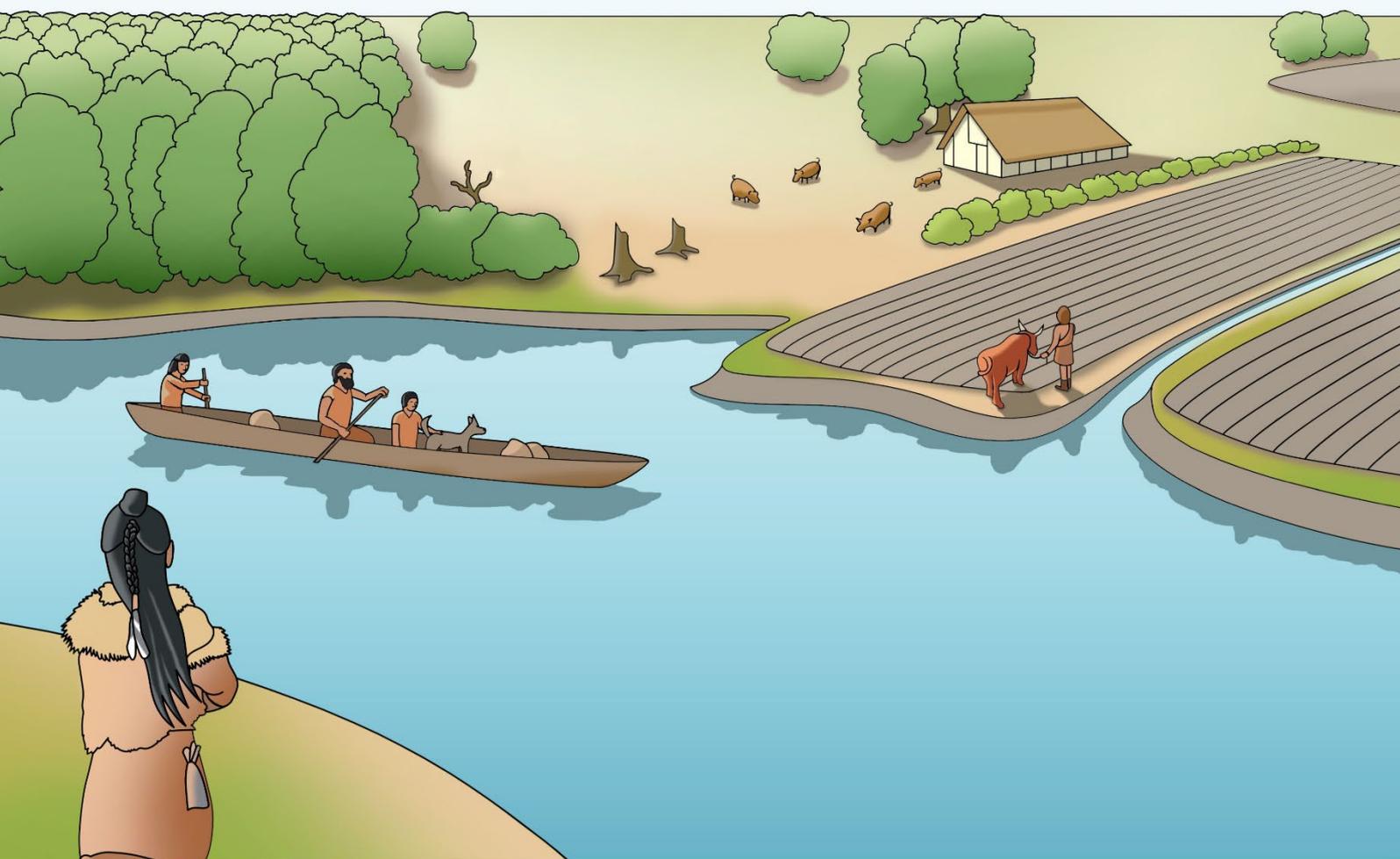


# TRANSFORMATIONS

during the Mesolithic and Neolithic



Groningen  
7-10 April 2026



**Programme and information**

(Only!) in case of emergency, phone:

Marie-France van Oorsouw: +31 6 5246 1065

# Transformations during the Mesolithic and Neolithic

**Groningen**

April 7-10 2026



The Transformations conference is part of the Finding  
Suitable Grounds project, funded by NWO  
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The transformation conference has been made possible by:



NWO (Dutch Research Council)



University of Groningen, The Netherlands



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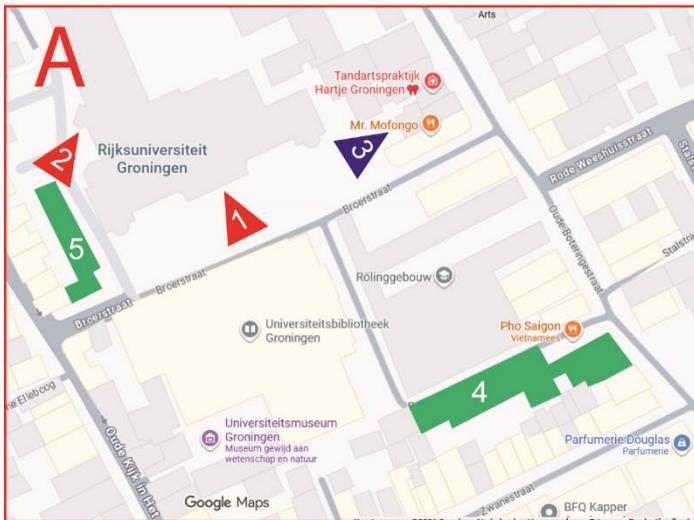
**Scientific committee:**

