, suggesting when ritual behavior became embedded in Middle Stone Age cultural traditions.

Sommer and colleagues (2022) used data from ROAD to investigate the potential connections between different industries. Using a Big Data approach, they processed data about culture and age to produce maps showing the similarity of different cultures to each other. They observed strong connections within cultures and also regionally, but weaker links outside of cultures and over long distances. While the results were intriguing, the authors caution that these connections could result from research bias or other factors.

Kelly and colleagues (2023) questioned whether the rapid increase in production of symbolic artifacts after 45,000 years ago was a consequence of taphonomic loss. They queried ROAD for fauna, organic tools and dating results and then calculated the theoretical loss of these finds in the archaeological record. The results indicated several small bumps during the African Middle Stone Age, in addition to a large peak starting at the beginning of the Upper Paleolithic. The authors demonstrate that these upticks are unrelated to taphonomic processes and suggest the beginnings of symbolic behavior.

We plan to add more features in the future, for example programing a routine to extract data from ROAD and process it for analysis using statistical packages such as R. We encourage you to visit ROAD (https://www.roceeh.uni-tuebingen.de/roadweb/) and provide expanded access to anyone interested. Discover for yourself what ROAD can do!

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Katarína Kapustka[1] & Kristýna Budilová[2]

Interpretation of the use of ground stone artifacts from the site of Hostim: preliminary report

Hostim is a key site of the Bohemian Magdalenian record, and it is well known for its artwork, especially animal engravings. The site was excavated from 1963 to 1965 and published by S. Vencl (1995). The site revealed numerous artifacts (lithics, engraved red ochre, engravings on slate tablets, macroliths, bowls, palettes, ornaments) and ecofacts (animal bones, charcoals, malacozoological remains). It is an open air site situated in Bohemian Karst above Berounka river. The site is dated by radiocarbon extracted from animal bones to the time span of 13851-11933 cal. BC (Kapustka et al. 2023). Thanks to the analysis of stable isotopes of N and C, we have some insight into the natural environment around the site.

From the site were gathered several types of stone artifacts, within this article we will focus on the possibilities of identification of performed activities connected to the use of bowls. At the site of Hostim were found 47 fragments belonging to 27-29 bowls of different sizes. Mostly made of quartzite, some of diabase. Sizes of these bowls vary from 61 to 288 mms.

The original interpretation of these pieces was, that they are containers (Vencl 1995, 141). However usually this type of artefact was used for different activities. At the site of Hostim as very likely we see: plant processing, ochre processing and use of bowls as a lamps. All these activities could be identified if there are residues present (starch/phytoliths for plant use; ochre, lipides for use of bowl as lamp), or if use wear traces are well preserved.

Our first sample contained 5 studied bowls. According to description in published volume one of them had traces of organic material in it (Ibid. 139). We sampled them to obtain starch / phytolith residues to identify used plants. Their use wear traces were observed and

documented. Results are still a little bit ambiguous which seem to us to be promising if obtaining more samples in the future especially if we will be able to reopen the site in the course of the new excavation.

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Neumark-Nord: A review

In 1985, Pleistocene mammal bones were found in the open cast mine Mücheln, near Merseburg (Saxony-Anhalt). These first discoveries triggered extensive and painstaking investigations by Dietrich Mania subsequently uncovering one of the largest Palaeolithic site complexes and high-resolution palaeoecological archives: the last Interglacial (Eemian) lake landscape of Neumark-Nord, approx. 125,000 years before present.

The record from Neumark-Nord consists of the infill of two adjacent basin structures covering the complete last Interglacial, a 26 ha sized lake (NN1) and a smaller pond (NN2), about 1,6 ha in size. To date, more than one hundred scientists and more than two hundred students were involved in field and laboratory work contributing to our detailed knowledge about Neumark-Nord.

In this talk we present a review of almost 40 years of archaeological and palaeoenvironmental research in the Neumark lake landscape, that has by now flooded our libraries with in-depth and overview articles, monographs and edited volumes, as well as popular science books. Building on the abundance of multidisciplinary palaeoenvironmental data and Dietrich Manias meticulous field observations we provide an overview about the topographic and hydrologic development as well as vegetation succession in both basins during the Eemian, which constitutes a frame for the temporal and spatial location of the archaeological records and unique thanatocoenoses within these basins. On this basis, we summarise what we have learned so far about the "warm side" of Neanderthal lifeways, how it affects our perception of the Neanderthal niche, and which further questions are now arising.

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Did Neanderthals go to heaven? Reinvestigation of Raj Cave, Poland

Raj Cave (Paradise Cave in Polish) is one of the most important Middle Palaeolithic cave sites in Poland, and there are several reasons for this. Firstly, it is located in the Holy Cross Mountains in south-central Poland, out of the karstic region of Krakow-Czestochowa Upland where most caves and cave sites are located. Secondly, the cave has been almost completely closed since the LGM and was only discovered in 1963 (Kowalski, 1972). For this reason, there are almost no Late Pleistocene and Holocene disturbances of the Middle Palaeolithic sediments. Next, two different layers containing Middle Paleolithic artefacts and animal remains were identified in the cave (Kozłowski, 1972). These two layers were separated by a sterile horizon, giving ground for comparative analyses. Finally, a large number of reindeer antlers found in the entrance zone led the excavators to hypothesize that the antlers had been deliberately collected by Neanderthals in order to build a protective fence at the entrance to the cave (Kozłowski, 1972). Both archaeological horizons were typologically assigned to the Mousterian technocomplex, but neither have been chronometrically dated.

The first and only archaeological fieldwork was carried out in 1966-67 and was aimed at cleaning the touristic path through the cave, which is still in use. The cave itself is famous in Poland for its magnificent speleothems, formed due to its special climatic conditions and high humidity. The name of the cave comes from the impression made on the first visitors. So far, the cave has been one of the most visited touristic sites in the region, but no archaeological research has been carried out at the site since the original investigations, apart from a re-evaluation of the large mammal collection (Patou-Mathis, 2004).

In 2023, we started a project to re-examine the site. We will re-assess the 1966-67 faunal assemblages, especially the small mammal collection. New archaeological and geoarchaeological fieldwork will be undertaken to:

1) determine the chronology of the site, including the human occupation episodes;
2) understand the site formation processes;
3) investigate human occupation of the site, and to evaluate the presence of the protective fence made of reindeer antlers;
4) identify periods of paleoenvironmental and climatic changes and see how these relate to human occupation.

Excavation of archaeological material with modern methods will be useful to verify the Mousterian attribution of the 1966-67 collection and exclude the presence of a bifacial component in it. Thanks to these new analyses, we will present a preliminary chronostratigraphic reassessment of the site as well as some preliminary paleoenvironmental considerations.

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Chronology and chorology of late Pleistocene hunter-gatherer groups in the Lower Rhine Region – From sites in the opencast lignite mines to the regional scale

The Late Palaeolithic in Central Europe is marked by significant climatic changes. The cold Greenland Stadial (GS) 2a is replaced by a rapid rise in temperature and the warm Greenland Interstadial (GI) 1e -1a begins (Baales 2021; Andersen et al. 2006). According to recent findings, these environmental changes were also accompanied by a genetic turnover (Posth et al. 2023). In this context, the technological and typological characteristics of the lithic assemblages differ markedly from the preceding Upper Palaeolithic (e.g. Floss / Weber 2013).
However, how exactly climate change and population dynamics contributed to this process is still largely unclear. One important effect seems to be an increase in spatial projectile variability, reflected in a marked increase of taxonomic units during this period. The integrity and consistency of these units has lately been challenged and it seems that their boundaries are often rather fluid (Riede / Sauer 2019).
For a better understanding of the cultural change and variability in the lower Rhine region during the Late Palaeolithic, lithic inventories from the key area of the Rhenish lignite mine area will be analyszed. They were excavated in numerous campaigns of the projects Prospektion Paläolithikum im Indetal (2005 to 2011) and Prospektion Paläolithikum im Rurtal (2012 to 2014) (Pawlik / Thissen 2011). The thus-gained information will be contextualised at the regional scale by integrating selected inventories from the area of Mönchengladbach, the Cologne Bay, and Westphalia in the analysis (Balthasar 2019).
The main research questions are:
• What technological and morphological developments can be identified from GI-1 to GS-1 inventories? And (how) does environmental change correlate with these developments?
• How variable are the inventories within and between these periods? And what does this imply for the traditional taxonomic units?
By generating and analysing quantitative, trait-based data on the technology and morphology of the studied assemblages, this project contributes to a better understanding of the chronological and chorological patterns of the cultural development during the Later Palaeolithic in the Lower Rhine Region.

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The Blattspitzen assemblage of AH X from Hohle Fels Cave in the Ach Valley of southwestern Germany

The period between 50,000 and 40,000 BP, the time of the decline of the Neanderthals and the spread of *Homo sapiens* across Europe, represents a critical research topic in prehistory. For decades researchers have examined the archaeological record to try better understand this period (1,2,4,5). This research led to the definition of so-called "transitional industries" between the Middle and Upper Paleolithic, as well as the concept of the Initial Upper Paleolithic. Assemblages attributed to these broad cultural units are reported to stretch across western and central Eurasia.

In Central Europe, discussion of the Late Middle Paleolithic and the transition between the Middle and Upper Paleolithic generally focuses on the occurrence of bifacial technology and the presence of leaf points know in German as Blattspitzen (1,4). The stratigraphic and chronological position of the Blattspitzengruppe remains disputed due to the lack of well-stratified sites and the fact that most available assemblages come from poorly documented contexts.

In 2020, researchers from the University of Tübingen recovered one leaf point in Hohle Fels, a cave site located in Ach Valley in southern western Germany. The Blattspitze originates from Archeological Horizon (AH) X 1.2 meters below the base of Aurignacian. The lithic assemblage from AH X underlies multiple ESR dates from AH IX with a mean age of 62.5 +/- 4 ka BP (3). This is the only well dated occurrence of a Blattspitzen horizon in southwestern Germany, and its age calls the transitional character of the Blattspitzengruppe into question. Excavators found the leaf point in situ within an assemblage of a few hundred piece-plotted lithic artifacts and numerous small and micro-artifacts recovered during waterscreening. The knappers during the formation of AH X generally exploited local Jurassic chert, but occasionally used radiolarite and black alpine microquartzite from nearby river gravels. Cores are scarce in the assemblage. They include only a few examples of exhausted Levallois cores, as well as a near absence of primary cortical flakes, suggesting that the preparation of the cores happened outside the area of excavation. The lithic assemblage from AH X also include bifacial shaping flakes, which indicate

on-site production or reworking of bifacial tools. Side scrapers and denticulated tools, however, are most numerous among the tools.
Hohle Fels represents a critical site for gaining a better understanding of the Blattspitzengruppe and presents a unique opportunity to look beyond the leaf points themselves and to consider more closely the technological and behavioral features of an intact assemblage.

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Cornelia Lechner[1], Andreas Pastoors[1], Thorsten Uthmeier[1] & Robert Bégouën[2]
Glätter? Smoother? Lissoir? A technological and typological analysis of a widespread Upper Paleolithic bone tool in Enlène (Département Ariège)

Early lissoirs first appeared during the Middle Paleolithic in sites like Peche-de-l'Azé and Abri Peyrony and they later become a standard component of the Upper Paleolithic toolkit. Lissoirs are commonly defined as bone tools used to treat animal hides with a standardized shape and a tool tip that shows striations and polish from usewear. Traces of usewear can easily be identified under a microscope and connect the lissoirs closely to the treatment of animal hides, thus making them an excellent marker for this type of work.
The site of Enlène is part of a system of three caves, together with Les Trois Frères, to which it is connected via a narrow passage, and Tuc d'Audoubert situated along the river Volp in the departement Ariège on the foothill of the Pyrénées. The main occupation of Enlène occured during the Middle Magdalenien (Magdalénien Moyen).
A total of 292 lissoirs were recovered from Enlène, 74 come from an old collection (ELB) and can no longer be attributed to a certain chamber of the cave. They were excluded from spatial analysis. The remaining lissoirs were put through a detailed analysis separated by cave chamber and layer. 24 observations were made for each lissoir, creating a data frame on their conservation, typology, morphometry, decoration and spatial distribution.
The lissoirs of Enlène are highly fractured, only 24 are intact. Distal parts (n=140; 48%) make up the biggest part of the fragments, followed by medial parts (n=115, 39%). Proximal parts (n=12, 4,1%) are comparably underrepresented, most likely because they often end in a simple break making it impossible to distinguish them from medial fragments. Three types of lissoirs were

found in Enlène: "commun" (n=145), "angle" (n=16), and "dièdre" (n=2). Lissoirs of the "angle" type showed concentrated polish near the edge, suggesting they were held at a steeper angle than lissoirs of the “commun” type, possibly for scraping off soft tissue from animal hides rather than softening them. Lissoirs of the "commun" type with high abrasion had the distal part slightly off-center from the middle axis of the tool, indicating uneven pressure during use, possibly related to the worker's handedness. Further studies are needed to confirm these findings.
Only a small amount of lissoirs from Enlène are decorated (n=13), as is usual for this type of tool. The decorations are mostly geometric patterns. Figurative motifs are only found on two of them. While one, most likely the representation of an animal hide, was already known, the research for my thesis identified another figurative motif, the representation of a bird or an owl.
Lissoirs were found throughout the cave in layers dating to both the Gravettian and Magdalenian periods. The lissoirs discovered in the narrow tunnel between Enlène and Les-Trois-Frères (ECD) exhibited a notable difference from those in other chambers, with a high percentage of intact lissoirs and a significant number of the rare "angle" type. As ECD cannot be considered a workspace, it is possible that the lissoirs were either accidentally dropped or intentionally left by the Magdalenian people on their way to Les-Trois-Frères. The innermost chamber of Enlène, Salle du Fond (ESF), yielded the largest number of lissoirs, which were categorized based on their archaeological layer and the square in which they were discovered. The upper layer 1a yielded only one lissoirs, the two lower layers (3 and 3inf) show a similar pattern of distribution centered around a fireplace in the western part of the excavated area.
My master thesis aimed to create a database for future research through the concentrated analysis of lissoirs. By focusing on this tooltype, we were able to gain a better understanding of the work that was carried out in the cave, adding a small piece to the huge puzzle of the Volp Caves.

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The lion's head from Vogelherd-cave: new insights from a recently reassembled ivory statuette

The ivory statuettes from the caves of the Swabian Jura (Baden-Württemberg, Germany) are among the oldest figurative representations in the world and one of the most important ensembles of early art. They were found within Aurignacian deposits at the sites of Hohle Fels and Geißenklösterle in the Ach valley, as well as at Vogelherd and Hohlenstein-Stadel in the Lone valley.
The Aurignacian levels are associated with the first settlement phase of modern humans in the region between 42,500 and 35,000 cal BP. Over 50 figurines have been found so far. With their three-dimensional design, the statuettes form a typologically and culturally coherent ensemble and are unique among other expressions of early art. They mainly depict large mammals typical of the mammoth steppe during the ice-age such as bears, mammoths, bison, horses and lions, but also smaller animals such as birds and fish. In addition to animal figures, there are also anthropomorphic representations and hybrid creatures. Most of the pieces are rather small in size, measuring only between 4 and 8 cm.
The so-called lion's head (Löwenköpfchen) from the site of Vogelherd is one of these objects and particularly well known for its delicate design. However, the sculpture is not completely preserved and split in two. Both halves were found by different private collectors in the backdirt of Gustav Riek's 1931 excavation at Vogelherd. The right side of the artwork has been on display in the Württemberg State Museum (Landesmuseum Württemberg) in Stuttgart since 1972. In 2020, the museum was also able to acquire the left half of the lion head from private ownership. By bringing the two parts into one place, it has now been possible to examine them together for the first time. This provides new insights into the specific design, the original dimensions of the object and the production techniques used.
The talk aims to present the piece and its history, to show the results of the microscopic analyses and to address frequently debated questions about the overall composition of the lion's head. In addition, the piece will be discussed in the context of the current state of research on the statuettes of the Swabian Jura and the emergence of art in the Aurignacian period.

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A Stag-gering Proposal: Perforated Cervid Tooth Ornaments for Band-Level Identity and Network Tracking in the Upper Paleolithic of the Swabian Jura

Personal ornaments have been singled out as a key artifact class for discerning cultural diversity within the Aurignacian and Gravettian technocomplexes of the European Upper Paleolithic, with regional patterns in the distribution of diverse bead forms investigated as windows into cultural identity, exchange, and network dynamics. To date, such studies have focused either exclusively on the distribution of highly-modified and standardized ivory bead forms or bundles of high and low-modification ornaments, such as perforated animal teeth, in tandem. This study shifts the focus of investigation to perforated cervid canines and incisors exclusively, asking whether or not they can be used to identify discrete sub-regional cultural units within the Aurignacian, Gravettian and Magdalenian occupations of the Swabian Jura. Beginning with excavated materials from the sites of Hohle Fels, Geißenklösterle and Vogelherd, this study will first evaluate faunal profiles to establish baseline ranges of morphological variation and sex ratios among regional cervid populations, granting insight into aspects of preferential selection. Experimental use-wear analysis on perforated cervid canines and incisors will then be used to investigate extraction, production and suspension practices performed on archeological materials. Lastly, 3D geometric morphometrics and multivariate statistics will be deployed to identify diachronic and geographic patterns in both the preferential selection, as well as the extraction, production, and suspension of perforated cervid teeth ornaments from the Ach and Lone valleys. If found, these patterns will be contrasted against the known distribution of standardized ivory beads to test the hypothesis that perforated cervid teeth likely participated in exchange between and within closely related local bands rather than between more regionally distant cultural groups. If a link between perforated cervid teeth and sub-regional cultural formations can be observed, future study of animal teeth ornaments may provide band level resolution for paleolithic network and identity tracking, significantly enriching cultural diversity models predicated on ethno-linguistic or macro-regional categories alone.

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Late Neanderthals Updated: New Insights into Duration of Occupations

The investigation of Late Neanderthal behaviour stands as a key focus in archaeological research. The analysis of behaviour is a crucial element in understanding the diversity of Middle Palaeolithic archaeological sites and it offers valuable insights into typology of occupation and site functionality. Moreover, it furnishes data for discerning mobility patterns, social interactions, and the size of groups inhabiting caves and shelters.

The typology of a site is closely linked to its function and the type of occupation it hosts (Binford 1980; Cascalheira and Picin 2020). Reconstructing the duration of Neanderthal occupations is a nuanced and intricate task. Differentiating between long-term and short-term occupations poses a considerable challenge, given that nearly all archaeological assemblages are palimpsests (Bailey 2007). This process can lead to the complete erasure of information or the partial preservation, accumulation, and transformation of subsequent activities.