Dr Nathalie Brusgaard	University of Leiden
Prof. Hans Huisman	University of Groningen & Cultural Heritage Agency of the Netherlands
Prof dr. Daan Raemaekers	University of Groningen
Prof. Dr. Yannik Devos,	Vrije Universiteit Brussel
Dr. Mans Schepers	University of Groningen

Note: Photos will be taken during the conference, some of which may be used for social media or similar purposes. If you do not want to appear (recognizable) in these photographs, please indicate this by e-mail to [hans.huisman@rug.nl](mailto:hans.huisman@rug.nl).

# Locations





**Conference venue:**  
Academy building of Groningen University  
Broerstraat 5

Entrances:

- 1: April 7
- 2: April 8,9,10

**Drinks location (April 7):**  
Mister Mofongo  
Oude Boteringestraat 26

3: Mr Mofongo

**Groningen Institute of Archaeology**

- 4: Location Poststraat
- 5: Location Broerstraat

**Location Conference diner:**

Florentin  
Langestraat 66

6: Location Florentin



Academy building  
main entrance



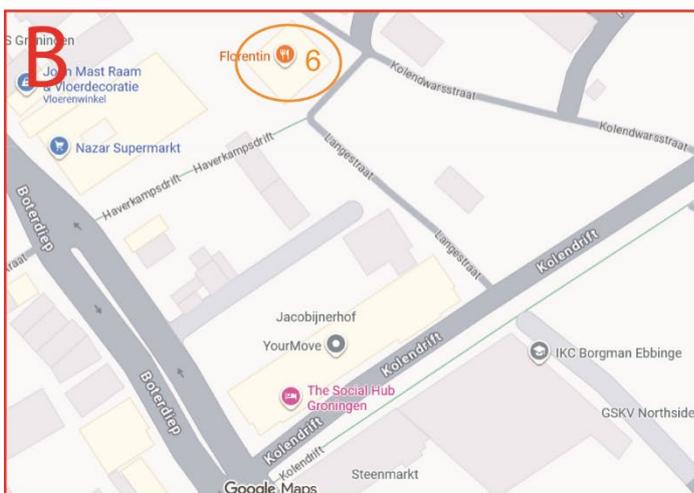
Academy building  
side entrance



Mr Mofongo



Florentin



# Programme

April 7<sup>th</sup>

10:00 [Start registration](#)

11:00 - 11:10 Opening

## **Session 1: Dynamics versus Continuity**

*Chair: Hans Huisman*

11:10 - 11:50 [Kim Cohen \(Key-note\)](#)

Doggerland, Wadden Sea and Rhine delta landscape transformations, 9000 to 3000 BC

11:50 - 12:15 [Elena Familetto et al.](#)

Dynamic Channels, Persistent Levees: Understanding Fluvial-deltaic Suitability for Early Agriculture during the Mesolithic–Neolithic Transition

12:15 - 12:40 [Judith van der Leije & Ivo van Wijk](#)

Neolithic transitions, the example of Angeren (Netherlands)

12:40 - 12:45 [Poster pitches](#)

12:45 - 13:45 [Lunchbreak + Posters](#)

13:45 - 14:10 [Johannes Müller & Wiebke Kirleis](#)

Socio-environmental transformations in a Neolithic key region of Northern Germany

14:10 - 14:35 [Moritz Mennenga et al.](#)

A changing landscape – Life in the Mesolithic and Neolithic on the southern North Sea coast

14:35 - 15:00 [Isabelle De Groote et al.](#)

Exploring Health Across the Mesolithic–Neolithic Transition in the Belgian Meuse Basin A Comparative Analysis of Skeletal Indicators

15:00 - 15:25 [Daniel Pilař et al.](#)

On the Edge of the Elbe Lowlands – Colonisation of Peripheries in LBK Bohemia

15:25 - 15:55 [Coffee/tea break](#)

15:55 - 16:20 [Detlef Gronenborn et al.](#)

Multiscale Perspectives on the Mid-Holocene Transformation in Europe

16:20 - 16:45 [Samuele Ongaro](#)

The Spread of Farming in the Northern Adriatic and the Role of the Palaeolandscape: An Ecological Frontier?

16:45 - 17:10 [Tobias Vervaart et al.](#)

Comparing modelling tools for a quantitative reconstruction of past vegetation patterns in the NE-Netherlands over the Mesolithic/Neolithic transition

17:10 [Walk to Mr Mofongo for icebreaker drinks reception](#)

## April 8<sup>th</sup>

*Chair: Hans Huisman*

- 9:00 - 9:25 Lea Frank et al.  
Reconstructing Holocene forest ecosystems and human signals at Solvikhola, Northern Norway
- 9:25 - 9:50 Alexander Weide & Müge Ergun  
Ecological transformations and the conceptualisation of the arable in the transition to farming
- 9:50 - 10:20 **Session close:** Dynamics versus Continuity (Kim Cohen)
- 10:20 - 10:50 *Coffee/tea break*

### **Session 2: Use of space**

*Chair: Yannick Devos*

- 10:50 - 11:30 Umberto Lombardo (key-note)  
10k years of landscape engineering in the Bolivian Amazon
- 11:30 - 11:55 Albert Gaitan-Roca et al.  
Quantifying Pre-Agricultural Anthrosols and Legacy Effects on Biodiversity in the Bolivian Amazon.
- 11:55 - 12:20 Mans Schepers et al.  
Plant Remains from Tillage Levels as Windows into Arable Farming
- 12:20 - 12:30 *Poster pitches*
- 12:30 - 13:35 *Lunchbreak + Posters*
- 13:35 - 14:00 Tamara Blagojević et al.  
Dynamics and continuity: settlement organization and duration in the Neolithic of the Southern Carpathian Basin
- 14:00 - 14:25 Konstantinos Trimmis  
Lives from the Underground: Investigating the transformations of human-cave interaction patterns in Neolithic of the Eastern Adriatic Ionian region
- 14:25 - 14:50 Anna Schick et al.  
Developments in the use of space during the 5th mill. BCE in the Central European Loess landscapes – a micro- and macroscale perspective
- 14:50 - 15:15 Arie J. Kalis & Jutta Meurers-Balke  
The use of space of a late Linear Pottery village
- 15:15 - 15:45 *Coffee/tea break*
- 15:45 -16:10 Ijk van Hattum et al.  
A Deeper Understanding of Neolithic communities in the Meuse Basin (Belgium): Radiocarbon Dating and multi-element Isotopic analysis on human remains.
- 16:10 - 16:35 Ana Smuk et al.  
Dry Ground in a Wet World: Ecological Succession, Cultivation Potential, and Adaptive Land Use from Swifterbant S2 to IJsselmeer Coastal Transects
- 16:35 - 17:00 Henrik Skousen, Rie Bloch  
A landscape of cultural transition: aspects of continuity and change in the Egå Valley, Eastern Jutland

## April 9<sup>th</sup>

*Chair:* Yannick Devos

9:00 - 9:25 Axel Müller et al.

The Windplan Blauw -project. Assessment on different scales. Development-led research of early Neolithic land use in Swifterbant area.

9:25 - 9:50 Hans Huisman et al.

The role of river floodplains in the spread of crop cultivation

9:50 - 10:20 **Session close:** Use of space (Umberto Lombardo)

10:20- 10:50 [Coffee/tea break](#)

### **Session 3: Migration & Identity**

*Chair:* Daan Raemaekers

10:50 – 11:30 Eveline Altena (key-note)

The Neolithic transition from a genetic perspective; how new methods helped to solve old questions and provide new insights.

11:30 – 11:55 Corey Alwell & Lara Cassidy

The Genomics of the first identified Irish Mesolithic Community

11:55 - 12:20 Joaquim Fort & Joaquim Perez-Losada

Demic and cultural diffusion in the spread of the Neolithic: comparing the eastern to the western Mediterranean

12:20 - 12:25 [Poster pitches](#)

12:25 – 13:25 [Lunchbreak + Posters](#)

13:25 – 13:50 Fulco Scherjon & Gerrit Dusseldorp

Unconstrained agent-based models of Linearbandkeramik (LBK) dispersal outpace the archaeological record in the European loess belt

13:50 - 14:15 Daniel Groß et al.

Challenging Dichotomies: Fishing and Identity across the Mesolithic–Neolithic Transition

14:15 - 14:40 Helene Rennesvik Robinson

Transforming Traditions: Technological Change in Neolithic Norwegian Cord-Stamped Ware

14:40 - 15:05 Jonas Sprißler

Not So Linear After All: Early LBK Variability in the Ammer Valley (SW-Germany)

15:05 - 15:35 [Coffee/tea break](#)

15:35 – 16:00 Lea Kopner

Same pots, different people? Exploring the dual burial custom of Westphalia's Funnelbeaker culture

16:00 - 16:25 Robin Peters et al.

On the transformation of funerary rites in the North Rhine Region from the 6th to the 3rd millennium

16:25 - 16:55 **Session close:** Migration & Identity (Eveline Altena)

19:00 [Conference dinner at Florentin](#)