Several factors have been identified to assess the duration of Late Neanderthal occupations. Some of these include the volume of archaeological remains, knapping sequences, evidence of butchering activities, the extent of carnivore damage, taxonomic diversity, the number and characteristics of hearths, spatial distribution, and the overall extent of the occupied surface (Bargalló et al 2020; Leierer et al 2019). Based on these criteria, a general paradigm has been developed to distinguish and identify occupations at the end of the Middle Palaeolithic. Various archaeological sites offer diverse data on Late Neanderthal occupations that appear to contradict the general paradigm.

The present study aims to conduct a thorough literature review, shedding light on the strengths and weaknesses of certain features within the current paradigm for classifying types of occupation. By doing so, the study aims to contribute to a more nuanced understanding of Late Neanderthal behaviour and the complexities associated with interpreting archaeological evidence from this period.

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Cave or rock shelter? Landscape evolution in the Lone Valley of the Swabian Jura as seen from the perspective of small mammals

Langmahdhalde is a rock shelter located in the Lone Valley (Swabian Jura, SW Germany). Excavation at the site began in 2016 and is still ongoing. The team from the University of Tübingen uncovered an archaeological sequence spanning from Middle Paleolithic to the Neolithic, including sediments dating to the Last Glacial Maximum, which is unique in this region (Conard et al., 2023; Schürch et al., submitted).
Analysis of the taphonomy conducted on first lower molars of voles indicates a change in the main agents of the accumulation of the small mammal assemblages. In the upper part of the sequence (GHs 4 to 17), the main accumulators were predators of category 3-4. In the last two GHs studied (GH 18-19) the accumulators shifted to category 2-3 (follow Fernández-Jalvo et al. 2016). Diurnal raptors that prefer to roost and nest in cliffs and trees while avoiding caves count among the predators of category 4. The absence of diurnal predators in the lower part of the sequence suggests that the current shelter was a cave before the Last Glacial Maximum.
We carried out direct dating of the small mammal remains to gain better control of the stratigraphy and of the timing of this transformation. Ongoing studies of micromorphology will further clarify the geological history of Langmahdhalde and will facilitate an improved understand of the use of the site by human groups during the Paleolithic.
The Middle Paleolithic occupation recognized in GHs 24-28 during the last two years and the rich Magdalenian occupation in GHs 4-9 might have taken place, not just under different climatic and environmental conditions, but also in different settings in the landscapes with different landmarks and spatial organization.

Acknowledgements:
The Geogenomic Archaeology Campus Tübingen (GACT) – Leibniz ScienceCampus Tübingen funded the dating of the small mammals. The excavations at Langmahdhalde have been funded by the Eiszeitkunst im Lonetal Verein, the project of the Heiderberger Akademie der Wissenschaften, the Role of Culture in the Early Expanisons of Humans, the Senckenberg Centre for Human Evolution and Paleoenvironment, and the Ministry of Science of Baden-Württemberg.

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Paleoecology of mid-mountain Alps (Trentino, Italy) between Greenland Interstadial 1 and Early Holocene. Carbon and Nitrogen stable isotope analysis of ibex and red deer

The Pleistocene-Holocene transition reveals a short and abrupt climatic sequence from the warming conditions of the Greenland Interstadial-1 (GI-1; 14.6-12.9 cal ka BP), followed by the Greenland stadial-1 (GS-1; 12.9-11.7 cal ka BP) cooling and the continuous warming during the Greenlandian Stage (11.7-8.2 cal ka BP), which flourished new ecological habitats, and therefore, demography and cultural dynamics among hunter-gatherers. Particularly at extreme latitudes and altitudes, these changes had a significant impact on human habitats like in the Southeastern Italian Alps. This region was continuously inhabited during this chronological span, even during the harshest periods, by Late Epigravettian at the late Pleistocene followed by Sauveterrian groups during the Early Holocene.
Carbon and nitrogen stable isotope analysis was performed on collagen extracted from archaeological bones. Ibex (*Capra ibex*) and red deer (*Cervus elaphus)* bones with evidence of human manipulation were selected for analysis. All samples come from four archaeological sites in Trentino (Italy) which are located at an altitude between 1070 m and 1250 m (Dalmeri, Cogola, Cornafessa shelters, Ernesto cave).
Results show that animals changed their niches to adapt to the ecological changes, almost always maintaining a separation of ecological niches. Combining the results with other environmental proxies, we reconstruct the animal habitats and sharpen the ultimately understanding of how this geological transition impacted on environment humans had to face. Hence, at the end of GI-1, ibex was grazing in an ecological niche characterised by open and wet conditions. In the dryer GS-1, also red deer experienced cold conditions, as ibex, while late Epigravettians were exploiting a diverse range of habitats to cope with severe climatic conditions. After the beginning of the Greenlandian, warming and moisture caused a visible change in ibex and red deer habitats. Unlike Epigravettians, Sauveterrians who inhabited mid-mountain of Trentino exploited a more restricted ecological range because of an ameliorated condition.

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Where Obermaier left off: excavating the unknown sequence of the early Middle Palaeolithic at El Castillo

The El Castillo cave is one of the emblematic sites of European archaeology. The excavation and description of its archaeological sequence by Hugo Obermaier was fundamental for establishing the chrono-cultural system of the Middle and Upper Palaeolithic in Europe. Excavated by Hugo Obermaier (1910-1914), Victoria Cabrera, and F. Bernaldo de Quirós (1980-2017) and by our team (since 2020), the site presents a sequence that spans from the Early Middle Palaeolithic to the Azilian.
One of the most interesting aspects of the El Castillo cave sequence is its beginning. Obermaier called these levels Acheulian and lower Acheulian, although we now consider it to be Early Middle Palaeolithic. To delve into this question, we have begun a one-square-meter survey at the base of the site, called level XXV, demonstrating that there is still an unpublished sequence in El Castillo. Unit XXVh shows a clear fluvio-karstic origin and has been described as a brown (10YR 3/2) sandy and silty clay, with abundant fine to coarse gravel towards its lowermost section. The overlying unit XXVe, which is the oldest described by Obermaier, has a chronology ~141 ka based on luminescence dating of sedimentary potassium feldspar grains (Demuro and Arnold, unpublished) and provides a minimum age bracket for level XXVh. The material recovered is scarce but offers information that complements the data obtained by Obermaier for the base of the sequence. Thus, the analysis of the faunal material recovered at level XXVh indicates the presence of *Cervus elaphus*, *Equus ferus* and *Ursus* sp. The taphonomic study of the assemblage attests to human activity in the form of cut marks and bone breakage. The activity of carnivores on the faunal remains is also proven. The small mammal community is dominated by voles and red-toothed shrews, suggesting an open environment. The lithic industry is scarce but indicates the use of large pieces in limestone and quartzite, with unipolar débitage and very few Levallois elements, as seen in the Obermaier collection. However, we have confirmed discoid exploitation in small formats and on quartzite, evidence not recovered by Obermaier and reported here for the first time.

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NeanderCloud: New and old technologies to understand past human tool technology, design, and use

During the Pleistocene, stone tools were essential to the survival of hominins. Hence, the emergence and changes of past human technologies provide fundamental insights into early hominin behaviour and have been seen as a combination of cultural traits but also human technological adaptations and innovations. The understanding of the correlation between production, design, function, and actual use of the huge variety of stone tools in the archaeological record, and their change over time and space, is fundamental. Therefore, research that combines studies on tool design and use at different scales of analysis is crucial. This understanding can have a major impact on questions related to the use-life history of a tool, including technological strategies, tool maintenance, resharpening and recycling mechanisms, but also on the nature of human decision-making processes (Marreiros et al. 2020). These mechanisms can only be addressed when aspects of tool technology, design and use are combined.

While such a holistic approach has not been achieved so far in archaeological research, the NeanderCloud project aims to achieve major developments in this investigation. This poster aims to present and discuss the research scope and goals of this research project, recently funded by DFG. Building upon a proof-of-concept study, the research will focus on the investigation of the Late Middle Palaeolithic (LMP) asymmetric tools, so-called Keilmesser, to understand their origin, nature, and pre-eminence within the LMP industries in Central and Eastern Europe (Schunk 2022, Schunk et al. 2023).

This project aims to answer questions such as:

- Were Keilmesser task-specific tools or multifunctionally used by Neanderthals?
- Did Neanderthals optimise the design of their tools and/or was this a consequence of techno-cultural conventions?
- What can the different aspects of tool design and use tell us about the processes of knowledge, learning and transmission in past hominin populations?

Through a multi-scale analysis, this study aims at a unique agenda that combines methods such as techno-typological and material properties studies, use-wear analysis, and controlled experiments. The amount of data produced and the necessity to combine these data requires a statistical tool that will provide a transparent, reproducible and user-friendly workflow for data analysis and data modelling. Building on an interrelated collaboration between archaeological research and computer science (Pedergnana et al. 2020, Calandra et al. 2022), the obtained data will be modelled using deep learning and Bayesian computer techniques. The resulting computational tool, following FAIR principles of big data set management, will be available to other researchers. The tool will offer different pipelines for different types of data analysis in order to allow addressing different data-related questions. Importantly, because the tool will be available as a cloud-computing service, it will be usable without knowledge and experience in the installation of the required software packages and libraries, which can be daunting for non-experts with the newest Bayesian and AI analyses. Results will be used as a proxy to interpret the archaeological record, and, therefore, contribute to the understanding of how and why technological behaviours took place in earlier populations, and how people were able to survive and thrive based on their technological traditions, innovations, and novelties. This will significantly contribute to the recognition and interpretation of different traits in the evolution and expansion of Human Behaviour. Through this poster presentation, our intention is not only to introduce the project ideas and objectives but also to engage in discussions with colleagues about potential avenues for collaboration.

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The last of them: late Neanderthals from AGP5 cave (Zaragoza, NE Spain)

The geographical framework established by the Iberian Mountain Range and its foothills is proposed as a key territory in understanding the dynamics of human populations in the Iberian Peninsula and Europe during the crucial biological and cultural transition from the Middle Palaeolithic to the Upper Palaeolithic. Currently, the number of sites attributable to the Middle Palaeolithic in the Iberian System reaches around twenty, including caves and open-air archaeological sites. However, an important data gap persists in region due to the available information mostly proceeds from not stratified sites ancient excavations. Unaltered stratigraphic sequences supported by reliable radiometric data are needed to better understand the timing and causes of neanderthal disappearance in the NE Iberia.
In the last two decades this set of known archaeological sites was joined by the Cerro del Pezón sites (Cuenca-Bescós et al. 2010; Mazo and Alcolea 2016), in the framework of a paleontological and archaeological survey project carried out in 2009 and 2010 in the karstic system of the Muel, Jaulín, Aguilón and Mezalocha (Zaragoza, NE Iberia), between the south of the Ebro River and the north of the Iberian Mountain Range. This work updates the current state of the archaeological project focused for more than a decade on the Mousterian occupations of the AGP5 cave (Zaragoza, NE Spain), which provides new data in the context of the last

Neanderthals on the Iberian Mountain Range. The fieldwork carried out since 2010, has allowed the definition of a complete stratigraphic sequence with five stratigraphic units, numbered from I to V, from top to bottom. At least two of them contain human occupations, as revealed by the lithic record recovered, and the presence of fragmented bones and combustion events structuring the space inside of the cave. Due to the lithic tool assemblage and radiocarbon dating (>50.0–41.9 kyr BP), human occupations have been attributed to the Mousterian techno-complex, contemporary with other late Mousterian sites in the Ebro Basin (NE Iberia) and Mediterranean region during the MIS 3 (Mazo and Alcolea, 2020). In addition to new stratigraphic, chronometric and paleoenvironmental data, in this communication we present preliminary results of ongoing studies of the lithic tool assemblage (raw materials, techno-typological and functional analysis) from the last human occupation of the cave.

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An in vitro simulation of sediment pressure on teeth for identifying abrasion marks within dental microwear patterns

The importance of understanding taphonomic impact on teeth has been previously demonstrated in various studies (e.g., Uzunidis et al., 2021; Micó et al., 2023). These investigations are rooted in the need to comprehend the alterations that various diagenetic agents can induce in dental microwear patterns, as well as the accompanying biases that may arise during the process of conducting dietary interpretations. It is well-known that dental microwear is a common and established technique which allows the short-term reconstruction of the dietary behaviour in extinct and extant vertebrates, allowing inferences about daily, seasonal, or regional variations in diets.

Nevertheless, dental wear-based techniques may encounter two primary challenges: 1) the exclusion of teeth from analyses due to structural or surface damage, resulting in a significant reduction of the sample size, and 2) the potential alterations of intrinsic dental microwear features that developed during the animal's life and are used in dietary reconstructions. These alterations can lead to their partial or complete elimination, introduce new taphonomic

modifications that could mimic dietary marks, or produce taphonomic alterations overlapping the microwear patterns.
In this sense, experimental studies that simulate in vitro taphonomic processes are essential for establishing reference frameworks to distinguish between taphonomic marks and quantifiable microwear patterns. This enhances the overall reliability of the data and, consequently, dietary inferences. Previous experimental research has focused on simulating various taphonomic processes, including mechanical abrasion from sedimentary transport using a tumbling machine (Uzunidis et al., 2021), wind abrasion via a sand blasting machine (Weber et al., 2022), chemical dissolution resulting from digestion or soil acidity through the application of diverse acid solutions (King et al., 1999), and trampling (Micó et al., 2023).

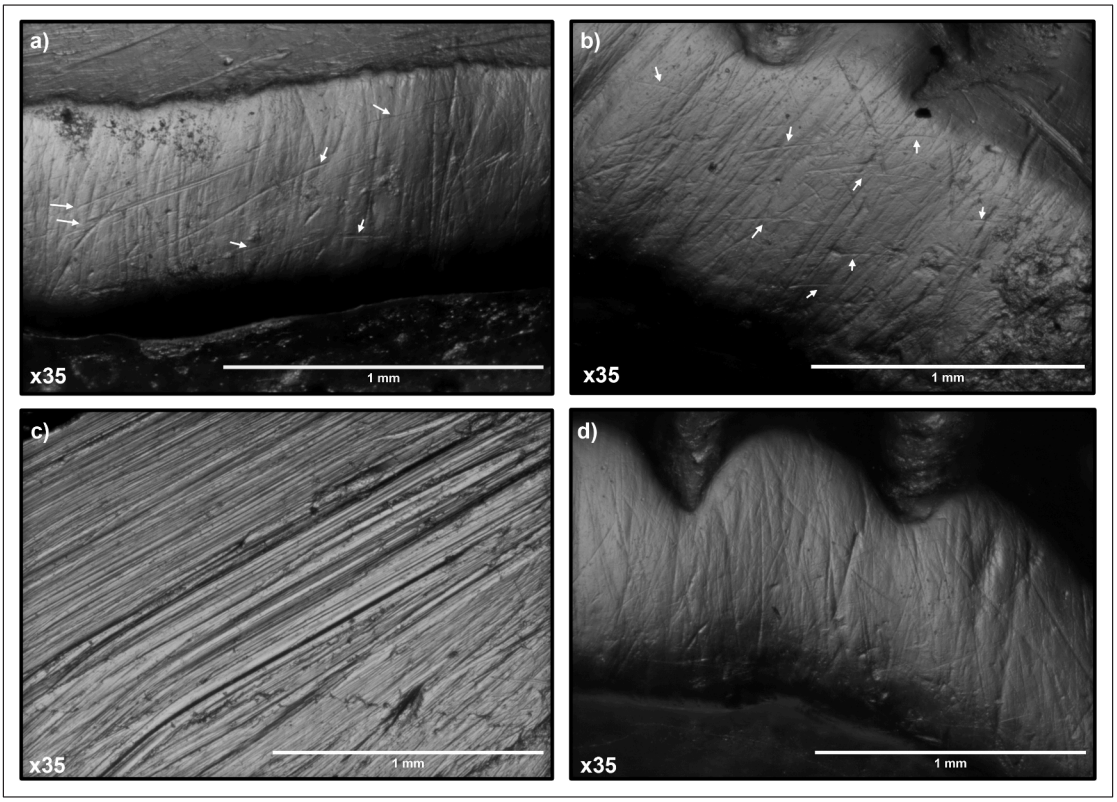

Fig. 9. a) and b) Taphonomic striae on the enamel produced during the experiment (pointed by the white arrows), c) taphonomic striae with internal microstriations on the dentine; d) dental microwear pattern on *Bos taurus* tooth enamel without significant taphonomic alterations.

While these studies have collectively advanced our understanding of the taphonomic impact on tooth occlusal surfaces, it is noteworthy that only Micó et al. (2023) have introduced a comprehensive typological classification system for taphonomic alterations caused by sediment abrasion. This classification framework facilitates the characterization and identification of marks, particularly those resulting from trampling, within the context of dental microwear patterns. This contribution is of paramount importance, as dental microwear analyses hinge on quantifying dietary scratches and pits. Consequently, once taphonomic marks are well-defined, they can be effectively discerned within the analyses, thereby enhancing data validity for dietary reconstructions. Despite these advancements, our understanding of the impact of diagenetic and fossilization processes on dental surfaces remains limited, particularly regarding their variability within diverse environmental conditions during the formation of archaeological or paleontological deposits. Additionally, the diverse nature of taphonomic processes, including often overlooked agents such as plant roots and rhizomes, moss, fungi, bacteria, insects, calcite coating, weathering, thermoalterations, and sediment pressure, can contribute to the formation

of various types of alterations. These understudied agents may significantly influence microscopic wear, highlighting the need for their inclusion not only to mitigate analytical biases for accurate dietary interpretations but also to extract valuable information for comprehending the taphonomic history of an assemblage. Consequently, further experimental studies are imperative to establish associations between specific features and different taphonomic agents.
In light of the aforementioned considerations, it has been experimentally investigated the effects caused by sediment pressure on the occlusal surface of teeth for the first time. A hydraulic press was used to simulate weights of 500 kg and 1 ton on modern teeth of various ungulate species (*Equus ferus*, *Ovis aries* and *Bos taurus*). Teeth were buried 10 centimetres deep with sediment recovered from level IIIb of Teixoneres Cave (Moià, Barcelona). High resolution moulds of the occlusal surfaces were made to record the initial conditions and allow their comparison with the teeth which were altered after the experiment. Taphonomic marks were characterised following the typological classifications established previously by Micó et al. (2023), mainly based on the morphology, orientation, and distribution.
Our results allow for the identification of taphonomic marks, and thus, exclude them from dental microwear analyses. It is also noteworthy that taphonomic alterations tend to occur more frequently and in more aggressive forms in dentine than in enamel, as a result of the greater hardness and resistance of the latter (Figure 9). This does not pose a problem because in dental microwear analyses the part considered for quantification is the enamel. Therefore, this study will help to avoid analytic bias by discarding remains (or surfaces) with significant taphonomic modifications and improve the reliability of dental microwear studies.

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An online application for the provenancing of radiolarite artefacts

Radiolarites, especially those of the Upper Jurassic, are one of the most used raw materials in the Palaeolithic assemblages of Central Europe. As regards Moravian territory (Czech Republic), they are present on all large Upper Palaeolithic sites. However, their provenance can vary, ranging from the Northern Calcareous Alps to the eastern fringes of the Pieniny Klippen Belt (PKB; Přichystal 2013).