**April 10<sup>th</sup>**

**Session 4: Subsistence & Diet**

*Chair: Mans Schepers*

- 9:00 - 9:40 Welmoed Out (key-note)  
Transformations? Plants and people in northwestern Europe
- 9:40 - 10:05 Lucy Kubiak-Martens et al.  
Roots, Hazelnuts, Fruits and Berries: New Insights into Mesolithic Plant Diet through the Archaeobotany of Almere Stichtsekan, The Netherlands
- 10:05 - 10:30 Molly Delaney Jones  
Submerged subsistence: preliminary archaeobotanical results from the early-mid 6th millennium BCE pile-dwelling site, Lin 3 (Lake Ohrid, Albania)
- 10:30 - 11:00 [Coffee/tea break](#)
- 11:00 - 11:25 Anna White et al.  
Ancient Birch Tar Mastics Offer New Insights into Oral Microbiome Evolution and Health
- 11:25 - 11:50 Marjolein van der Linden et al.  
*Early Neolithic diet based on studies from coprolites*
- 11:50 - 12:15 Nathalie Brusgaard  
Where the wild things were: how the rise of farming changed human-wildlife relationships
- 12:15 - 12:25 [Poster pitches](#)
- 12:25 - 13:30 [Lunchbreak + Posters](#)
- Chair: Nathalie Brusgaard*
- 13:30 - 13:55 Lara La lacona et al.  
Hunting in the wetlands: a morphometric approach to human-red deer relations
- 13:55 - 14:20 Ayse Atas Hooglugt et al.  
Tracing Early Cattle Domestication: Evidence from the Neolithic Site of Bouqras
- 14:20 - 14:45 Nadine Nolde Middle Neolithic pastures and ruminant diet. A dental microwear approach
- 14:45 - 15:10 Glauke Wylin et al.  
Transitions of Physical Behaviour from the Later Stone Age to the Neolithic in Northwest Africa
- 15:10 - 15:40 [Coffee/tea break](#)
- 15:40 - 16:10 **Session close:** Subsistence & Diet (Welmoed Out)
- 16:10 - 16:25 [Conference close](#)

## **Posters:**

### **April 7<sup>th</sup>**

Cristina Val-Peón et al.

*TRANSFORMED: Environmental transformations in the context of the last hunter-gatherers and first agropastoral groups of the Mediterranean Alps*

### **April 8<sup>th</sup>**

Angelo Vintaloro et al.

*Unpublished prehistoric research in Sicily*

Elliot Van Maldegem et al.

*Playing with Fire: Fire regimes, population dynamics and human impact during the Late Glacial period and Early Holocene in the Scheldt Valley*

Hans Huisman et al.

*New evidence for the use of Mesolithic pit hearths*

Marcel J.L.Th. Niekus et al.

*The Late Mesolithic dwelling of Kampen-Reevediep: results of the spatial analysis with ring and sector analysis*

Max Mesman et al.

*To go with the flow? The Neolithization process in a drowning landscape. Environmental insights from the Paleo-Vecht river valley, central Netherlands*

### **April 9<sup>th</sup>**

Atze Sijtsma

*Practices on the move. A second look at transformations in the funerary record of the Mesolithic and Neolithic of Northwestern Europe*

Iris van Bommel

*Hunter-Gatherers, Farmers and Everything in Between. Revising the Archaeological discourse behind the Mesolithic-Neolithic transition*

### **April 10<sup>th</sup>**

Isabelle Spengler et al.

*Plant use and plant economy in the Kleine Gete LBK settlements*

## **Abstracts per session**

## Session Dynamics vs. continuity

*Stone age humans lived in landscapes that could be highly dynamic. Post-glacial climate warming and rising sea levels were long-term processes that set the stage for human potential. Medium and short timescale landscape-dynamics, owing to coastal drowning, storm erosion, occasional river avulsion, irregular river floods and natural fires will likely have had noticeable impacts on the lives of stone age humans. Integrating geoarchaeology with other disciplines makes it possible to study the implications of the disasters and opportunities provided by dynamic and stable landscape elements.*

### **Key-Note:**

#### **Doggerland, Wadden Sea and Rhine delta landscape transformations, 9000 to 3000 BC**

Kim Cohen

Utrecht University

There once was a time when nature outpaced humans and pushed coastal habitats landwards as low land sunk while sea levels rose. Putting dates, depth and rates of vertical and lateral shifting on these developments to enable teasing out order of events and infer causalities, requires combination of geological, geophysical, paleoenvironmental and archaeological bodies of knowledge. Each of these bodies has considerably grown the last decades, and plenty of cross-combinations are being made. Let us highlight some of the gained insights, and put our finger on convergence and divergence. The keynote will take chronological palaeogeographical tour, also aiming to give general backdrop to no-doubt many more topical presentations on sites, events and developments within the Mesolithic and neolithic of the North Sea and adjacent lands.

We will cover, for 9000 to 5000 BCE: relative sea-level change and breakdowns in true rise and land movements, geological data vs. geophysical modelling of that, palaeogeographical mapping progress, the patchwork of habitats and environments considered, accentuated chronologies with short-duration events superimposed on gradual deceleration trends. We will cover, for 6000 to 3000 BCE: initiation of more-akin to present coastal and deltaic sedimentary environments, i.e. how did neolithic lowlands differ from such in younger millennia, and such in mesolithic Doggerland. Resolution differences before and after 6000 BCE, and from that, geoarchaeological scope and attention differences, are also addressed.