The multimodal approach using a combination of petrological evaluation, X-ray fluorescence spectroscopy (XRF), and laser ablation inductively coupled plasma mass spectrometry (LA-ICP-MS) was applied to more than 160 radiolarites from seven different areas: 1. Northern Calcareous Alps (NCA; AUT), 2. St. Veit Klippen Belt in and around Vienna (AUT), 3. Gerecse Mts. (HUN), 4. Miocene gravels under the Pálava Hills (CZE), 5. White Carpathians (SVK), 6. Pieniny Mts. (PL) and 7. Bakony Mts. (HUN). A raw dataset of elemental data was acquired in this way. The isometric log ratio transformation was applied to this dataset, transforming the elemental data to the Euclidean vector space, allowing the application of standard statistical procedures. Subsequently, Linear Discriminant Analysis (LDA), representing a supervised learning algorithm, was applied to classify geographically specific radiolarite groups, based on their measured chemical elements (James et al., 2013).
The most suitable features (elements) for distinguishing between different radiolarite areas were Fe, Co, Ba, Nd, W, 206Pb, 207Pb, 208Pb and Ti. The visual representation of LDA outcome has shown that the areas of NCA, Vienna, and Gerecse Mts. form relatively uniform clusters, whereas the fingerprint of West-Slovakian and south-Polish radiolarites is similar. Initially, this effort was primarily aimed at provenancing of radiolarite artefacts from Moravian Aurignacian and Gravettian sites, in which case we were successful. In addition, the online application has been created to facilitate the provenance of radiolarite artefacts with some degree of confidence for other researchers. This application will be accessible and usable by anyone with XRF or LA-ICP-MS elemental data.

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Ethnographic toolstone heat treatment among Konso hideworkers (Ethiopia)

The heat treatment of rocks to improve their flaking qualities features among key prehistoric innovations, evidenced from the Lower Palaeolithic onwards (Crabtree, Butler 1964; Brown et al. 2009; Agam et al. 2021). Because the intentionality and technicality of this transformative process can also have cognitive implications, the topic has attracted great archaeological research interest worldwide. Yet, with no directly studied ethnographic example, assumptions about archaeological heat treatment, including attributes potentially optimized by prehistoric knappers, are consistently tested using experiments.
We report results from the detailed study of ethnographic toolstone heat treatment by Konso hideworkers in southern Ethiopia. They heat-treat a whitish form of hydrothermal chalcedony which occurs in the form of fist-sized geodes in weathered rhyolitic bedrocks that widely crop out in the region.
Our analyses of the processes and end products show that material transformations commonly used as indicators of improved toughness (e.g., fracture toughness and elastic modulus) are not

evident in the heat-treated chalcedony studied, while improved homogeneity and newly formed lustre are informative. Our mechanical tests have shown that more energy is accumulated in the heat-treated material prior to cracking. This new finding indirectly confirms an earlier suggestion (Moník et al. 2021) that crack propagation in successfully heat-treated materials is faster as the accumulated energy increases its velocity. As a result, the flakeability of the raw material used is improved, enabling the production of the smallest of any contemporary stone hidescrapers used in Ethiopia (Sahle, Negash 2016). Transgranular fracture and lustre are the epiphenomena of this material improvement.
Our results have implications for the diversity and peculiarity of the intentions and mechanisms involved in improving toolstone workability. The motives, techniques, and material transformations evidenced in the Konso siliceous toolstone heat treatment afford insights into similar aspects of the technology in past societies that are inaccessible with experiments alone.

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What´s the point? Gravettian projectile technology in the Ach Valley of the Swabian Jura

The Swabian Upper Paleolithic sequence preserves a uniquely rich record of the Aurignacian, Gravettian and Magdalenian cultural units (Conard & Bolus 2003). Each of these technocomplexes has yielded diverse assemblages of lithic and osseous artifacts.
Here we focus on the material from Brillenhöhle, Geißenklösterle and Hohle Fels to present an overview of Gravettian lithic projectile technology from the caves of the Ach Valley. Building on previous work by Moreau (2009), Taller & Conard (2016) and Scheer (1986), we summarize the available information on likely projectiles and consider the relationships between technology and prey choice. We also consider where, in what number and in what condition Gravette points, micro-Gravette points, Flèchettes and Font Robert points occur in the different find

horizons at these caves. Using this information, we examine how the Gravettian hunter-gatherers of the Ach Valley selected lithic raw materials for each tool type and develop a model to explain the patterns of manufacture, use, curation, and eventual discard of these artifacts.
The study also reflects on the documented lithic refits between these three sites and Sirgenstein (Taller et al. 2019), to reconstruct Gravettian mobility, social-economic structures, and settlement dynamics from the perspective of these important assemblages.

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Three-dimensional reconstruction of the stratigraphy at the Blätterhöhle entrance area using PyVista

The Blätterhöhle site is located near the city of Hagen in North Rhine-Westphalia, Germany and comprises a narrow cave and an entrance area. The cave was discovered in 1983 by speleologists from the association 'Arbeitskreis Kluterhöhle e.V.' in a dolomitic limestone massif. A first exploration took place in 2004. Since 2006, excavations also took place outside the cave at the cave entrance under the direction of Jörg Orschiedt and later supported by the LWL-Archaeology for Westphalia and the City of Hagen, (Orschiedt et al., 2012; 2017; Heuschen et al., 2017).
The entrance area has been excavated in an area of 22 m² on the surface and 9 m² on the bottom. The excavation revealed a stratigraphic sequence with neolithic stray finds of human remains in the entrance area, an important Mesolithic sequence and a Final Palaeolithic layer, and yielded Mesolithic combustion zones as well as Late Palaeolithic human remains (Baales et al., 2023; Orschiedt et al., 2012). Understanding the course of the sediment layers is challenging, because the entrance area is steeply sloping towards the south.
At the 64th Annual Meeting of the Hugo Obermaier-Gesellschaft in 2023, a poster presented a digital reconstruction of the sequence in a single square meter. Meanwhile the method for reconstruction has been refined, strongly enhancing the reproducibility of the results and

allowing for the reconstruction of larger areas. The new method uses PyVista (Sullivan and Kaszynski, 2019), a Python module, to create a digital model of the stratigraphy of the Blätterhöhle entrance area. To generate the model, the manually drawn profile documentation was scanned and the individual images were placed in a three-dimensional environment. Here, the course of the different sediment layers can be traced by setting points along the layer boundaries. PyVista is employed to perform a triangulation using these points, thus reconstructing the course of each sediment layer.
This paper demonstrates the method and presents initial results. The three-dimensional model will help to better understand the complex lithological stratigraphy of the entrance area of the Blätterhöhle and – by integrating the spatial coordinates of the artifacts – also the succession of the archaeological layers.

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HESCOR WP7: Multiregional cultural evolution in Africa

The African origin and the Late Pleistocene dispersal of anatomically modern humans (*Homo sapiens*) form a widely accepted interdisciplinary consensus. However, by reducing the continent to a source of out-of-Africa migrations, past population dynamics within Africa have received little attention (Tryon & Waweru, 2023). Currently, a deep and complex demographic history of isolation and convergence of structured subpopulations forms the most parsimonious explanation for the diversity and heterogeneity of its genetic, palaeoanthropological and archaeological (Middle Stone Age) records (Scerri et al., 2018), roughly spanning from 300 to 30 thousand years BP. In contrast, much research has focused on individual sites' contribution to questions of human' behavioral modernity'. Attempts seeking regional syntheses with standardized data presentation and theoretically sound bridging of data and theory are rarely found (but see e.g. Mackay et al., 2014).

Work Package 7 (Multiregional cultural evolution in Africa) of the newly installed HESCOR project aims to model different scenarios of human cultural evolution in Africa during the last 300 millennia against the backdrop of changing environmental conditions. We seek to explicitly parameterize mechanisms driving the distribution of ideas and humans in time and space to formulate testable hypotheses that can be compared to cultural patterns in the archaeological record. The latter involves collecting, reviewing, and analyzing data on diversification and homogenization processes of material culture on a medium spatiotemporal scale. These steps are paramount to understanding the complex dynamics of past human and earth systems. Whilst intending to work on a continental scale, we initiate our research by choosing two research areas with high degrees of geographic, climatic, and ecological variability: (1) High- and lowlands flanking the Rift Valley in the Horn of Africa and (2) a southern African transect reaching from the Maloti-Drakensberg Mountains of Lesotho to the Indian Ocean. Here, we are particularly interested in carving out the medium-scale spheres of interaction, connectivity, and cultural transmission within population networks. Changes in the material culture record will be used to model these spheres using existing datasets, e.g. the ROCEEH Out of Africa Database project (Kandel et al., 2023).

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Carinated technology in the Levantine Aurignacian

Carinated items are a hallmark of the earliest Upper Palaeolithic in central Europe and likewise of the early Upper Palaeolithic in the Levant. Yet they are a much-disputed category of lithic material and their definition as well as their functional interpretation has changed drastically over the last 30 years. Firstly understood as tools, detailed technological and refitting studies in western Europe have come to the conclusion of their additional (?) function as bladelet cores, which initiated a paradigm shift in the interplay between typology vs. technology. Also in the Levant, carinated items have traditionally been understood and recorded as tools.
We have therefore reassessed the carinated assemblage from the hallmark site of Hayonim Cave, Layer D, Western Galilee, Israel (Belfer-Cohen and Bar-Yosef 1981), one of the type sites of the

Levantine Aurignacian. The aim of the study was to investigate the possibility that also Levantine carinated items might have functioned also (or solely) as cores.
The results of a detailed techno-typological assessment will be presented that encompasses all aspects of the assemblage. The focus is being laid on the reconstruction of the operational chains, as well as the identification and typology of characteristic by-products of the carinated reduction. Innovative multivariate statistical methods are applied to test the formed hypotheses on the data from the attribute analysis. It can be concluded that also in the Levantine Aurignacian carinated items fulfilled, at least partially, a core function similarly to their role in western European assemblages. The operational chains are complete, and all by-products like e.g. Type Thèmes bladelets are also present in the Levant. These findings open up the possibility of either a migration of humans into the Levant in the middle of the Early Upper Palaeolithic or an innovation transfer of the paradigms of this technology. Finally suggestions for the reason of the success of carinated technology are being discussed and placed into the context of human emigration out of Africa.

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Current research on lithic artefacts in the Middle and Upper Pleistocene travertine deposits of Thuringia (Germany)

The Pleistocene travertine deposits of Thuringia are well-known sites for scientific research: Dietrich Mania excavated at Bilzingsleben in northern Thuringia from 1971 to 2002, research at Ehringsdorf and Taubach in the Ilm valley by the Institute of Quaternary Palaeontology at Weimar and the Thuringian State Office for the Preservation of Monuments and Archaeology led to numerous publications on Quaternary geology, Pleistocene palaeolontology and Neanderthal archaeology.
Two decades ago, the University of Jena started its investigations on these sites: in 2004-2007 new excavations were done in the travertine deposit of Bilzingsleben. In 2013, a project started in cooperation with the Thuringian State Office for the Preservation of Monuments and Archaeology. Its aim is the first registration of all lithics from the travertine quarries of Weimar-Ehringsdorf. Currently, c. 6.300 lithics have been registered with an attribute analysis and c. 4% have been documented by new scientific drawings. A comparable investigation of Taubach started in 2023: currently, the artefacts stored at the University of Jena, which derive from archaeological and palaeontological research over 100 years ago, are registered with an attribute analysis and scientific drawings.
The presentation of the results of this research introduces the model of Pleistocene travertine deposits in Thuringia created by Walter Steiner, the principal investigator of the Ilm valley travertines. The lithostratigraphy of Bilzingsleben is presented in combination with data on fabrics and vertical find distribution as well as recent results of research on micromorphology, ostracods and archaeozoology. Interpretation of these data is of great importance for the recognition of lithic artefacts, in particular for the existence of ´Lower Palaeolithic small tools´. For Weimar-Ehringsdorf the attributes of the recorded objects are presented with a focus on the distinction of artefacts and natural lithics, on typology of lithic blanks and tools as well as

differences in use of flint, quarzite and magmatic rock types. The presentation of the lithics of Taubach will show that the very early research by palaontologists, archaeologists and amateurs influence find representativiness, for example selection of objects as well as breakage and edge damage of lithics. Thus, lithic artefacts from these three sites contribute to knowledge on taphonomy, how the archaeological record of travertine sites is created by Middle and Upper Pleistocene humans and by natural processes as well as by our research methods and interpretations.

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The Volp Caves – Contextualising Palaeolithic Rock Art

Four years after the completion of the book trilogy on the Volp Caves, a research project has been approved in 2023 to take the next steps in the analysis of the caves, building on the results of the monographs in a holistic approach and profiting from the potential of these unique archaeological sites.

Project description

The Volp caves in south-western France (Tuc d'Audoubert, Trois-Frères, Enlène), discovered more than 100 years ago (Bégouën & Breuil 1958) and one of the most important multi-layered structured painted caves, containing unique cultural evidence attributed mostly to the Middle Magdalenian, are the subject of a new research project based in Germany (Erlangen) and France (Montesquieu-Avantès).

The 12-year DFG funded research project has two main objectives: (1) in the Volp caves, the identification of activity zones, their spatial location and the reconstruction of the connections between the individual activity zones (on-site) and (2) within the Upper Palaeolithic of the Pyrenees, the integration of the Volp caves as multi-layered structured painted caves into the regional subsistence systems (off-site).

It is expected that the comprehensive analyses of the three caves of Tuc d'Audoubert, Trois-Frères and Enlène will provide high resolution data that will allow insights into their use concepts. The approach of integrating the Volp caves into the regional subsistence system will be combined with the methodological-theoretical study of the high diversity of painted caves as a whole, which is expected to stimulate the debate on the significance of painted caves.

The project will be carried out in close collaboration with internationally renowned experts, scientists from French institutions and other universities with a focus on prehistory/ palaeoecology, and with the involvement of young scientists (PhD students with a position in the project).

The Volp caves: Tuc d'Audoubert, Trois-Frères, Enlène

Enlène and Trois-Frères, together with Tuc-d'Audoubert, make up the Volp caves, located in the commune of Montesquieu-Avantès (Ariège), in the foothills of the Pyrenees. Tuc d'Audoubert was discovered in 1912 by the three sons of Count Henri Bégouën, Trois-Frères in 1914 while Enlène was acquired in 1925. Never opened to the public, they are now under the protection of the Louis Bégouën Association, whose aim is to own, preserve and study the Volp caves.

Enlène, which has no rock art apart from a few red marks, has yielded numerous mobile art objects on organic remains, as well as 1,171 engraved stone slabs. It is 200 m long and was the prehistoric entrance to Trois-Frères, which is closely linked to it. Unsystematic excavations were carried out in the 19th century, before Louis Bégouën worked on the site between the two world wars and unearthed numerous artefacts. Major systematic excavations were then carried out throughout the cave between 1976 and 1988 under the direction of Robert Bégouën, Jean Clottes, Jean-Pierre Giraud and François Rouzaud (Bégouën et al. 2019). This work revealed a Noaillien as well as evidence for an Early Badegoulian, both confined to the area of the entrance, while the Middle Magdalenian is present in every chamber of the cave. This main occupation yielded a wealth of Late Middle Magdalenian artefacts, some of which are classics of the genre, such as the spear thrower with confronted ibex. An Early Middle Magdalenian is also attested by the Lussac-Angles points.

Trois-Frères is connected with Enlène by a 65 m long narrow passage. It then extends for 285 m from east to west along the axis of the hill. Although there is little portable art, cave art is omnipresent in all the galleries, right down to the small activity zone in the Salle du Foyer at the end of the cave, excavated between 1985 and 1990 under the direction of Robert Bégouën and Andreas Pastoors (Bégouën et al. 2014). There are around 1,400 mostly engraved graphic units in the cave, both figurative and abstract, often grouped together in large clusters. The engravings in the chamber known as the Sanctuary are arranged in panels at human height, dominated 3 m above the ground by the anthropomorphic figure known as the Sorcerer. In the absence of diagnostic typological pieces, the ^{14}C dating carried out at Trois-Frères confirms that the cave was mainly used by humans in the Late Middle Magdalenian (17,743-16,575 calBP; Calibration with OxCal v4.4.4, IntCal20, 95.4%, $\sigma<150$, Bronk & Ramsey (2021)).

Tuc d'Audoubert, 640 m long, is divided into three levels: the lower level, where the Volp flows underground; the middle level, which contains rock art and the remains of a Late Middle Magdalenian occupation; and the upper level, 12 m higher, which extends over 450 m of sometimes difficult terrain and has preserved numerous traces of cave bears on the clay floor, as well as later traces of the Late Middle Magdalenian (Bégouën et al. 2009). On the upper level, rock art is present only in the first part and is absent in the second half of the gallery. Finally, at the end of the cave, in the middle of the last chamber, on a small promontory, a pair of clay bisons appears. In Tuc d'Audoubert, the 371 graphic units are mostly abstract signs; the dominant type is the claviform, with 125 examples. The 103 animals are mostly represented by bisons. The category of nine unreal creatures is an original feature of the site. Scattered throughout the cave, five pairs of bisons, set apart from the other figures, emerge as the main theme of the site, highlighted once again by the exceptional modelling in the last room.

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The Final Palaeolithic site of Mühlheim-Dietesheim (Hessen, Germany): new excavations, new analyses, new insights

The open-air Final Palaeolithic site of Mühlheim-Dietesheim is located in the Federal State of Hessen on the southern banks of the River Main, a few km from the town of Hanau. This site was discovered and thereafter meticulously excavated by the Landesamt für Denkmalpflege Hessen and Cologne University in the late 1970's and early 80's (Fruth 1979, 1994). During these investigations, an area of 63 m^2 was excavated, revealing a surprisingly well-preserved Pleistocene surface, which in turn yielded ~15,000 artefacts, a central hearth feature, several different activity areas around a latent tent structure. Among the stone tools were many examples of backed projectile points, related to the Final Palaeolithic arch-backed point complex – then as now a rarity in the region.
In 2022, the material from the old excavations was revisited, and in the autumn of 2023, a geo-archaeologically motivated keyhole excavation campaign was carried out. The aim of this return to Mühlheim-Dietesheim was to gain a more detailed understanding of the stratigraphy of the site and thereby a more precise dating of the occupation. The original excavation area was extended in a south-eastern direction, exposing fresh profiles for in-situ sampling. The stratigraphy observed during the new excavation correspond well with the older descriptions and the western, northern, and eastern profiles were documented, and samples for OSL, micro-tephra, and heavy minerals analyses were obtained. Although this excavation focused on the very margin of the occupation, it yielded lithic material of primarily lydite, but also quartzite and formal tools such as thumbnail scrapers, burins, cores and arched-backed points were retrieved. These fit well within the tool spectrum of the Final Palaeolithic.
We here present the new lithic inventory, new insights about the site's chronological position, and the activities carried out here, as well as its relation to other locales in the region.