## Oral presentations:

### **Dynamic Channels, Persistent Levees: Understanding Fluvial-deltaic Suitability for Early Agriculture during the Mesolithic–Neolithic Transition**

Elena Familetto<sup>1</sup>, Ana Smuk<sup>2</sup>, Kim Cohen<sup>1</sup>, Mans Schepers<sup>2</sup>, Esther Stouthamer<sup>1</sup>, Marco Madella<sup>3</sup>, Lucy Kubiak-Martens<sup>4</sup>, Hans Huisman<sup>5</sup>

<sup>1</sup> Department of Physical Geography, Faculty of Geosciences, Utrecht University, The Netherlands

<sup>2</sup> Groningen Institute of Archaeology, Faculty of Arts, University of Groningen, Groningen, The Netherlands

<sup>3</sup> CASEs Research Group, Department of Humanities, Universitat Pompeu Fabra, Barcelona, Spain

<sup>4</sup> Biological Archaeology & Environmental Reconstruction, BIAx Consult, Zaandam, The Netherlands

<sup>5</sup> Groningen Institute of Archaeology, Faculty of Arts, University of Groningen, Groningen, The Netherlands; Section Archaeology, Cultural Heritage Agency of the Netherlands, Amersfoort, The Netherlands

In the Rhine-Meuse delta, Late Mesolithic and Early Neolithic communities experienced a wetland landscape shaped by dynamic aggrading rivers and rising sea level. Settlement and cultivation were confined to elevated, relatively dry features, including inland dunes and fluvial levees. While several Swifterbant culture settlements in the delta are documented and the subsurface is densely mapped and dated, land use beyond excavated sites remains less understood.

We integrate geoarchaeology and archaeobotany to investigate a cored transect across the Middle Holocene Benschop River System, positioned between archaeologically identified settlement sites Nieuwegein t’Klooster and Tiel-Medel upstream (Neolithic Swifterbant Culture) and Gouda Westergouwe downstream (Late Mesolithic). Sediment stratigraphy and radiocarbon dating show that between ca. 6000 and 4500 BC, levee aggradation was repeatedly interrupted by short-lived phases of surface stability and soil formation, averaging around 200 years, resulting in stacked paleosols.

Multi-proxy archaeobotany (macroremains, phytoliths, and charred herbaceous tissues), combined with soil micromorphology, reconstructs vegetation, environmental conditions, and repeated human interaction in each buried paleosol. Anthropogenic indicators, including burning and disturbed soil aggregates, are consistently most abundant on levee crests, corresponding to the highest and driest parts of each successive levee phase. Archaeobotanical assemblages, dominated by grasses and sedges with emergent freshwater taxa, indicate repeated burning and incorporation of locally available herbaceous wetland vegetation within each paleosol.

These results show that while suitable land surfaces shifted upstream through the Neolithic due to sea-level rise and river channel avulsion, levees persisted as repeatedly suitable and selected locations for land use.

## **Neolithic transitions, the example of Angeren (Netherlands)**

Judith van der Leije<sup>1</sup>, Ivo van Wijk<sup>2</sup>

<sup>1</sup> Gemeente Tilburg / Archol

<sup>2</sup> Universiteit Leiden / National Museum of Antiquities

In 2020 and 2022, two Early to Middle Neolithic sites were excavated in the eastern part of the Netherlands. These sites (Angeren Kampsepad and Angeren Kraaienstraat), just 1 km apart, are situated in the Dutch River area. During the Neolithic they were separated by a residual channel about 500 m wide. Both locations were visited and used by people for many centuries between roughly 5000 and 3400 BCE, providing opportunities to study various aspects of the transition from the Mesolithic to the Neolithic, as well as elements of Neolithic lifeways.

Angeren is situated roughly on the border between regions with distinct cultural practices. To the southeast, LBK farming communities had already been established by around 5300 BCE, whereas in the central and western Netherlands, the Neolithic way of life was not fully adopted until over a thousand years later. This location influenced the timing of the adaptation of the Neolithic lifestyle at the Angeren sites. Domesticated animals were introduced very early here, before 4500 BCE, marking the oldest evidence of domesticated animals in the Netherlands outside the LBK area and its descendants. However, cereal production seems not to have begun before 4000 BCE.

Although much has been learned about subsistence strategies, the origins of the inhabitants remain unclear. Four inhumation graves form a valuable addition to the small collection of Early and Middle Neolithic burials known from the Netherlands and they shed light on burial customs and the people of Angeren.

## **Socio-environmental transformations in a Neolithic key region of Northern Germany**

Johannes Müller, Wiebke Kirleis

Kiel University

Eastern Holsatia in the southwestern Baltic region represents one of the most ecologically diverse and, during the Neolithic period, most densely populated regions in Northern Germany. Research conducted over several decades has focused on the environment, demography, settlement patterns, and the ecological, economic, culinary, social, and ritual practices of its Neolithic communities.

The socio-environmental transformations spanning the period from 4100 to 1800 BCE include the adoption of new subsistence strategies with the establishment of distinct crop cultivation practices and the introduction of certain herding practices, the formation of villages, individual and collective practices embedded in rites de passage, and a transformation in the symbolic meanings ascribed to cultural landscapes. These profound socio-environmental shifts are visible archaeologically as well as in the records of ecofacts and in local vegetation developments. The main periods of sustainable change are observed at approximately 4100, 3600, 3100, 2800, 2200, and 1800 BCE. While the analysis of individual life histories and localized practices is essential, the region will be ultimately be contextualized within wider, supra-regional trajectories of change.

## **A changing landscape – Life in the Mesolithic and Neolithic on the southern North Sea coast**

Moritz Mennenga<sup>1</sup>, Svea Mahlstedt<sup>1</sup>, Steffen Wolters<sup>1</sup>

<sup>1</sup> Lower Saxony Institute for Historical Coastal Research, Wilhelmshaven

The mid-Holocene landscape of nowadays northwestern Germany has a long settlement history of migratory hunter-gatherers groups and sedentary farming communities alike which is proven by many Mesolithic sites as well as Neolithic megalithic tombs and settlements. But the mid-Holocene of northwestern Germany was also a period of major landscape changes triggered by a climatic shift to more oceanic conditions and a changing local hydrology. Paludification, the terrestrialization of small lakes, marine incursions into the Pleistocene mainland, and the onset of widespread raised bog growth set the scene for the living and settlement conditions for the local populations along the North Sea coast and its hinterland. But what have been exactly the consequences for the individual settlement micro regions? How much land was lost, how did the patterns of land use changed and how did people respond to the environmental changes? Two archaeological projects intensified research into a long inhabitation tradition in the area between the estuaries of Elbe and Weser by reviewing old data, conducting new excavations, taking geophysical measurements and carrying out almost 1,000 boreholes combined with peat stratigraphic investigations.

The combination of all data made it possible to trace the development and influence of environmental changes on humans in time slices. It can be shown that the area remained attractive to human inhabitation through all times despite paludification with vast wetlands, intermittent marine inundations and extensive raised bog growth.

## **Exploring Health Across the Mesolithic–Neolithic Transition in the Belgian Meuse Basin A Comparative Analysis of Skeletal Indicators**

Isabelle De Groote<sup>1</sup>, Michel Toussaint<sup>1</sup>, IJk van Hattum<sup>1</sup>, Caroline Polet<sup>2</sup>, Hans Vandendriessche<sup>1</sup>,  
Philippe Crombé<sup>1</sup>

<sup>1</sup> University Ghent

<sup>2</sup> RBINS

The transition from the Mesolithic to the Neolithic in Northwestern Europe marked a profound shift in human lifeways, with the adoption of agriculture, changes in settlement patterns, and evolving social structures. The Meuse Basin, with its rich archaeological record, offers a unique opportunity to investigate the biological consequences of these cultural transformations. While it is well established that human stature declined from the Palaeolithic to the Neolithic, the position of Mesolithic populations within this trajectory remains unclear. This uncertainty stems from an insufficient osteological data, leaving open the question of whether the decline in health indicators was a direct consequence of neolithization or part of a broader trend already underway during the Mesolithic.

This study presents an ongoing comparative analysis of key health indicators—stature, linear enamel hypoplasia, cribra orbitalia, and porotic hyperostosis—in skeletal samples from Mesolithic and Neolithic contexts within the Belgian Meuse Basin. These markers are proxies for childhood stress, nutritional status, and general health, and can illuminate whether the biological changes observed were abrupt outcomes of agricultural adoption or evidence of longer-term processes, potentially including selection and genetic shifts.

While results are forthcoming, our approach integrates osteological assessment with contextual archaeological data to clarify the role of the Mesolithic in this transition. By situating Mesolithic populations within the broader framework of health and stature change, this research contributes to discussions on the costs and benefits of early agriculture in Europe and refines our understanding of the complex interplay between culture, environment, and human biology during this transformative period.

## **On the Edge of the Elbe Lowlands – Colonisation of Peripheries in LBK Bohemia**

Daniel Pilař<sup>1</sup>, Kristýna Doležalová<sup>1</sup>, Petr Kočár<sup>1</sup>, Kristýna Budilová<sup>2</sup>

<sup>1</sup> Institute of Archaeology of the Czech Academy of Sciences, Prague

<sup>2</sup> Laboratory of Archaeobotany and Palaeoecology - University of South Bohemia

Research of the Linear Pottery Culture (LBK, 5500–4950 BC) in Bohemia has mostly focused on central sites in fertile, densely populated lowlands, while the colonisation of peripheral areas on the edges of uplands has received much less attention. The newly discovered settlement in Dobřeň, excavated in 2024, offers an opportunity to gain a deeper understanding of this topic.

The aim of the presentation is to explore the character of LBK settlements on the periphery of the Elbe lowlands and to analyse how this area was colonised. Results of relative chronology and C14 dating suggest that the region was not colonised during the early LBK period, but rather 50–100 years later. This may reflect secondary densification of the settlement structure in Bohemia rather than initial colonisation. The results further show that settlements in the peripheral zone had a different spatial character, with longhouses arranged more loosely than in the lowlands.

According to preliminary results, these settlements relied mainly on the cultivation and processing of basic cereals (*Triticum monococcum* and *Triticum dicoccon*), similarly to lowland sites. Notably, most settlements show little or no evidence of occupation in the late LBK period. This may be related either to a relatively rapid abandonment of the area and a return to the lowlands, or to limitations in the current relative chronology of Bohemia.

Overall, research into peripheral areas provides a valuable perspective on LBK settlement dynamics and is crucial for a broader understanding of major Neolithic centres in the Bohemian lowlands.