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Foliate tools from the Middle Palaeolithic in the Italian Alps. A summary of the current evidence from of the Vajo Salsone site

The Middle Palaeolithic site of Vajo Salsone in the Monti Lessini plateau, the Italian Eastern Alps, is the subject of this contribution aimed to illustrate the geological and geomorphological context, the faunal and cultural remains discovered in a massive clast-supported breccia filling a karst crack exposed in 2017 during the construction of a truckable road. Rescue excavation led to the recovery of a huge lithic assemblage featured by the predominance of the Levallois method with an ephemeral use of discoid and volumetric blade exploitation. A large number of scrapers of different shape and particularly, leaf tools and leaf points make Vajo Salsone an exceptional case in the Adriatic-Po Region, as their recovery is rather sporadic west of the Balkan Peninsula and south of the Alps.

Predetermined blanks, cores and numberless of flat, elongated, cortical flakes attest the integrity of the Levallois reduction sequences. The fauna assemblage is dominated by ungulates, the most abundant herbivore is the red deer followed by roe deer, chamois and elk. Only cervid bones show anthropogenic modifications related to the exploitation. Again, for red deer, dental wear analysis reveals mixed feeding and grazing diets, whereas microwear analysis shows that these ungulates had a diet between mixed feeding and browsing.

Reconstruction of the sedimentary formation processes combined with the unweathered state of the animal bones and of the lithic artefact edges despite their extensive patination, are consistent with the hypothesis of a short-distance displacement of the material from a single archaeological deposit possibly related to human occupation during the warm season.

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Humps and bumps. Particular ornaments on osseous artefacts as indicators of human presence in Central Europe during the earlier Magdalenian?

Carved trapezoidal protuberances (décor à tubérositées) are a well-known ornament on projectile points and half-round rods in the francocantabrian Magdalenian. It is dated to around 17 ka cal. BP, and hence to the late Middle Magdalenian. Individual examples have also been described further east, namely from the cave sites of Kesslerloch and Freudenthal in northern Switzerland and Balcarka and Pekárna in Moravia.
Newly identified pieces and direct ^{14}C measurements add further facets to the current discussion about the when and whereabouts of human presence in Central Europe and the supraregional networks before the onset of the Upper Magdalenian.

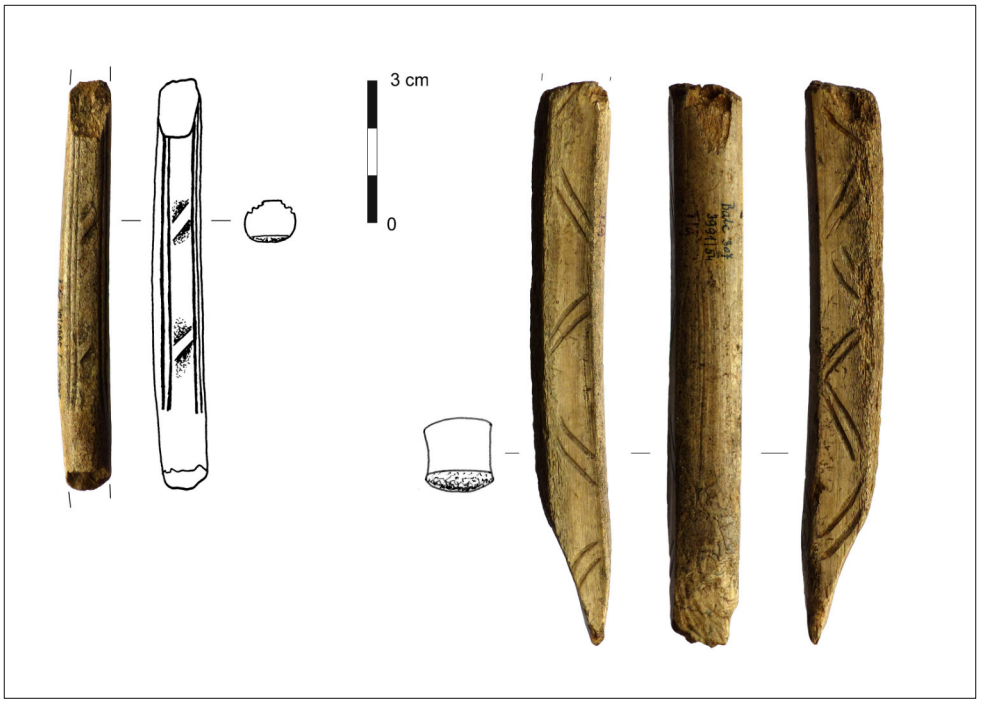

Fig. 10. Directly dated decorated osseous artefacts from Balcarka cave (Czech Republic). Photos: Sebastian J. Pfeifer.

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Plant depictions in Paleolithic art

Palaeolithic art is dominated by images of various animals, humans and signs, whereas depictions of plants have received little attention in archaeological research. While some scholars have even doubted or denied their existence (e.g., Clottes 1995), archaeologists such as P. Bahn (1983) and A. Marshack (1972) have taken up the subject and discussed plant depictions on a small scale.
The aim of this research is to show that plant representations are more common in the European Palaeolithic than previously thought. The depictions can be categorized into different groups concerning the presence of biological markers, such as roots, stems and leaves. The objective is to create a dataset, comprise both parietal and portable art, that shows the different forms that plant representations took on in the Palaeolithic. Particular attention will be given to motive and type of depiction, as well as the temporal and regional context.
A further part of the research is a comparison with the Palaeolithic flora in the relevant regions, with the aim of investigating whether there is a relationship between the depictions and the environment.
The preliminary results show around 130 depictions. These are dominated by motives of stems with stylised leaves. Compared to parietal art, portable art shows a much wider spectrum of variety and a significantly higher number of representations. Looking at the regional and temporal aspect, an accumulation in France troughout the Magdalenien time period is visible. This research attempts to lay a foundation for subsequent work and to raise awareness of plant representations in paleolithic art.

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Stable carbon ($\delta^{13}C$) and oxygen ($\delta^{18}O$) isotope analysis of animal teeth from the Magdalenian site of Bad Kösen-Lengefeld

The Magdalenian site of Bad Kösen-Lengefeld, discovered in 1954, has been investigated by members of the University of Cologne and the Friedrich-Alexander-Universität Erlangen-Nürnberg in close cooperation with the Landesamt für Denkmalpflege und Archäologie Sachsen-Anhalt for more than ten years. Between 2009 and 2023 an area of 111 m^2 has been excavated. A number of highly consistent radiocarbon dates obtained from different areas of the site centre around 15.3 ka cal BP and indicate that the archaeological material was deposited over a relatively short period of time (Richter et al. 2021).
Here, we address the question, if the archaeological remnants represent a single stay of prolonged duration, or if the remnants resulted from repeated stays of Magdalenian hunter-gatherers. The faunal assemblage is largely characterised by the presence of horse (*Equus ferus*) and reindeer (*Rangifer tarandus*), and the spatial distribution of this material suggests that each species corresponds to chronologically-separated hunting events. The determinable horse remains indicate an age of 5 years and older for all individuals. An attribution, of the hunting episodes, to the spring season has been proposed. However, the two young reindeer individuals, represented by their mandibles, appear to have died in the spring.
We applied stable carbon ($\delta^{13}C$) and oxygen ($\delta^{18}O$) isotope analysis to horse, reindeer, and fox (*Vulpes vulpes* & *Vulpes lagopus*) tooth enamel to further investigate the question of site occupation frequency and seasonality. By sequentially sampling the enamel of reindeer and horse, we can study intra-annual variation in diet and ecology of these important prey species as well as local paleoenvironmental conditions.
Our results identify similarities in intra-species trends that seem to confirm the hypothesis that the analysed individuals died within a relatively short time-frame, with small-scale differences between the species likely indicative of differences in diet or habitat preference, or two separate hunting events. When compared to the wider literature available, our data provide further insights into the decision-making of Magdalenian hunters in Central Europe during the terminal Pleistocene, foregrounding Pleistocene human-environment interactions.

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Palaeoecological reconstruction of the early Middle Pleistocene sites of Grotte à Hominidés and Grotte des Rhinocéros (Casablanca, Morocco) based on tooth wear

The changes in climatic conditions and vegetation landscapes are key factors that have a strong influence on dispersal, occupations, and, more broadly, the evolution of hominins. The earliest evidence of settlement on the Atlantic coast is dated a minima to 1.3 Ma at Thomas Quarry I (ThI) -Unit L in the southwest of Casablanca city (Gallotti et al., 2021). Later, their presence is documented in the same quarry at the Grotte à Hominidés site (ThI-GH, 0.5-0.6 Ma) and a few hundred meters away in the Oulad Hamida 1 Quarry (OH1) at the Grotte des Rhinocéros site (OH1-GDR, 0.5 Ma upper complex and 0.7 Ma lower complex). The latter two sites yield *Homo* fossils, in addition to abundant fauna and lithic industry (Geraads et al., 2022; Raynal et al., 2023). However, the ecological conditions of these early occupations and dispersions in the Atlantic Morocco are poorly understood.

The aim of this work is to reconstruct the paleoecology of the large mammals identified in the archaeological sites of ThI-GH and OH1-GDR, characterizing the diet and habitat of the communities of herbivores through dental wear analysis and integrating these data to understand the palaeoecological context of the early Middle Pleistocene Homo on the Moroccan Atlantic Coast.

Dental remains of large herbivores such as *Ceratotherium mauritanicum*, *Equus* cf. *mauritanicus*, *Phacochoerus africanus*, *Gazella* cf. *atlantica*, *Camelus thomasi*, and Alcelaphini were studied using mesowear and microwear analyses. The two techniques provide dietary information on different timescales: mesowear averages the diet over months or even years (long term), while microwear reveals the diet in the last days/weeks (short term) of an animal's life. A total of 124 molars were selected, molded, and screened under a stereomicroscope at 35× magnification, and 94 were analyzed for the mesowear analysis.

Our results do not show significant differences in the dental wear pattern between the same species from the two sites or among different levels of OH1-GDR. Differences primarily occur between species. On the one hand, mesowear indicates low levels of abrasion for *Gazella*, intermediate for Alcelaphini, and high levels of abrasion for *Equus*, *Ceratotherium*, and *Camelus*, with *Equus* from ThI-GH and *Ceratotherium* from OH1-GDR presenting a more abrasive diet. On the other hand, microwear reveals browse-dominated dietary traits for *Gazella* and *Camelus*, and a mixed feeder tendency towards a grazer diet for *Ceratotherium*, Alcelaphini, *Phacochoerus*, and Equus. Although no species is classified as a pure grazer based on microwear, the high number of scratches (20 or more per species) in mixed feeders indicates significant consumption of grasses. However, all species, both browsers and mixed feeders, exhibit a high number of pits (between 20 and 40). This elevated number, along with the presence of large pits and gouges in all species, is likely caused by incidental ingestion of abrasive grit resulting from feeding close to the ground, a characteristic pattern of open habitats and dry environments (Semprebon and Rivals, 2007).

In conclusion, the dental wear pattern at the beginning of the early Middle Pleistocene is very similar to the pattern identified from the Ahl al Oughlam fauna (around 2.5 million years ago), located in the same region (Ramírez-Pedraza et al., 2023). The striking similarity among taxa, such as *Gazella*, Alcelaphini, or Equidae, is particularly noteworthy despite the temporal gap between the different sites. In both sites, the diet of certain herbivores is linked to an arid climate with open landscapes dominated by grasslands and shrublands.

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Examining southern Burgundy's potential for Palaeolithic cave art

During the last decades, the discovery of new Palaeolithic rock art sites in and outside of Europe lead to an extension of the art's known geographic distribution (Bahn et al. 2003; Clottes et al. 2013; Ruiz-Redondo et al. 2019; Aubert et al. 2014, 2018; Huyge et al. 2011). Parietal art seems to be a more universal cultural practice than assumed in the past. Also, the discovery of more and more sites outside of the "classic" Franco-Cantabrian region highlights that low research intensity could be one of the reasons for the absence of rock art in certain areas.

This could also be true for our research area in Bourgogne-Franche-Comté in Eastern France, a region long regarded as the north-eastern periphery of Franco-Cantabrian cave art. From 2017 onwards, our work at Agneux Caves in Rully (Floss et al. 2018, 2022) allowed us to establish it as the first cave art site in the département of Saône-et-Loire in southern Burgundy, ca. 110km south-east of the sites of Arcy-sur-Cure (Yonne) and ca. 70 km south-west of Grotte des Gorges (Jura).
In this context, the question arose if more yet undiscovered sites with parietal art could exist in southern Burgundy. Generally, the region seemed to be well suited: it has yielded countless open-air and cave sites which show that it was habitually frequented during the Middle and Upper Palaeolithic (Floss 2022). The local karstic landscape has enabled the formation of numerous caves (Guillot et al. 2005). Also, the preexisting rock art sites contradict the idea that the area may not have been used for cultural reasons. Therefore, it was decided to examine the potential of the region for other parietal art sites by using a combination of literature research, GIS-analyses and by carrying out prospections in the caves of the Côte Mâconnaise, the Côte Chalonnaise and into Côte-d'Or. The poster aims to present the specific characteristics of the research area, the surveying approach and preliminary findings.

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A Rockshelter with a View: preliminary results from a re-examination of the Middle Paleolithic small mammal record of Sesselfelsgrotte (Altmühl Valley, SE Germany)

The demise of Neanderthal groups across Central Europe at the end of Oxygen Isotope Stage (OIS) 3 and the role played by contemporaneous shifts in climate and vegetation composition are a keystone topic in Paleolithic research.
Previous studies of the Paleolithic record in the Swabian Jura, SW Germany, suggests that Neanderthal groups occupied the region infrequently and were replaced by anatomically modern human populations as early as 43,000 calBP. Recent analyses of the geoarchaeological and faunal records of the Ach and Lone valleys suggest that climate played a limited role in Neanderthal groups' abandonment of the region.

In contrast, the nearby Altmühl Valley, SE Germany, and particularly the site of Sessefelsgrotte, reveals a rich record of intense Neanderthal occupation throughout OIS 3, including numerous fire residues which are absent from the Swabian record[1]. New research, as part of the National Geographic funded project "SHARP – Testing hypotheses on the transition from Neanderthals to *H. sapiens* at the Paleolithic site of Sesselfelsgrotte," is updating the cultural and paleoenvironmental records from the site using innovative scientific methods. In addition to new radiocarbon and OSL dating efforts and ongoing micromorphological, stable isotopic, and paleogenetic studies of the sedimentary and paleoanthropological records, a renewed analysis of the small mammal (i.e. rodent and insectivore) assemblage integrating taphonomic and paleoclimatological methods is currently underway.

This contribution presents preliminary results on the accumulating agent and paleoecological implications of this rich small mammal assemblage, previously analyzed in paleontological detail elsewhere[2]. Our reanalysis of the small mammal remains from the OIS 3 deposits from Sessefelsgrotte (Unit III, including Schicht E – H, with an expected age between 40,000 and 50,000 years ago[3]) reveals distinct differences in the vegetative composition of the landscape surrounding the site in comparison to the Swabian Jura. A greater presence of open landscapes, including steppe grassland, cold tundra, and patchy forest, was reflected in the biodiversity of the small mammal record when compared to the Hohle Fels and Geißenklösterle records in the Ach Valley[4]. These differences remain, despite newly documented similarities in the mode of accumulation of the small mammal assemblages from Sesselfelsgrotte and the Ach Valley sites, with evidence for the presence of the Eurasian Eagle owl (*Bubo bubo*)[5], an opportunistic avian predator, and inputs from more dietarily selective small carnivores, such as the Arctic and Red fox.

Our detailed taphonomic analysis also reveals the significant impact of post-depositional trampling on the preservation of the small mammal assemblage, reflecting the high occupational intensity at Sesselfelsgrotte during the Middle Paleolithic.

Further, we present new measures of average precipitation, temperature, and vegetative activity period directly comparable to estimates from the Swabian Jura. The presence of thermally altered specimens, recognized as bone surface discoloration and cracking, within distinct sublayers of the G-Complex (eg. G3, G4a and G5) further support claims that fire use was prevalent at Sesselfelsgrotte[1], in contrast to the Swabian Jura sites.

Ultimately, our contribution explores the implications of these new findings on the current picture of Neanderthal settlement dynamics in the region, as well as the correlation between the climatic volatility of OIS 3 and Neanderthal extinction in the region. Finally, we discuss our ongoing and future avenues of research within the SHARP project.

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Objects with intent? Examining the ontological turn in archaeology and its impact on the nature of Palaeolithic research

In recent years, the prevailing theoretical paradigm in archaeology has undergone substantial changes. Formerly characterised by an explicit focus on epistemology, research predominantly centred on the Anthropos – either as the subject studying the past or the agent navigating it. However, contemporary archaeological theory is experiencing a momentous transformation, increasingly influenced by considerations of materiality and ontology. In this evolving landscape, non-human entities, specifically objects and artefacts, are acknowledged as active participants in past processes and as holding considerable importance for our narratives of the past. Advocates of a more symmetrical archaeology, scholars such as Bjørnar Olsen and Christopher Witmore, endorse a non-hierarchical treatment of humans and non-humans as the actors and agents influencing the realities of the past.
The methodological implications of such a theoretical shift, however, are not without contention. Particularly in Palaeolithic research, employing ontological perspectives pose serious challenges to how we commonly conceive of the past. Palaeolithic archaeologists primarily study early hominins and their lifeways, and objects and artefacts have traditionally been perceived mainly as their materialisations and derivatives, and not as being agentive and past-making themselves. Against this background, this paper presents an ongoing bachelor thesis that seeks to examine the so-called ontological turn in wider archaeology and its implications for current Palaeolithic research. Furthermore, it aims to critically reflect upon the applications of ontological theory in the field: Are ontological approaches applied to Palaeolithic problems and how do they impact the nature of our research?
To assess these questions, the thesis will analyse and compare three perspectives on the current discourse surrounding the ontological turn; the proponents, the critics, and those adopting intermediate positions. I will evaluate each perspective's understanding of the ontological turn, its perceived impact on ongoing research, and, if discernible, how this impact is shaping or ought to shape the trajectory of Palaeolithic research, withal highlighting the methods that are adopted through an ontological approach.

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Birds of prey use by paleolithic hunter-gatherers: new insights from Lazaret Cave

Recent studies have shown that the use of birds by Paleolithic hunter-gatherers is an ancient phenomenon, with some archaeological evidence dating back to the Middle Pleistocene in southern Europe (Blasco et al. 2022). The use of raptors during the Middle Palaeolithic has been a subject of considerable discussion, with growing archaeological evidence suggesting that birds of prey held human interest. This evidence extends beyond mere food acquisition and may involve the utilization of secondary products, such as talons, feathers, bones, or tendons. This aspect has also been linked to utilitarian purposes, as well as other cultural, aesthetic, and/or symbolic expressions of Neanderthal behaviour (see Morin and Laroulandie, 2012; Gómez-Olivencia, 2018, and references therein).

The presence of cut marks on raptor bones, particularly on wing and leg bone elements, has been extensively documented (see, for example, Gómez-Olivencia et al. 2018). However, discerning the activities that caused these striae remains challenging, especially in cases where both the removal of feathers and the obtaining of meat could have occurred, as is the case for bones such as the humerus. The humerus, despite having attached packages of meat content, also features the first large wing feathers. The removal of these feathers can leave significant traces on the bones.

In this context, the Lazaret cave has recently provided new data that could contribute to the discussion on this topic. During the first zooarchaeological approach to the avifauna assemblage of the site, numerous bones belonging to birds of prey from different stratigraphic units were identified. These raptor bones were analyzed from a taphonomic perspective to document and describe the observed modifications (Fernández-Jalvo and Andrews, 2016). Notably, in the Archaeological Unit 22 (MIS 6), a humerus bone from a golden eagle (*Aquila chrysaetos*) exhibited anthropogenic damage in the form of cut marks. This study delves into the activities that could have produced these cut marks and compares them with the existing archaeological record.

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Marcel Schemmel[1]

Spatial organisation of Magdalenian sites – An update on Bad Kösen-Lengefeld (Saxony-Anhalt)

Analysing how past humans organised their living and working spaces is a key component in understanding their daily behaviour and social organisation. Quantitative and GIS-based studies of the spatial distribution of artefacts help to identify areas of different activities and assess taphonomic biases.
This paper presents latest insights into the preservation and organisation of the Magdalenian site of Bad Kösen-Lengefeld and explores how geomorphological and human activities contributed to the site formation (Schemmel 2023).
In 1954, the site has been discovered on a plateau 30 meters above the Saale River vis-a-vis the neighbouring site of Saaleck. Over the past 15 years, researchers from the University of Cologne and the Friedrich-Alexander-Universität Erlangen/Nürnberg have excavated an area of around 120 square meters with the final campaign taking place in summer 2023. During those campaigns, more than 14.000 artefacts have been single plotted and form the backbone of this research. The analysis of faunal remains suggests that wild horse and reindeer hunting activities have played a significant role at the site (Richter et al. 2021).
Analysis of the orientation and inclination of elongated artefacts shows that large scale geomorphological events did take place at the site, but due to low energy did not affect the in situ preservation of the find layer. However, small areas were partially disturbed by recent human activity. Regarding the Palaeolithic occupation, seven individual zones of human activity were identified using a combination of kernel density estimation and the newly developed core area index. The activity zones show varying ratios and absolute numbers of lithic artefacts, faunal remains and stone slab layers. Particularly, the analysis revealed distinctive variabilities of tool to blank ratios across the seven activity zones. Drawing on evidence from earlier analysis of faunal remains (Peter 2018), it seems likely that these activity zones correspond to multiple occupations over time.

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HESCOR – A new interdisciplinary project for investigating coupled Human and Earth System processes

HESCOR (Human and Earth System Coupled Research) is a collaborative research project recently established at the University of Cologne. It provides a cross-faculty and multi-disciplinary structure to investigate how the constellations and interactions of the human and earth systems influenced the cultural evolution during the main phases of human expansion. In particular, it aims at bridging the boundaries between the humanities and the natural sciences to make the data generated in both fields mutually fruitful. Expertise is brought together through a team of 22 Postdocs and Principal Investigators from climate and Earth-system science, computational science and machine learning, archaeology, linguistics, and the environmental humanities.
Scientists have long been interested in how climate and other environmental factors influenced human dispersal, but the effort to study the archaeology of climate change was bottlenecked by a lack of knowledge on dynamic human processes and the capacity for quantifying climate-human relations. Within HESCOR, it is planned to model human population and dispersal as a manifestation of the interactions of human and earth system components, both characterised by a large degree of freedom, a range of non-linear processes on different scales, and external forcings which are unsteady or stochastic. Besides a systematic review on how human culture affects large-scale transformation processes that accompany environmental changes, HESCOR investigates spatiotemporally defined case studies ranging from the Palaeolithic to the Neolithic period.
The project, funded by the "Profile Building 2022" initiative of North Rhine-Westphalia's Ministry for Culture and Science, also intends to lay a foundation at the University of Cologne for future research and teaching initiatives on engaging with past, present and future cultural evolution from the perspective of complex system interactions. This poster gives an overview of the project's structure and objectives to reach out to interested colleagues and offer topics for collaboration.

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For more information, please see https://hescor.uni-koeln.de/.

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Animal and hominin fossil footprints on the ancient shores of the 300 ka paleolake of Schöningen

The Schöningen site complex in northern Germany yields new finds and insights year after year. Implements made of wood, bone and stone help to investigate the way of life of the late *Homo heidelbergensis* at the transition to *Homo neanderthalensis*, in a key period corresponding to the cultural and typo-technological shift between the Lower and the Middle Paleolithic. The lacustrine paleoenvironment and the hydrogeological setting of the area deeply affected the archaeological deposits. Erosion, transgression and regression / terrestrialisation phases were induced by seasonal and climatic-driven processes that on the one hand allowed an excellent preservation of the finds, but on the other hand also complicated the overall picture.
In recent years, special attention has been paid to the analysis of the stratigraphic anomalies that were repeatedly recorded in the sediments and that were interpreted in different ways, mostly as geological features. We pointed out that these anomalies were biogenic structures instead, and that they correspond to the tracks left by both animals and hominins that gathered on the shores of the ancient lake during the Middle Pleistocene (Altamura and Serangeli 2023; Altamura et alii 2023; Serangeli and Altamura 2023).
At Schöningen 13 I, Schöningen 13 II-2 Untere Berme, Schöningen 13 II-2, Schöningen 13 II-2-1, and Schöningen 13 II-4, footprints left by elephants, rhinos, large and middle sized ungulated as well as three potential hominins footprints are documented, while more bioturbations are currently under study due to new excavations and a revision of the archival documentation from the site.
This new field of research (ichnology) is offering a snapshot of the ancient biological activity on the shores of this lake and contributes to a better understanding of the ancient landscape, environment and behavioral strategies adopted by the ancient animal and hominin communities of the area at ca. 300 ka ago.

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Midges, Disease, and the Materiality of Birch Tar Production in a Wetland Environment

Birch tar is a commonly used adhesive for composite tools in the Middle Palaeolithic of Europe, having been found in varying quantities and under a range of preservation conditions. Recent research has emphasised the complex process of production of birch tar under anaerobic (oxygen-deprived) conditions, following the investigation of samples found at Königsaue, Germany. There is, however, a much easier production method involving condensation that yields smaller quantities of birch tar, and could be obtained as a byproduct of birch wood fires. *Betula pubescens* and *Betula pendula* were widely available charcoal sources throughout the Late Pleistocene.

Here, we explore the emergence of birch tar use and argue that its application as a hafting agent was likely preceded by processes of exploration involving application to the skin as part of a wider shifting material engagement, and needs to be considered as multimodal. Whereas birch tar of the Middle Palaeolithic has hitherto almost exclusively been discussed in regard to its adhesive properties, other uses have been neglected. Along with its material properties – its colour, scent, and texture, birch tar oil has recently been shown to have a range of medicinal and insect repellent properties when applied to the skin. This includes anti-oxidative, broad spectrum antibiotic and insect repellent properties, and we have documented and investigated its use in an ethnopharmacological context of indigenous L'nuk Mi'kmaq in Unama'kik, eastern Canada.

Considering that Neanderthal use of medicinal plants is recorded in multiple instances, such as at El Sidrón, Spain, and structures of care have been established in different contexts, such as at Shanidar Cave, Iraq, we explore the multimodal affordances of Middle Palaeolithic birch tar. In particular, we focus on its insect repellent properties within the context of the Late Pleistocene ecologies of Europe.

The use of plants with insect repellent properties has been documented at Sibhudu, South Africa, around 77 ka BP, evidencing that potential medical utilisation of plants was not a trait exclusive to Neanderthals, and further demonstrating capacities to mitigate insect-imposed pathogenic pressure during the Late Pleistocene.

In our research, we have focused on a set of sites in northern Germany to initiate our investigations into birch tar as both a medicinal and insect repellent substance and means of signification. At the margins of human occupation, the site of Lichtenberg witnessed the transition from the Eemian interglacial into the Weichselian glaciation. Its archaeological layers Li-I and Li-II date to early MIS 4 and MIS 5c respectively (with bore cores suggesting prior Neanderthal presence in MIS 5e), and contain multiple tools suggesting the use of a hafting agent as indicated by microwear traces. The ecology of the site was shaped by the adjacent Salzwedel palaeolake, the sediments of which have preserved extensive remains of various insect species that have coinhabited the area alongside the Neanderthal communities. These consist primarily of Ceratopogonidae and Chironomidae, and the presence of other flying insect species is indicated. Indeed, the growing wetlands during the later Eemian and discontinuous permafrost in the early to mid Weichselian gave rise to a rich insect landscape that would have created a dynamic pathogenic niche. The insect species at the Salzwedel palaeolake may have acted as vectors for pathogens including Flaviviruses and Arboviruses. Such RNA viruses display rapid mutation rates, and present a significant burden in humans and mammal populations. Indeed, analysis of introgressed Neanderthal genetic material in modern humans has suggested selective pressures imposed by RNA viruses upon Neanderthals.

As such, we consider how birch tar oil may have been explored in multimodal ways leading up to and following the establishment of complex anaerobic fire setups used for the regular production of birch tar for hafting purposes. Given the ease at which birch tar is produced through condensation on stone surfaces, we interpret the emergence of birch tar through the lens of material engagement. The explorative processes at the core of the establishment of complex

anaerobic fire setups would have required experimentation and engagement with the colour, texture and scent of birch tar. Instead of having solely shifted from non-use to utilitarian use, we adopt a more dynamic understanding that frames birch tar use on a spectrum shifting between various applications. Much rather than pre-conceptualised, the production and engagement with birch tar would have been situated within moments of action, generating unique and contextual meanings beyond utilitarianism and representationality.
Application to the skin is not only likely, but fingerprints on birch tar finds from Königsaue demonstrate the engagement involved in its use. Hence, we propose to shift the narrative regarding a material that has received relatively one-sided attention in Middle Palaeolithic research and consider a breadth of applications blurred by preservation bias. The emergent feedback loops between the insect, human, pathogen, and cognitive niches at Lichtenberg and elsewhere gave rise to interactions at the core of the innovations of the Middle Palaeolithic. In considering the unique material and ecological context of the Salzwedel palaeolake, drawing on archaeological, entomological, epidemiological and ethnopharmacological evidence, we attempt to formulate a set of research hypotheses that we will continue to address regarding the multimodal use of birch tar in a medicinal and insect repellent context.

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Natasha T. Singh[1], Rudolf Walter[1], Sibylle Wolf[1,2] & Nicholas J. Conard[1,2]

Beads, burins, bladelets – A functional investigation of burin spalls from Hohle Fels Cave in the Swabian Aurignacian

During the Upper Palaeolithic of the Swabian Jura, hunter-gatherers used ivory as a raw material to produce a diverse array of artefacts. Objects interpreted as personal ornaments account for one category of symbolic ivory artefacts and begin appearing in the archaeological

record of this region in the Aurignacian (Wolf & Conard, 2015). Previous and ongoing excavations at several cave sites yield ivory ornaments in a variety of shapes and forms, but none are as abundant as the double perforated bead form (Wolf & Conard, 2015). For example, Hahn (1992) identified this form in the Aurignacian layers of Geißenklösterle and Conard et al. (2001) identified it in abundance at Hohle Fels in subsequent excavations of the Aurignacian layers. Importantly, Hiller (2003) discusses the standardization of bead forms at Hohle Fels and the striking similarity between the double perforated bead assemblages of Geißenklösterle and Hohle Fels. The work of Hahn (1992) and others provides a plausible production sequence for this bead form based on the identification of different stages of worked ivory at Hohle Fels.
To further our understanding of how the makers of these beads carried out the manufacturing process, a techno-functional exploration of the accompanying lithic assemblage can provide insight into which stone implements were likely used in the various stages of bead production. At Hohle Fels, Bataille & Conard (2018) describe the production of bladelets and microblades from formal burins as a characteristic of a techno-functional variant they name "Hohle Fels IV facies" and hypothesize that the Aurignacian inhabitants of Hohle Fels used these small tools in the on-site production of symbolic organic artefacts, for example to perforate ivory beads. To test this hypothesis, we employ experimental archaeology and use-wear analysis to collect functional data on a sample of burin spalls recovered from Aurignacian layer IV at Hohle Fels. Through optical microscopy at low and high magnifications, we assess the state of preservation of the specimens and, where possible, document the use-related macro- and microtraces on the lithic artefacts with reference to a targeted experimental collection. By evaluating the hypothesized role of these bladelets as drills in the production sequence of ivory beads, our results help to clarify the methods and techniques employed by these Aurignacian craftspeople to produce personal ornaments at Hohle Fels, and reinforce the potential of high-resolution microscopic data in contributing to investigations of functional variability and technological traditions in the archaeological record.

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Alternately effects of climate, landscape, fauna and man in the Holocene primeval landscape of the European Lowlands

Since the beginning of the Holocene the landscape of northern Europe experienced several fundamental changes caused by climate change and humans. Firstly the reforestation from an open vegetation in the Earliest Holocene to deep deciduous mixed forests during the Mid-Holocene Thermal Maximum. Later, forests are again transformed into open landscapes by farmers of Neolithic societies. Only in the late Holocene, beech expanded into the area and become a dominant tree taxon. These changes in landcover during the Mesolithic and Neolithic period are reflected also in the dynamics of the fauna.

Within the project "Climate-Landscape-Fauna-Man" (DFG founding SO 861/2-1) we studied the dynamics and important connections of the interplay between humans and environment during the transformation from Mesolithic primeval forests (with only marginal impact of humans) to a considerably human affected landscape at the end of the Neolithic period. Analysis is based on data compiled for indicator species, i.e. economical important mammals such as wild horse, red deer, moose and roe deer from more than 500 Mesolithic and Neolithic sites (Fig. 11). We used composition and abundance of indicator species as marker for landscape change. Furthermore, we applied stable isotopes analysis (^{13}C and ^{15}N) to explore adaptations of the indicator species to the changing environment. Dynamics of vegetation openness were reconstructed on the basis of numerous pollen records and using the Extended Downscaling Approach.

Our data show that reindeer went extinct in the study area in the course of afforestation soon after the onset of the Holocene at 9.300 cal BC. Wild horse instead disappeared only temporary during the early Atlantic caused by increasing deciduous woodlands. It recolonized the lowlands during the Neolithic period with expanding open areas. Stable isotope composition and dominance of focused large mammal species show species-specific responses along the major Holocene environmental transitions. The pattern of moose, wild horse and wild boar may reflect environmental changes during the course of the Holocene more representative than other focused species. There is no evidence for a human caused overkill of megafauna. Pattern of stable isotopes from indicator species reflect different regional conditions during the Mesolithic primeval landscape and the modelled local dynamics of vegetation openness shows concordance in some extent with the pattern of stable isotopes of megafauna species. In contrast to the lower mountain range, the opening of woodlands by Neolithic humans can be shown in the European Lowlands to a greater extend firstly during the Sub-boreal.

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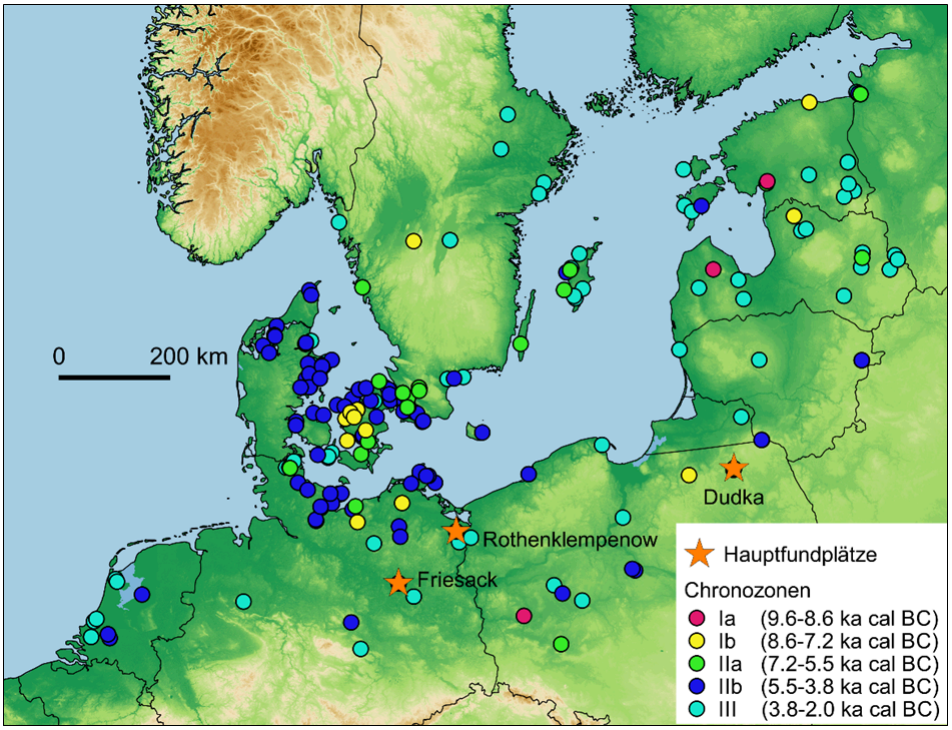

Fig. 11. Working area in the European lowlands with the analyzed Holocene archaeological sites. The focused core sites (i. e. highest numbers of archaeozoological bone remains, presence of a stratigraphy comprising layers representing significant environmental changes, isotope analysis of ungulate bone remains) are displayed with a star (map: www.terrestris.de).

Sonja Tomasso[1] & Veerle Rots[1]

The role of comprehensive functional studies in understanding Palaeolithic technological systems

This presentation explores the pivotal role of comprehensive functional studies in enhancing our understanding of lithic technological systems during the Palaeolithic. It specifically addresses the challenge posed by the often-missing organic components in archaeological materials, highlighting how functional studies bridge the gap between lithic artefacts and the non-preserved organic elements of technological systems. This approach not only deepens our understanding of tool use variability, but also provides valuable insights into the site activities and the dynamic interplay between hunter-gatherers and changing environments. In addition to techno-typological approaches, functional analysis provides direct evidence about the complete lifecycle of stone tools. This allows new insights into previously overlooked functional characteristics of lithic assemblages, such as interactions with organic materials (e.g., handles, worked materials, and knapping hammers) that have decayed and are not directly preserved in the archaeological record. For instance, the functional analysis of Aterian tanged tools has suggested that the incorporation of animal materials into hafting systems may explain observed changes in stone tool morphologies. This implies that the integration of animal materials within toolkits denotes technological flexibility and an adaptive response to environmental changes,

potentially related to fluctuating resource availability and the necessity for versatile technologies.
The presentation will highlight the role of functional studies in understanding Palaeolithic lithic technologies by presenting various case studies from Europe and Northwestern Afrcia. We emphasise the importance of a phased approach. An initial step is to meticulously assess the preservation state of lithic artefacts, including the impact of post-depositional alterations and potential preservation biases unique to the context. Subsequently, a thorough, integrated functional approach that addresses the lifecycle of lithic tools – including traces of production, use, hafting, maintenance, and discard – through the analysis of wear patterns, residues, and controlled experimentation, allows a better understanding of lithic technological organisation. Finally, an integration of the functional evidence with available paleoenvironmental data permits a nuanced understanding of the relationship between site-specific activities and the broader interplay between human activities and their immediate environment. This approach may also offers deeper insights into human adaptive strategies and how they interact with their environment.