## **Multiscale Perspectives on the Mid-Holocene Transformation in Europe**

Detlef Gronenborn<sup>1</sup>, Aleksandr Diachenko<sup>2</sup>, Kai Wirtz<sup>3</sup>

<sup>1</sup> Leibniz-Zentrum für Archäologie, Mainz, Germany

<sup>2</sup> National Academy of Sciences of Ukraine, Kyiv, Ukraine

<sup>3</sup> Helmholtz-Zentrum hereon, Geesthacht, Germany

Societal transformations emerge from the archaeological record at many points in time and at multiple scales. Here, we focus on the general transformation from societies based on a hunting/gathering to a farming subsistence economy in Europe, focusing on three case studies.

This major continental transformation process is composed out of regional population cycles which correspond to the traditional archaeological phases of the Early to Young Neolithic, encompassing archaeological entities like the Linear Pottery Culture (LBK), Michelsberg (MK), or Western Tripolye Culture (WTC). For all case studies we take both a bottom-up and a top-down perspective comparing local and regional dynamics with those on the continental scale.

Regional and local cycles indicate both synchronous but also decoupled behavior from continental population cycles. We discuss how exogenous factors such as climate variability are amplified by endogenous factors such as phase-dependent changes in social cohesion.

## **The Spread of Farming in the Northern Adriatic and the Role of the Palaeolandscape: An Ecological Frontier?**

Samuele Ongaro

University of Southampton

Although recently our understanding of the spread of farming in Europe has improved significantly, this has not been the case for the Northern Adriatic, where unresolved issues include the paucity of Late Mesolithic sites, the problematic evidence for hunter-gatherers' acculturation, and the sudden appearance of a fully developed farming economy. While archaeological evidence shows that different mechanisms of Neolithization would have been in place in different areas of the basin, some knowledge gaps persist. This is the case of the coastal sector of the Venetian-Friulian plain, where significant changes in landscape configuration caused by post-glacial sea level rise have not only reduced archaeological visibility, but also require us to consider the role that very different and highly dynamic environments would have played in the transition to farming. Here we present new palaeolandscape reconstructions for the Northern Adriatic to assess the palaeoecological implications of these environmental changes on the Mesolithic-Neolithic Transition. The results presented are based on the analysis of unpublished geophysical data for the offshore sector, and a review of published sedimentological cores for the onshore sector, while SLIPs have been used to produce sea level predictions. We will argue that while the presence of extensive brackish environment (e.g., marshes, barrier lagoons, limans) would have attracted and supported foraging populations – thus suggesting a transition at least partially mediated by local hunter-gatherers – areas favourable to agriculture would also have existed (e.g., delta plains, fluvial ridges), therefore suggesting that farmers could have infiltrated this ecological frontier.

## **Comparing modelling tools for a quantitative reconstruction of past vegetation patterns in the NE-Netherlands over the Mesolithic/Neolithic transition**

Tobias E.P. Vervaart<sup>1</sup>, Thya van den Berg<sup>2</sup>, Martin Theuerkauf<sup>3</sup>, Oliver Schmitz<sup>1</sup>, Derek Karssenber<sup>1</sup>, Timme Donders<sup>1</sup>, Thomas Giesecke<sup>1</sup>

<sup>1</sup> Utrecht University

<sup>2</sup> Rijksdienst voor het Cultureel Erfgoed

<sup>3</sup> Greifswald University

Reconstructing the past relationship between humans and the landscape is important to understand human environment interactions through time. Pollen analysis provides the information on past landscape change, but results cannot be used directly in comparison to archaeological information. This is due to two challenges: i) differential pollen production and deposition resulting in a biased representation of the vegetation; ii) the point representation of pollen analytical results, which don't provide spatially explicit information. Different approaches have been developed for quantitative vegetation reconstruction with similar solutions to the production and deposition biases, while they differ in their approach to provide spatially explicit reconstructions. Two of them use the fact that the abiotic environment, such as soil substrate, elevation or proximity to the sea influence the vegetation composition. We tested how the two tools, the Multiple Scenario Approach (MSA) and Extended Downscaling Approach (EDA), perform in an 8000 km<sup>2</sup> case study area in the Northeastern Netherlands with ~50 sites for two time slices: 3850BC and 2750BC. The MSA is an 'hypothesis-driven' approach and therefore requires autecological information on the plant taxa. The EDA is a 'data driven' approach and mainly requires well defined gradients in the abiotic environment. The focus of the study was to assess how the two methods modelled the spatial patterns of forest cover change and emergence of agricultural indicators & cereals between 3850BC and 2750BC.

## Reconstructing Holocene forest ecosystems and human signals at Solvikhola, Northern Norway

Lea Frank<sup>1</sup>, Samuel James Walker<sup>1</sup>, Emma Katrin Onshuus<sup>1</sup>, Lene Synnøve Halvorsen<sup>2</sup>, Holly Young<sup>3</sup>, Mona Henriksen<sup>4</sup>, Trond Klungseth Løddøen<sup>5</sup>, Sanne Boessenkool<sup>1</sup>

<sup>1</sup> Centre for Ecological and Evolutionary Synthesis, Department of Bioscience, University of Oslo