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Marlon Transfeld[1], Levin Cavak[1], Andreas Maier[1] & Martin Heinen[2]
Final Palaeolithic settlement patterns in the Niers valley. The case of Bresgespark – southern area

In the framework of renaturation measures along the Niers River in 2021, a cluster of Final Palaeolithic sites was excavated in Bresgespark (Mönchengladbach-Rheydt, Germany) under the direction of Martin Heinen. In nine archaeological test trenches, more than 300 stone artefacts, several charcoal fragments and a few faunal remains were excavated. Here, several smaller concentrations could be identified and distinguished in a northern and a southern area. This paper presents the analysis of the southern area, while the northern area is presented by Cavak et al. (this volume). The southern area comprises two concentrations at a distance of about 25 m from one another. One concentration is located in the dry zone and is centred around a fire place, while the other lies in the shallow water zone of an old branch of the Niers-River that still contained water during the settlement period.
The lithic assemblages are made up of a large variety of raw materials, among which Maas gravel flint dominates. The inventory of both concentrations mainly consists of unmodified blades and flakes and only contains a smaller number of tools, such as backed points, endscrapers and burins. The presence of a fire place together with the heterogeneity of raw materials of different origins suggest a longer period of use for the dry zone concentration. The concentration in the shallow water zone, in contrast, seems rather to reflect a zone for waste deposition. The character of the southern area is thus partially complementary situation to the one observed in the northern area.
However, the relation between the northern and the southern area is still unclear and currently investigated. In addition to a comparison of the raw materials as well as the technological and morphological characteristics, refittings within and between the two areas are currently underway to determine whether the different concentrations were connected to one other or show signs of contemporaneity.

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Excavations at two new sites in Bavaria (Germany) with artifacts of the earliest dispersals of anatomically modern humans into Europe

The exact timing and cultural context of early dispersals of modern humans into Central and Western Europe is still a major question in Paleolithic research. Recent case studies at Bacho Kiro (Hublin et al. 2020) and Ranis (Mylopotamitaki et al. 2024) strongly suggest that assemblages of the Initial Upper Paleolithic (IUP) and the Lincombian-Ranisian-Jerzmanowician (LRJ) were produced by *Homo sapiens sapiens*. Here, we report about excavations conducted by the Institut für Ur- und Frühgeschichte of the Friedrich-Alexander-Universität Erlangen-Nürnberg at two new sites with surface collections yielding artefacts of the IUP and the LRJ.

The open-air site of Herrnsaal (Fig. 12A) is situated some 5 km east of Kelheim in view distance to the Danube and was discovered by M. Hilgart and R. Pleyer. Both independently collected lithic artifacts from the surface, which have been identified as belonging to the Bohunician (Uthmeier et al. 2023). Profiles were opened in several square meters along an artificial drainage ditch (Fig. 12B), which runs parallel to a small road that divides the two agricultural fields with surface finds. In addition, two square meters to the north of the drainage ditch were opened to elucidate the preservation and spatial distribution of potential archaeological layers. Artifacts were found in low numbers immediately below the ploughing horizon in a loess-like sediment overprinted by the Bt-horizon of the Holocene soil formation. Artifacts were vertically stretching over app. 10 cm in depth, but the presence of small artifacts obtained from wet-sieving leaves open the possibility that post-depositional processes were less severe and restricted to small-scale cryoturbation and/or bioturbation. To solve this question, both micromorphological and OSL-samples were taken from the find horizon. The excavated artifacts included formal tools, blanks and cores, which all are technologically and typologically identical to the rich surface finds. The surface finds were so far only preliminarily analyzed using a sample of app. 1,000 artifacts. The indicative pieces among the cores exhibit clear attributes of the Levallois concept, albeit of a specific method described as being typical for the Moravian Bohunician (cp. Skrdla 2017: 37ff.). Numerous exhausted cores have one negative or several parallel unipolar negatives originating from the detachment of Levallois points as target flakes. The respective flaking surfaces were prepared via lateral elongated flakes or blades (éclats débordants). The dominance of preforms and flakes from the initial preparation of raw nodules is indicative of a primary site function as a workshop. Furthermore, the quantity of technological marker pieces ascribed to a Bohunician technology allows a secure correlation with this industry of the IUP. Of special interest is the occurrence of ventrally thinned (Levallois-)points recalling Jerzmanowician points. The linear distance between Herrnsaal and Brno as the center of the Moravian cluster of Bohunician sites is app. 350 km, the distance towards the formerly most western Bohunician site of Hradsko (see Skrdla 2017: 77ff.) is 250 km (Fig. 12A).

The site of Schmähingen-Kirchberghöhle (Fig. 12A) is located in the vicinity of the small town of Schmähingen near Nördlingen, where Jurrasic Malm limestones dislocated and fractured by the meteorite impact were exploited by intense quarrying. One of the quarry walls (Fig. 12C) yields the ruin of a karstic cavity destroyed quarrying activities. Eroded Pleistocene fauna collected from below it since the mid of the 20th century and excavated from the proper site by amateurs led to further destructions until the discovery of three Jerzmanowice points, which put the site into the context of the LRJ (Uthmeier et al. 2018). Three ^{14}C-dates obtained from the surface collected remains of mammoth, bovid and horse resulted in calibrated ages between (Erl-20425) 44,714-48,120 calBP and (Erl-2043) 39,713-

41,886 calBP (Uthmeier et al. 2018: Fig. 4). To elucidate the stratigraphical context of the lithics and faunal remains, undisturbed sediments confined to two quarter square meters near to the westernmost vertical walls of Kirchberghöhle were excavated. Our observations regarding the depth and number of archaeological horizons correspond well with pictures that illustrate the stratigraphical position of the Jerzmanowician points found by one of the amateur excavators. The find horizon is one in a series of sub-layers within GH 2 characterized by debris of different size and different degree of weathering mot probably stemming from the gelifraction of the limestone walls and the roof. The low content of clay speaks against a deep karstic cavity and favors the hypothesis that the so-called "Kirchberghöhle" was in fact a rock shelter or, alternatively, a short cave. Digested bones among the faunal remains support the findings based on the surface collected fauna that the primary function of the site was that of a hyena den. The horizontal orientation of the find horizon, the good preservation of the bone surfaces, and numerous small fragments of faunal remains point to less severe post-depositional processes at least within the excavated area.

Ongoing analysis at Herrnsaal and Schmähingen-Kirchberghöhle are dedicated to 1) the understanding of the sedimentation processes based on micromorphological samples, 2) the absolute dating of the archaeological horizons using OSL- and radiocarbon dating methods, 3) faunal analysis (if preserved) including the application of ZooMS to detect human remains, and 4) lithic analysis (especially in the case of Herrnsaal; the excavated lithic and part of the surface collected material are the topic of an ongoing MA thesis of L. Stiller).

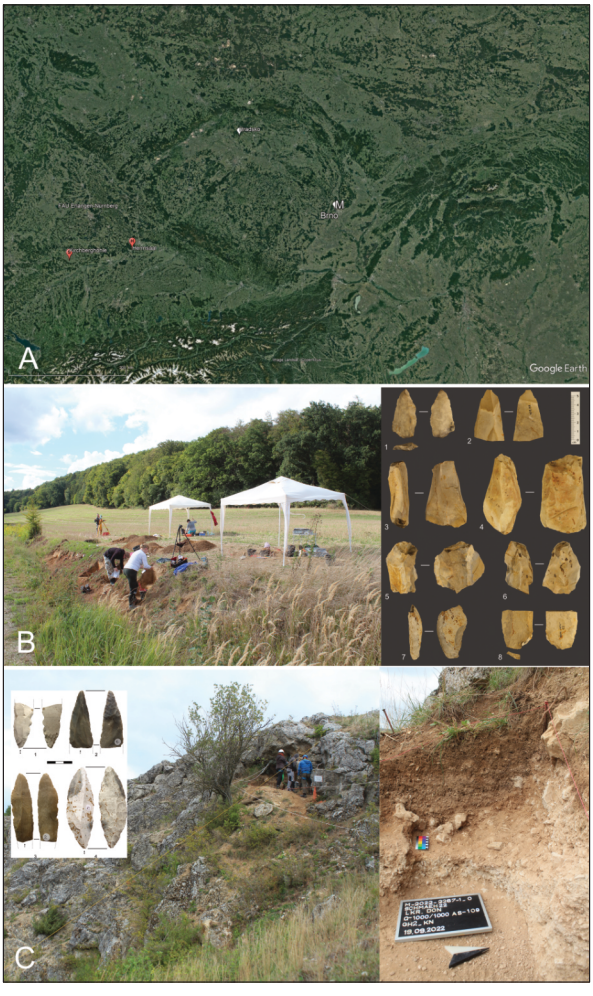

Fig. 12. A - Geographical position of Schmähingen-Kirchberghöhle and Herrnsaal (M is the center of the Moravian site cluster of the Bohunician, Hradsko is the most western Bohunician site known so far; map: Google Earth, Data SIO, NOAA, U.S. Navy, NGA, GEBCO, Image Landsat/Copernicus, Image IBCAO, Image U.S. Geological survey, picture taken 12/14/2015, hight 683.43 km);
B - Herrnsaal, view from east with excavated square meters along the drainage ditch (in the foreground) and on the agricultural field (below the tents), and Bohunician artifacts (surface collection M. Hilgart) (photos: Th. Uthmeier, M. Weiss);
C - Schmähingen-Kirchberghöhle, view from southeast with the position of the remnants of the cavity and it´s filling (the people are standing on the surface of the sediments, the excavated square meter is at the western limits of the preserved sediments near to the tree), and view from the west on the square meter under excavation (white arrow: horse tooth indicating the stratigraphical position of the archaeological horizon; artifacts in the inserted figure were taken from Uthmeier et al. 2018: Fig. 6).

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Exploring Mousterian Cultural Dynamics in the Northwestern Technocomplex: A Techno-functional Approach

The early Weichselian period witnessed the emergence of the Northwestern technocomplex, spanning a vast geographical region from the Paris Basin to the Rhine River. This technocomplex is characterized by a unique lithic industry, with the production of flakes, points, and blades. Although these productions appear mostly contemporaneous, their representation varies across sites in northern France, where extensive excavations have been conducted through three decades of preventive archaeology, yielding numerous opened air sites and a strong understanding of the stratigraphic sequence of the region.
Positioned as a crossroads between Late Middle Palaeolithic cultures of eastern central Europe and the well-documented region of southwestern France, the Northwestern technocomplex prompts inquiries into the origins of its diverse lithic industry. Indeed, some scholars posit that

this unique lithic industry may be attributed to a confluence of influences resulting from successive migrations of different cultural groups responding to climatic variations.
But how can we assess the footprint of different mousterian groups in one region? Beyond the lithic components themselves, would it translate in the archaeological records in different «lifeways» regarding strategic economies and territorial behaviour ? Moreover, if those various influences can be demonstrated, would it be possible to consider the cultural structuring of Neanderthal populations of Western Europe?
Drawing upon historical methodologies employed to investigate these questions, this presentation introduces a techno-functional approach implemented in an ongoing PhD research. This approach shifts the analytical focus from emphasizing differences in productions to interrogating similarities between various products, whether retouched or not. By adopting this perspective, the research aims to shed light on the nuanced techno-economic strategies employed by Mousterian groups in the Northwestern technocomplex. Through a comparative analysis of the techno-functional aspects and considering existing knowledge about the lithic production within the technocomplex, the study seeks to enhance our comprehension of the cultural dynamics and economic strategies of the mousterian populations during the early Weichselian.

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Turtle with leafpoint – New Middle Weichselian finds from the Elbe gravel pit Barleben-Adamsee near Magdeburg

The Middle Elbe valley near Magdeburg with its numerous gravel pits has long been known as a region of archaeological finds from the Middle Pleistocene to the modern period (Weber & Beye 2015). The data from artefact (even flake) attribute analyses suggest for most of the assemblages a temporal correlation with the Saalian Glaciation (Weber 1997, 194, Abb. 6). The Barleben-"Adamsee" gravel pit forms a new source of exciting discoveries, relating to the Middle Palaeolithic. Already in 1998/99, a sharpened rib from the Ur was found there, which yielded a ^{14}C date between approx. 33,000 and 32,400 BC (Weber 2023).
From 2008 until the closure of the site in 2021, the volunteer archaeologist Uwe Beye collected stone tools and bones on the vibrating screen of the dredger (Beye et al. 2017), which would otherwise have fallen back into the dredging lake and therefore lost forever. Unfortunately, this

recovery method causes difficulties with the stratigraphic classification of the pieces collected by the sieve: even if the dredging depth is known, objects from higher layers may of course have slipped into the depths during underwater excavation. These finds include hand axes in the typical shapes of the last ice age, scrapers and leaf points (Beye & Weber 2012), but also the waste pieces from the production process – core stones and flakes – mostly of "Middle Palaeolithic style". Remains of prehistoric and medieval pottery from the Early Neolithic to the Medieval "blue-grey" design were also recovered.

The Palaeolithic flint artefacts (including the "waste" with cores and flakes), however, seem to be technologically homogeneous, as far as one can tell from the not always clearly distinguishable individual pieces. Figure 13 – a multidimensional scaling of eight flake attributes – shows the well known trend from modern experimental hard impact technology to the "Clactonoid", the "Levalloid", the (latest) Interglacial Middle Palaeolithic and the Weichselian Middle and Early Lower Palaeolithic artefacts. Here the trend is visible from the diagram´s

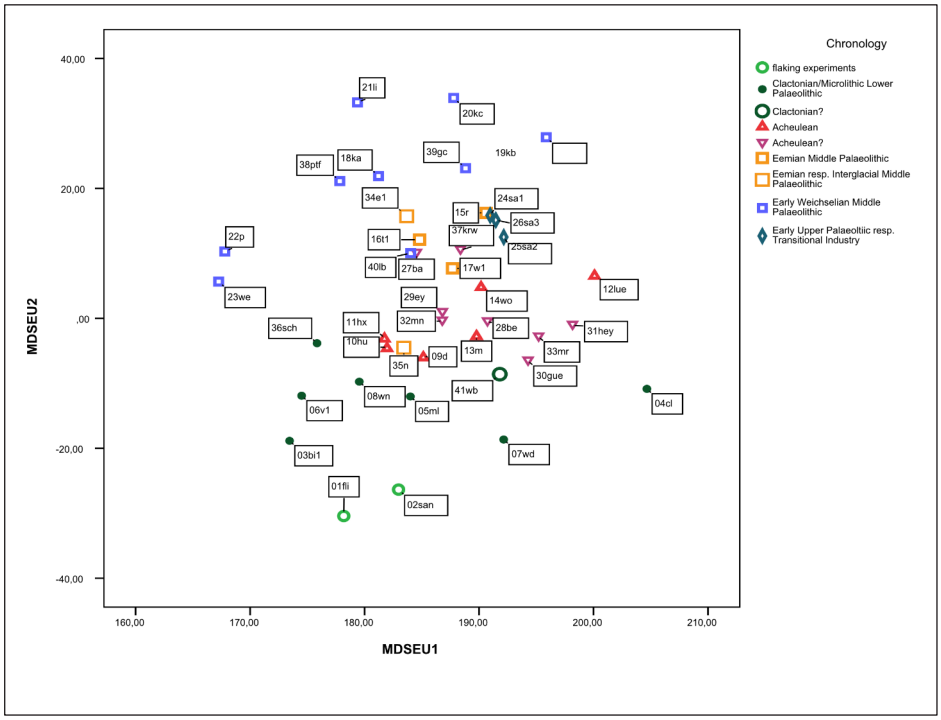

Fig. 13. Multidimensional scaling of eight markers for tlint flake technology in a two-dimensional representation. *Attributes:* lbix - arithmetic mean of the length-width indices; rdix - arithmetic means of the relative thickness indices; wtix - arithmetic means of the width-depth indices of the striking platform remnants; asqux - arithmetic means of the quotients of the (theoretical) areas of the area (length x width) of the flakes and the (theoretical) areas of the striking platform remnants (width x depth); schlagwx - arithmetic mean of the (internal) flaking angles; primsfr - relative frequencies of the flakes with striking platform remnants covered exclusively by the primary surface; facsfr - relative frequencies of the flakes with striking platform remnants exclusively or partially covered by faceting; zdf1 - relative frequencies of the flakes with dorsal surfaces exclusively covered by negatives. *Assemblages:* 01fli – flaking experiments with flint impact stones; 02san - flaking experiments with sandstone impact stones; 03bi1 - Bilzingsleben-Flint; 04cl - Clacton-on-Sea (GB); 05ml - Memleben, Burgenlandkreis; 06v1 – Vértesszölös-Flint (HU); 07wd - Wallendorf, Saalekreis; 08wn - Wangen, Burgenlandkreis; 09d - Delitzsch-Südwest, district Nordsachsen; 10hu - Hundisburg, distict Börde; 11hx - Hoxne, Mid Suffolk (GB); 12lue - Lübbow, district Lüchow-Dannenberg; 13m - Markkleeberg, district Leipzig; 14wo - Woltersdorf, Oder-Spree district; 15r - Rabutz, North Saxony district; 16t1 - Taubach, Weimar district; 17w1 – Weimar-flint, district Weimar; 18ka, 19kb, 20kc - Königsaue, Salzlandkreis, A, B, C; 21li - Lichtenberg, district Lüchow-Dannenberg; 22p - Petersberg, Saalekreis; 23we - Westeregeln, Salzlandkreis; 24sa1, 25sa2, 26sa3 - Samuilitsa (BG) 1, 2, 3; 27ba - Barleben-Adamsee, district Börde; 28be - Bertingen, district Börde; 29ey - Eythra, district Leipzig; 30gue - Gübs, district of Jerichower Land; 31hey - Heyrothsberge, district of Jerichower Land; 32mn - Barleben/Magdeburg-Neustadt; 33mr - Magdeburg-Rothensee; 34e1 - Ehringsdorf, district-free town of Weimar, district-free town of Weimar; 35n - Neumark-Nord, Saalekreis; 36sch - Schöningen, district Helmstedt; 37krw - Krähenwinkel, Hannover region; 38ptf - Pouch-Terrassenpfeiler, district of Anhalt-Bitterfeld; 39gc - Goitzsche, district of Anhalt-Bitterfeld; 40lb - Löbnitz, district of North Saxony; 41wb - Haldensleben-Wichmannsdorf (Wichmannsburg), district Börde.

lower (left) part through its central position with Clactonian and more or less "mixed" sure and unsure Acheulian flake samples up to the Eemian and Weichselian inventories in the uppermost area. Barleben-Adamsee is situated together with the clear Weichselian finds from Löbnitz – but also not far from Eemian Ilmtal inventories (Weimar and Taubach).
Fortunately, the finds from Lake Adam provided the opportunity for a series of ^{14}C dates on faunal remains, which yielded an astonishingly consistent picture for the Ice Age animal remains. Following the discovery of a carapace fragment of *Emys orbicularis* that surprisingly belonged to the period between 41985 and 41228 a cal BP (Beye, Prilloff & Weber 2023, 46), eight further dates on four other apparently unrelated fragments yielded values between >49000 and 41319 a. Even if we have to reckon with the so-called "hard water effect" in creatures that feed on aquatic organisms - such as turtles - which leads to "too high" ^{14}C dates, these distortions in the Elbe river system do not reach a maximum of 1500 years, however, to the extent that Holocene dates actually appear as supposedly Weichselian-high glacial. 1 Other faunal elements also appear to belong to this period, such as a mammoth molar (>49,000 – 43,205), a rhinoceros tooth (39,137 – 37,273) and a hyena femur (46,556 – 43,060) (S. Lindauer, report from 06. 03. 2023). Obviously these data correlate with the MIS 3 (57-27 ka BP), without it being possible at present to assign them more precisely to a stadial or interstadial within this period.
Notes: Dr J. Meadows (University of Kiel) wrote me on 03. 11. 2023: "I assume that the diet of the pond turtle includes many aquatic organisms; if so, in most situations its radiocarbon age will be misleadingly old, depending on the freshwater reservoir effect (FRE) in the water body concerned. This varies over space and time, so it is difficult to know exactly what age correction would be applicable to your material. However, the largest FRE in modern material from the Elbe seems to be e. g. 1000 years, perhaps 1500 years in some tributaries, which is probably within the margin of error of the uncalibrated dates when you have such old bones. Since FRE is fundamentally determined by geology, I would not expect the Pleistocene situation to have been dramatically different. FREs have a theoretical upper limit of about 5500 ^{14}C years, due to the way carbonic acid is formed in the soil before dissolving carbonate bedrock, but in practice there is a lot of exchange between freshwater and the atmosphere, resulting in much smaller FREs."

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It's the small things that matter – detecting find layers based on small flakes. A case study from Drelsdorf, Schleswig-Holstein and a contribution to distinguish artefacts from geofacts

Drelsdorf in Schleswig-Holstein is currently the northernmost Middle Palaeolithic site that we know of (Hartz et al. 2022). The site is known since the 1970s for Middle Palaeolithic artefacts, like cores, flakes, and scrapers found on the surface. All these artefacts show surface modifications, such as edge and surface abrasion, brown patination, gloss, and sometimes cryo-retouch. During test excavations in 2021, we detected freshly preserved flakes and tools in cryoturbated sands and silts, and in 2023, we started a large-scale excavation in Drelsdorf which will be continued.

Within the sediments excavated so far, we found 69 flakes ≥ 2 cm, and more than 200 small flakes during wet screening of 1100 l of sediment. Unfortunately, due to the proximity of about 25 km to the Weichselian glaciers during MIS 2, the sediments are highly disturbed by periglacial processes, making spatial analysis and dating of the site challenging.

Here we present a method to reconstruct the original find layer sediment based on the small flake distribution. Due to cryoturbation, however, we must assume that some of the small flakes can be a result of natural processes. Given that – we use the term flake in a neutral way: as a removal from a flint object either by natural processes or by humans. To help distinguishing natural from artificial flakes, we developed a new combined field and lab method. In a first step, we sorted the screening fraction in the field and attributed the flint pieces into three different categories: potential artefacts, insecure pieces, and potential geofacts. Afterwards, these pieces were discussed in the team and only the most promising pieces were included in the following analysis. In a second step, the potential artefacts were checked with a stereomicroscope with a magnification up to 120x and again divided into two groups: potential artefacts based on microscopic evaluation, and potential geofacts. Up to this point, the entire methodology had some subjectivity based on individual knowledge and experience of the researchers. Therefore, we adapted a scoring system for flakes based on Peacock (1991) and Wiśniewski et al. (2023) to our assemblage to evaluate the artificial or geological character of the two groups. Additionally, we screened 100 liters of cryoturbated gravelly-sandy sediment from a nearby gravel pit, and 100 liters of moraine deposits, both sediments where no archaeology occurs. 163 natural chips from these screening fractions were also scored with the same method. Next, two handaxes were produced by a professional flint knapper (Harm Paulsen, Schleswig), using hard and soft hammer percussion respectively. 469 small flakes originating from edge retouch and surface shaping were scored to include the variability of unquestionable artifacts. Finally, we included 100 small flakes from the site Lichtenberg I/ Lower Saxony that are the result of bifacial tool shaping and edge retouch, as well as 100 small flakes from Sesselfelsgrotte/ Bavaria, layer G1. This last step was done to add data from other Late Middle Paleolithic sites. The complete scoring process was done under the stereomicroscope, or a Dino Lite microscope, respectively.

As a result, in the Drelsdorf small flake assemblage we could confirm the distribution patterns for geofacts and artefacts found and defined by Peacock (1991). We could confirm the artificial character of most of the pieces classified as artifacts prior to scoring. On the other hand, we could also detect some potential artefacts among the group of pieces that were classified as geofacts prior to scoring. Finally, the spatial distribution of the artefacts within the sediments provides good proxy for detecting the original find layer sediment.

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

Osseous artifacts and the raw materials selected to produce them have the potential to reveal novel insights into cultural values, norms, and belief systems. Beyond the form or function of the artifact, understanding why bone was chosen over stone for particular artifacts and which species were selected can reveal the status, treatment, and relationship those animals had with past societies.
Since the processing of bones usually removes the diagnostic features that are otherwise used for the macroscopical taxonomic identification of faunal remains, heavily worked artifacts are usually not identified in terms of their raw material on a species level. Applying ZooMS (Zooarchaeology by Mass Spectrometry) can help identify such heavily worked osseous artifacts. To deepen our understanding of jewellery production and the animal-human relationships in early agricultural societies of eastern Europe, this study analyses beads from two Late Neolithic/Early Copper Age graves at the site Movila lui Deciov in Romanian Banat (mid-5th Millennium BCE).
Taphonomic processes made stone and bone beads indistinguishable in many cases. Hence, FTIR-ATR (Fourier Transform Infrared Analysis using Attenuated Total Reflectance) was applied prior to ZooMS to avoid errors in material identification. For the ZooMS analysis, non-destructive (eraser and ammonium bicarbonate methods after Fiddyment et al. 2015, and van Doorn et al. 2011) and destructive extraction strategies (acid base methods after Buckley et al. 2009) were applied and compared for their effectiveness. FTIR-ATR analysis showed how calcite deposits in bone beads can lead to a limestone-like appearance. The results indicate a possible connection between calcite deposits and the degradation of protein in the archaeological record, which led to the failure of the non-destructive extraction methodologies. Further research on the relation between calcite deposits and ZooMS could enhance the method's success rate and our knowledge of related depositional processes.
The beads that could be successfully identified to taxon were made from deer (*Cervus elaphus)*, goat (*Capra*), pike (*Esox lucius*), and perch (*Perca fluviatilis*). These species belong to the everyday life and subsistence of the associated people and correspond to the concept of raw material

selection of subsistence-slaughter products introduced here. These results deepen our understanding of human-animal relations and expand our picture of Late Neolithic/Early Copper Age grave goods.

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Treasure between rubble: Lithics from Itireleng and Maralaleng, southern Kalahari, Botswana

Lithic artefacts from land surfaces and excavations provide valuable information regarding the potential for stone age and open-air archaeology. The analysis of lithic technology also plays an important role concerning possible connections between different sites within nearer and farther regions and also different and parallel time periods. Desert-like environments like the southern Kalahari are particularly suitable for open-air archaeology because numerous lithic single finds and lithic scatters can be found at various locations on the surface of this landscape, as well as underneath it.
A part of this landscape is the pans around the town of Tsabong in the Kgalagadi- Southdistrict of southern Botswana. Despite there have been early reports of evidence for possible Stone Age sites, for example by E.T. Wayland in 1920 and from other sources like permit reports and impact assessments (Ecker et al. 2023; Wayland 1920), publications concerning the rich Stone Age archaeology of this region are rare. Excavations at one of these pans, Seo Pan, were conducted in 2014 by T. Hardaker and P. Segadika, but the results have not been published yet.
The Kgalagadi Human Origins Project (KHO project) has conducted surveys and excavations at different pans and sites since 2021 (Ecker et al. 2023). Qualitative and quantitative analysis of lithics can hereby be used to assess and interpret prehistorical sites concerning possible time frames of occupation, geographical connections to areas with well-studied records as well as human behaviour and mobility in the past.
This study presents the results of the analysis of lithics yielded from several test excavations during the KHO project's survey at two sites: Itireleng and Maralaleng Pan in July and August 2022. The goal of the study is to provide a preliminary report on lithics from this region that can be used as a starting point for further research on the subject. Over 2000 stone artefacts from six different test pits were collected, counted, and categorised into lithic types. About 25% of them, coming from four different test pits, were assessed more closely. This analysis was performed with the help of a catalogue of attributes and documented with several photos of each artefact. This catalogue features over 30 different attributes concerning technological and typological details.
The results of this lithic analysis are presented as a collective of artefacts. The Itireleng and Maralaleng collective included a very small number of handaxes, modified cores and a higher number of triangular-shaped flakes and blade-like flakes with and without retouch. Similar types of assemblages representing a simple flake based toolkit, can also be found in other assemblages from the southern Kalahari in South Africa. In the interior of South Africa, at the

edges of the Kalahari basin sediments, there are several sites, mostly in the Kuruman Hills and at the Vaal River region, that yielded, among other things, similar combinations of lithic artefacts. These assemblages have been defined as belonging to the Fauresmith, a period attributed by some to the end of the Earlier Stone Age and some to the start of the Middle Stone Age. The Fauresmith is roughly dated between 233.7–471.5 ka (Lombard et al. 2022). The comparisons of assemblages belonging to the Fauresmith from Canteen Kopje, Pniel 6 and Kathu Pan 1 exhibited a number of parallels that lead to the conclusion, that the Itireleng/Maralaleng collective's lithics might have been manufactured in a similar matter, toward similar goals and therefore possibly within a similar timeframe (Kuman et al. 2020; Wilkins/Chazan 2012).
We conclude that the sites of Itireleng and Maralaleng Pan near Tsabong might have been occupied and used by early humans at some point during this period, which would increase the geographical extension of the Fauresmith technocomplex.

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Reassessment of the Aurignacian Lochstab of Geißenklösterle Cave and its Find Context

In 1983 Joachim Hahn and his team excavated worked mammoth ivory fragments in the Aurignacian layers IIb and IIa of Geißenklösterle Cave near Blaubeuren in the Ach Valley, southwestern Germany (Hahn 1988). Finds of these archaeological horizons date back to appr. 37,700-40,700 cal BP (Higham et al. 2012). Hahn assembled the ivory fragments into a so-called Lochstab. The preservation of the artifact was not optimal. The fragments underwent taphonomic processes and the Lochstab was very fragile. Four perforations with spiral rifling

were preserved and the Aurignacian craftspeople carved v-shaped notches on one edge of this artifact.
2015, in the neighboring Hohle Fels Cave near Schelklingen, Nicholas Conard and his team excavated an almost complete Lochstab made from mammoth ivory, also with four perforations (Conard and Malina 2016). This tool is more massive in diameter than the object from Geißenklösterle Cave. The latest investigations show that Aurignacian people used the Hohle Fels Lochtab for rope making (Conard and Rots, accepted).
This find provided the impetus to re-examine the similar artifact from Geißenklösterle. The mammoth ivory Lochstäbe are unique artifacts from the World Heritage cave sites of the Swabian Jura (Riek 1934; Hahn 1988; Conard and Malina 2016). They bear witness to the early manual skills of our ancestors. Our aim was therefore to verify the current composition of the Geißenklösterle artifact and to reassemble the piece as completely as possible with other fragments that Hahn was unable to refit, in order to preserve the cultural heritage in the best possible way. This project was realized by restorer Eva Schreiber and team in the workshops of the Landesmuseum Württemberg Stuttgart. We present the restauration procedure. We also document the find context for this particular artifact as accurately as possible. As a result, we reconstructed the Lochstab from Geißenklösterle Cave with a larger volume than before. Its preservation as well as the circumstances of its discovery allow conclusions to be drawn about the daily life of hunter-gatherers in the Aurignacian in the Ach Valley.

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Excursions

Tim Schüler

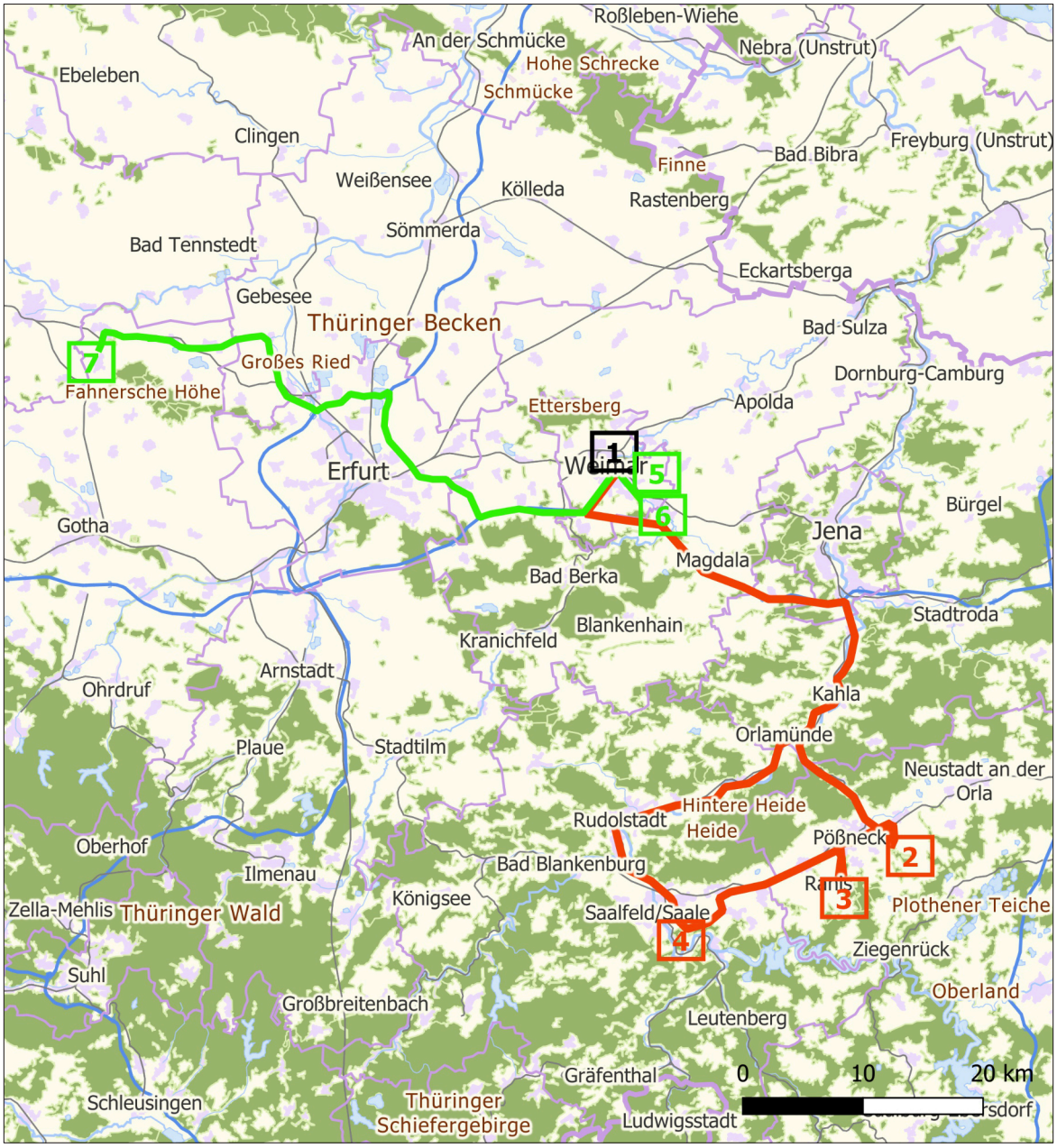

Fig. 14. Map of the excursion destinations. Black: 1 - Start and End for both excursions in Weimar. Red: Day 1, 2) Döbritz, Kniegrotte; 3) Ranis, Ilsenhöhle; 4) Saalfeld, Teufelsbrücke. Green: Day 2, 5) Travertine sites Belvederer Allee/ Parkhöhle; 6) Weimar Ehringsdorf quarry; 7) Burgtonna/ Gräfentonna travertine quarry.

The excursion on the first day takes us to the Palaeolithic sites in the area of the Zechstein reefs in the northern Thuringian Forest. The route runs through the Saale valley with many other sites, including the well-known Ölknitz site, but also sites dating from the Mesolithic to the Middle Ages. The second day of the excursion includes sites from the Middle Palaeolithic in the various travertine deposits. Weatherproof clothing and sturdy shoes are required for both excursions.

Friday, April 5th, 2024

The meeting point is the Museum of Prehistory and Early History in Humboldtstraße. First we drive into the Saale valley. We pass an area with sinkholes near Göttern. A Mesolithic site has been documented there during road construction work. Then we turn into the middle course of the Saale, which is rich in sites. Near Rothenstein, the Ölknitz site is located on a spur leading into the Saale valley; near Schöps, a small Magdalenian settlement was excavated. Today the road leads over a burial ground from the Latene period. At Kahla we pass the area of the Kahla-Löbschütz site. In Orlamünde, we leave the Saale valley and continue along the Orla valley. Near Freien Orla there is a Latene period burial ground on a slight hill. In Pößneck, we turn off into the old Orla valley. Shortly before the turn-off to Döbritz, we pass the Gamsenberg, where quarry work has opened up a crevice filling. During excavations by D. Schäfer, Pleistocene animal remains and Middle Palaeolithic artefacts belonging to the Keilmesser group were found there.

2: Döbritz (also known as Döbritzer Schweiz)

Fig. 16. Döbritz, Kniegrotte.

The path to the caves is not very far and leads across a meadow on a slope. Due to time constraints, we are unable to visit the site Wüste Scheuer.

2a. The cave Kniegrotte was excavated by Richter in the 1930s. A pavement of Kulm shale slabs was found in front of the cave. The material found is very extensive and has been published by Höck. Particularly noteworthy are the engravings depicting animals and the microliths found in the artifact spectrum.

2b: The Urdhöhle was also excavated by Richter after the Second World War. Particularly noteworthy are the human skeletal remains, which were originally dated to the Upper Paleolithic. However, radiocarbon dating revealed a Mesolithic age. aDNA analyses were carried out on the skull. The haplogroup identified corresponds to other Mesolithic population groups. The recovered artifact spectrum is not very extensive and can be placed in the Magdalenian. There is a profile in the area of the northern cave exit that was documented once again by Rudolf Feustel. This profile was opened again in 2023 to obtain samples for sedimentological analysis and dating. The results are still pending.

3: Ranis, Ilsenhöhle and Ranis Castle Museum

Fig. 17. Ranis, Ilsenhöhle.

The Ilsenhöhle lies directly beneath Ranis Castle and was first excavated by the owner of the castle, Dietrich von Breitenbuch in 1927. After he had excavated the medieval layers and the first stone artifacts were discovered, Werner Hülle took over the excavation in 1932 and continued it until 1938. In a basal layer, he found both bifacial leaf points and Jerzmanowice blade points alongside a large number of animal bones. From 2015 - 2022, re-excavations took place in the area of the main profile from 1934. The basal layer sequence could be reached after the removal of large roof collapse blocks. It is particularly noteworthy that human bones are now also present. The first aDNA investigations revealed that only *Homo sapiens* fossil remains are present in the leaf point layer. The age of this archaeological horizon was determined to be at least 45,000 years old.

After visiting the Ilsenhöhle we will visit the exhibition at Ranis Castle and eat our packed lunches.

4: Saalfeld, Teufelsbrücke

The site Teufelsbrücke is located on an exposed south-west-facing section of the Gleitsch (a hill with Zechstein reefs on the top). To reach this point, we have to walk about 2 kilometers. The geological formation Teufelsbrücke was formed by the collapse of parts of the cave roof. During excavations by Rudolf Feustel, numerous finds were recovered. The animal bones were recently re-analyzed by Werner Müller. On the hike to the site, we also pass a Mesolithic surface site. Along the way there are always wonderful views of the Saale valley.

Fig. 18. Saalfeld, Teufelsbrücke.

Saturday, April 6th, 2024

5: Weimar, Parkhöhle

This cave system was first used as a brewery sewer in the 19th century and later as a quarry. The Parkhöhle is located in the middle of the extensive travertine body on Belvederer Allee in the city of Weimar. The first stone artifact was found here in 1871 by the geologist Karl von Fritsch in quarries along this road. Wolfgang von Goethe and his son August collected extensive paleontological finds here as early as 1800. The genesis of the travertine is well documented by boreholes and other outcrops. The geologist Walter Steiner then developed a facies model. The base layers of the travertine, from which the archaeological finds originate, can be viewed in the outcrops of the Park Cave. A new exhibition on the history of the Parkhöhle will open in March 2024, which we will be the first to visit here.

6: Weimar Ehringsdorf quarry

The quarry is still active today, although the travertine has already been mined industrially since 1900. Particularly noteworthy are human finds from the period between 1914 and 1925, which come from a small settlement area with hearths (Brandschichten). There is now an open-air museum in the area of the Brandschichten layers. The current quarry can also be visited. Because of the use of diamond wire saws, the layer structures of the lower travertine with the current find layer are very clearly visible there.
Finds can be viewed in the nearby former agricultural estate, now a branch of the Thüringisches Landesamt für Denkmalpflege und Archäologie. We also take our lunch break there.

Fig. 19. Weimar Ehringsdorf quarry.

7: Burgtonna travertine quarry

The travertine of Burgtonna is best known for the discovery of straight tusk elephants in the 17th century. W. E. Tenzel recognized the large mammal bones here as elephant bones and thus heralded the beginning of modern Quaternary paleontology. Later, a few stone artifacts were also found. Intensive quarrying activities began in 1990. The quarry front moved further and further north. The outcrop visible today lies in a valley facies and is characterized by cascades and basins filled with travertineous sand. This structure is clearly visible on the profiles. Above the travertine lies a thick Weichselian cover layer of loess with soil formations. Please wear sturdy shoes when visiting the quarry. Afterwards we return to Weimar.

Fig. 20. Burgtonna travertine quarry.

Report on the 64th Meeting of the Society in Aarhus

Felix Riede, Jesper Borre Pedersen & Trine Kellberg Nielsen

In 2023, the Hugo-Obermaier-Society went abroad – northwards – for its 64th annual conference. From April 11th – 15th, members convened in Denmark's 'second city', Aarhus, for a lively exchange of ideas and news on all things Quaternary. The war in the Ukraine was still ongoing and the restrictions and uncertainties we all experienced during the Covid pandemic were also still fresh in everybody's minds. In this respect, it was all the more joyful and enjoyable that we could meet quite freely this year for an annual conference that, despite those worries, felt quite normal.

The science discussed at this meeting was far from normal, however, as many exciting discoveries from the field and the laboratory were presented, some for the first time. The Society had never been in Denmark before, and never this far north for one of its meetings. The theme of the meeting – "Going to extremes – hominin lives at ecological margins" – was therefore very apt given that Scandinavia in many periods likely represented the very periphery of the hominin niche. Our meeting – co-hosted by the Department of Archaeology and Heritage Studies at Aarhus University and Moesgaard Museum – was graciously hosted by the Aarhus Institute for Advanced Studies (AIAS) on the first and third days, while Moesgaard Museum (MOMU) acted as host on the second day. Following opening addresses by AIAS' deputy director Ms. Lotte Holm, the conference hosts, and the Society's president, presentations commenced – mostly in-person, some from online – in traditional chronological order from the Lower Palaeolithic to the Mesolithic. The geographical scope of the 64th conference was vast, reaching Africa and the Middle East, as well as all parts of Europe.

Fig. 21. Evening lecture by Dr. Trine K. Nielsen (Moesgaard Museum/Aarhus University): *Searching for hominins along their northern extremes – a Fennoscandinavian perspective.*

The excellent modern facilities of the Aarhus Institute for Advanced Studies and the inspiring historical setting of Moesgaard Manor and the new museum next to it provided an uplifting setting for the presentations and discussions. The oral presentations were of consistently high quality with some sparking great excitement. Sarah Pederzani, for instance, gave us a glimpse of then still forthcoming results from Ranis Ilsenhöhle and provided tantalising clues to the remarkable new results of early *Homo sapiens* in Europe that have since been published. Very

different but no less exciting, Petr Neruda revealed a new find of a Magdalenian engraved pebble with the overlying images of a horse and a mammoth. The solid mix of new finds, new results from cutting-edge laboratory analyses, and insights emerging from new computational analyses aptly showcased the strengths of Palaeolithic and Mesolithic archaeology in general, and of the Society's members in particular.

It is worth noting that the 64th Annual Meeting of the Society saw a record number of poster submissions, which we see as a positive trend. Many projects and results can be presented very well in this form. A good poster session takes the pressure of the oral presentation part of the meeting, and it is also nice to hold more dynamic and detailed conversations near the posters. In this spirit, the Aarhus meeting included two poster sessions, one over evening drinks at the end of the first day, the other over morning coffee at the beginning of the third day – both were a great success. True to tradition, the meeting also included a public lecture, which was given by Moesgaard Museum's own Trine Kellberg Nielsen on the topic "Searching for hominins along their northern extremes – a Fennoscandinavian perspective". After the evening lecture we also had a lovely and very Nordic conference dinner.

Fig. 22. Participants of the annual meeting inspecting the Mejlgård kitchen midden, today a forest floor.

Following the first three days – filled as they were with presentations and posters – a select group of Society members braved the usually temperamental Danish April weather and headed out on an excursion. Our route took us northwards from Aarhus out towards the large peninsula known as Djursland – the land of the animals – where 1st year archaeology students from Aarhus University gave a tour of the prehistoric landscape. One of our stops did feature a Late Palaeolithic open air locale, but given the paucity of Palaeolithic sites in Denmark in general, the excursion also included stops at sites of younger date. These included the prominent Late Mesolithic Ertebølle shell-midden, and locus classicus, Mejlgaard, which were the scene of the earliest excavations by the Kitchen Midden Commissions of the Danish National Museum in the mid-late 1800's, marking the cradle of Danish archaeology. Now situated 6-7 meters above sea level due to land-rise, and part of a forest, it is still marked by the Sorteå (Black River), which

approximately aligns with the ancient shoreline. Other stops included various Neolithic monumental tombs, Bronze Age barrows, as well as a Medieval castle ruin, all interspersed with a hearty lunch at a local inn, where we were served the classic Danish open-faced sandwich called stjerneskud (shooting star). The weather was kind to us and the beautiful landscapes of Djursland, together with the spectacular monuments, made for a very worthwhile first excursion.

Fig. 23. Lunch at the local inn in Gjerrild, Djursland.

The second excursion day focused on the many excellent museums in and around Aarhus. Premier among these is of course Moesgaard Museum. Now housed in a remarkable purpose-designed building, the museum's exhibitions masterfully combine objects and traditional displays with modern digital techniques. Those who had the energy could also visit the ARoS museum of modern art downtown – a widely visible landmark in Aarhus thanks to its interactive rooftop installation 'Your rainbow panorama' by the acclaimed Danish/Islandic artist Olafur Eliassons. It is striking to see from the outside and the view from the inside provides a stunning but also surprising view of the city and its surroundings through the coloured glass panes. Finally, members could also visit the urban outdoor museum Den Gamle By (Ye Olde Town) just off the city centre in Aarhus. This museum focuses on urban culture and buildings from the Middle Ages to today with its most recent parts covering a period that most society members remember well: the early 2000s! Den Gamle By is among the most visited museums in Denmark and has a broad portfolio from promoting traditional crafts to therapy for these suffering from dementia. While far from the Quaternary, this museum is certainly worth a visit.

Fig. 24. 1st year archaeology students giving a presentation of a Neolithic dolmen.

Report on the General Assembly on the Occasion of the 64th Annual Meeting of the Hugo Obermaier Society

Marcel Weiß

On Thursday evening (April 17, 6:30 p.m.), the President of the Society opened the general meeting. Present were 40 members, 11 members additionally participated online. First of all, it was established without objections that the invitation to the General Assembly had been sent to all members in due time. The general meeting has a quorum and the agenda was accepted.

The president reported on the 63rd Annual Meeting in Berlin in 2022. Despite some organizational problems, the meeting went well and was satisfactory. Due to the conference location in a big city, the excursions were not focused on visiting archaeological sites, but on exploring the museum landscape of Berlin (see report on the 63rd Annual Meeting in the conference proceedings for the 64th Annual Meeting). It was a very nice and interesting experience for all participants to get to know the structure of the museum landscape in Berlin and to look at other time periods as well.
Afterwards, the president briefly reported on the difficulties that the board has faced in recent years. The COVID-19 pandemic and the resulting new conference formats (online, hybrid), and last but not least, the Russian war against Ukraine, have presented the board with unprecedented problems and difficult decisions. The president acknowledged the good crisis management of both boards in recent years, and the problems were well managed within the society.
Between 2022 and the date of the general assembly in 2023, there has been a strong increase of the society with a total of 44 new members (17 in 2022 and 27 in 2023). In contrast, there have only been 5 withdrawals and one death to report. The latter concerns Prof. Dr. Gisela Freund / Erlangen, who passed away on March 9, 2023, at the age of 102. Due to her many years of service to the society and as a founding member, her death is a great loss for the Hugo Obermaier Society.
Lastly, the president reported on the awarding of the Hugo Obermaier Grant, which unfortunately could not be awarded to any of the six applicants. Unfortunately, no application met the desired quality to receive the award, and none of the applications met the formal criteria of the application to receive the grant. The grant will be announced again in the 2023 fiscal year. In addition, the board will specify and adapt the formal criteria for the scholarship.

The report of the treasurer Amira Adaileh, as well as the auditor Merlin Hattermann for the fiscal year 2022 were presented. In addition, the treasurer reported that there were problems with transferring the bank account from the former treasurer to the new treasurer. As a result, the membership fee for 2022 could not be debited. The treasurer therefore proposed to collect the fee for 2022 in the spring of 2023 and the fee for 2023 in the fall of that year.
A member then proposed to vote on this proposal. As a result, 45 members were in favor of this approach, none were against, and 6 members abstained. Thus, the proposal was accepted, and the membership fees will be collected in two stages as proposed by the treasurer.

The treasurer was unanimously discharged upon request from the floor (1 abstention, with no dissentient) and Andreas Maier was appointed as new cash auditor.

Andreas Pastoors and Thorsten Uthmeier reported on the current status of the Quartär Yearbook. Quartär Volume 68 (2021) was published digitally in March and in print in April. Volume 68 consists of approximately 200 pages and contains 9 articles, with a mixed authorship of both young and experienced authors. This broad spectrum reflects the profile of Quartär.
Quartär Yearbooks Volume 69 (2022) and Volume 70 (2023) are already in progress. Currently, 15 manuscripts have been received, with 7 still in the editorial process and 8 ready for production.

It is planned to publish Quartär Volume 69 (2022) in 2023. The completion of Volume 70 (2023) is expected to coincide with the 65th Annual Meeting of the Hugo Obermaier Society in April 2024.
Next, it was reported that Marcel Weiß / Erlangen will be a member of the editorial team starting with Volume 69 (2022).
Regarding the online presence of the Quartär Yearbook, it was reported that all texts and information were transferred from the previous website (http://quartaer.obermaier-gesellschaft.de/) to the new website at Propylaeum (https://journals.ub.uni-heidelberg.de/index.php/qu/index). The website is available in three languages (English, French, and German). However, currently two websites (old and new) are running in parallel. The old website can be shut down, but the process still needs to be clarified. Florian Linsel has been maintaining the old website, while the new website is maintained by the editorial team.
One member requested the installation of an automated generation of bibliographic information for individual articles (e.g., Bibtex), and the editors are looking for such a possibility. Lastly, it was reported that the last two yearbooks have also been entered into Scopus.

Tim Schüler invited the Society on behalf of Thüringisches Landesamte für Denkmalpflege und Archäologie for the 65th Annual Meeting, April 2-6, 2024, to Weimar. The Society thanked Tim Schüler for the invitation.

The board proposed to increase the conference fees for online participants to the same amount as for in-person attendance starting in 2024. The rationale for this is that the provision and use of technology (support from assistants) for online transmission also incurs costs. In addition, online participants are already saving on travel and accommodation expenses. Generally, the conference fees for the annual meeting of the Hugo Obermaier Society are considered very low compared to other conferences. To achieve parity with in-person fees, online conference fees would need to be increased by 50%.
After the arguments for and against were discussed with the members, a vote was taken on the board's proposal. 32 members were in favor, 6 were against, and 13 (including the 6 board members) abstained. Thus, the board's proposal was accepted, and starting from the 65th Annual Meeting of the Hugo Obermaier Society, the fees for online and in-person attendance will be uniform.

Susanne Münzel proposed to the board to consider and find a solution for supporting the financing of participants from financially disadvantaged countries.

Aitor Calvo pointed out that the Basque Studies Society has photos of Hugo Obermaier in their archives. He proposed to contact the Basque Studies Society and establish a contact with the Hugo Obermaier Society for the purpose of collaboration. The proposal was accepted with gratitude.

The general assembly was closed at 7:30 p.m.

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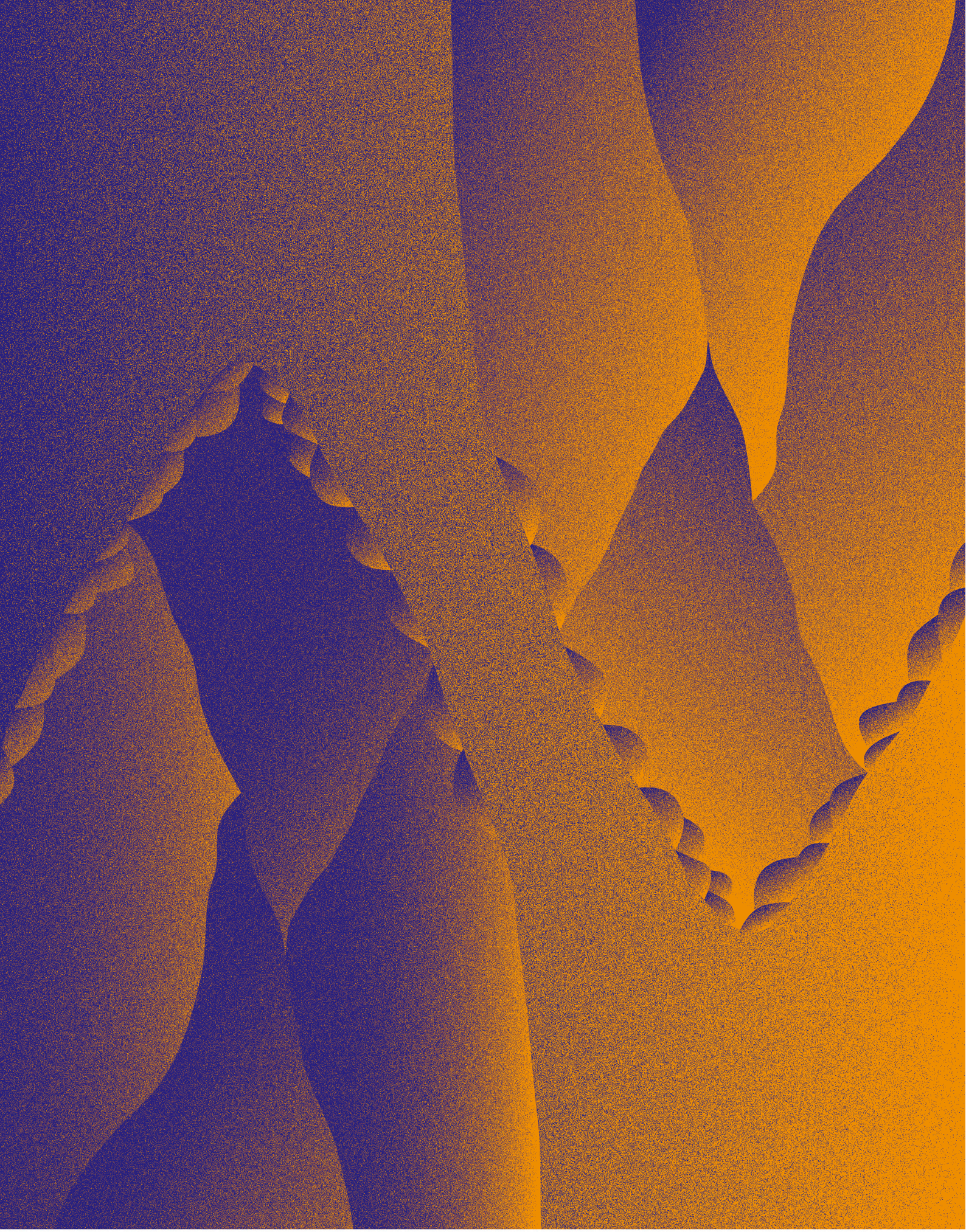

ISBN 978-3-946387-56-5