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Cave sedimentary palaeoarchives allow for a multimillennial reconstruction of biodiversity, landscape dynamics, and anthropogenic impact. A cave's stable microclimate enables the preservation of organic material and archaeological records, providing perspectives on local site use and environmental change. Solvikhola (67°12'46.2"N, Northern Norway), a cave excavated in 2023 and located in a highly dynamic region at the centre of formerly glaciated areas, revealed a remarkable sedimentary palaeoarchive spanning 7600 years. Ten distinct layers contained organics (e.g., bones, shells, charcoal) providing a unique opportunity to reconstruct palaeoenvironments and prehistoric human activity in higher latitudes. Applying a multidisciplinary methodology including (zoo)archaeology, ancient DNA bulk-bone metabarcoding (aDNA BBM), archaeomalacology, palynology, geology, and 14C-dating, we identified a relatively stable forest ecosystem with small climatic fluctuations during the Late Mesolithic/Neolithic and noticeable human impact evidenced by a hearth and charcoal horizon dated to the Late Bronze Age (~2700 BP). Osteological analysis identified 15 taxa across Amphibia, Aves, Mammalia, and Pisces representative of 9% of the bone fragments. The remaining 91%, analysed with aDNA BBM, considerably expanded taxonomic resolution of species identifications to a total of 48 taxa. Moreover, palynological profiling suggests a shift in woodland taxa to a more open shrubland hosting a variety of bird (e.g., *Strigidae*, *Phasianidae*), and mammal species (e.g., *Arvicolidae*, *Leporidae*, *Canidae*, *Cervidae*). Long-term records are underexplored in the interior of Northern Norway and rare from cave investigations, Solvikhola therefore offers a unique insight into ecosystem transformations over millennia and presents new contributions to the limited knowledge of human activity in this region.

## **Ecological transformations and the conceptualisation of the arable in the transition to farming**

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Archaeologists understand arable fields as a key innovation of Neolithic life. Arable fields serve as the reflection of a fundamental change in human subsistence from passive and extractive to active and productive. This narrative continues to situate human-environmental relationships on either side of a conceptual boundary of collecting versus producing, mirroring the dichotomy between wild and domestic. In this paper we challenge the notion that Neolithic arable fields represent entirely new habitats in ecological and practical terms. Ecologically, we situate arable fields along a continuum of variable conditions of disturbance and productivity, connecting them to related habitats like grasslands. This ecological continuum builds a crucial bridge to crop progenitor habitats and offers a way to conceptualise the evolution of arable fields. In practical terms, farmers engage in activities that are also found in past and present 'non-agricultural' societies globally, including in pre-Neolithic periods. This demonstrates that many practical aspects of creating and maintaining arable fields are not restricted to agricultural systems, allowing us to situate the arable in its wider socio-ecological context. Our discussion aims to show how a revised understanding of the arable field as an ecosystem that is part of an extended continuum of ecologies and practices allows archaeologists to analyse change and continuity instead of seeing artificial boundaries during the global emergence of agriculture.

**Posters:**

**TRANSFORMED: Environmental transformations in the context of the last hunter-gatherers and first agropastoral groups of the Mediterranean Alps**

Cristina Val-Peón<sup>1</sup>, Guillaume Porraz<sup>2</sup>, Elodie Brisset<sup>3</sup>

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The transition from the socioeconomic organization of the last Mesolithic hunter-gatherers to the new way of life based on food production during the Neolithic marked a turning point in human history and its relationship with the landscape. In this context, the Mediterranean Alps played a key role as a natural corridor linking the Mediterranean to Central Europe. Additionally, this region is highly sensitive to climate variability, and palaeoenvironmental transformations during this period may have influenced mobility, resource availability, and subsistence strategies. Here we present the initial stages of the project “TRANSFORMED”, which aims to assess the timing of natural and cultural events in the Mediterranean Alps by integrating new decadal-scale paleoecological and hydroclimatic data with existing environmental and archaeological records within a common calibration model.



## Session Use of space

*In settlement sites a range of techniques are used to mark which areas were used for which activities within dwellings, or how activities were distributed within settlements. In the wider landscape, understanding human land-use - e.g. vegetation management or crop cultivation - and their spatial aspects requires different types of research into the physical landscape, ecosystems and the (often ephemeral) archaeological remains.*

### **Key-note:**

#### **10k years of landscape engineering in the Bolivian Amazon**

Umberto Lombardo

ICTA & Departament de Prehistòria, Facultat de Lletres, Universitat Autònoma de Barcelona

The Llanos de Moxos (LM), a vast, seasonally-flooded savannah in the Bolivian Amazon, has undergone intensive human transformation for over 10,000 years, establishing a complex history of human-environment interactions.

Beginning around 10,850 calibrated years before present (cal. yr bp), the early human occupation resulted in approximately 4,700 artificial forest islands (accumulative middens) within the savannah landscape. These structures hosted the earliest documented cultivation in Amazonia, including manioc (~10,350 cal. yr bp), squash (~10,250 cal. yr bp), and maize (~6,850 cal. yr bp).

In central LM, this stability was disrupted around 4,000 cal. yr BP by a major increase in fluvial activity, leading to sediment burial and a 2,000-year archaeological hiatus. Agriculturists reoccupied the region around 2,000 cal. yrs BP, leading to the rise of the Casarabe culture (500–1400 CE). The Casarabe culture represents a rare instance of low-density urbanism in the Amazon, evidenced by monumental mounds and regional-scale infrastructure.

The Casarabe culture heavily engineered the seasonally flooded savannahs with a sophisticated system combining dense drainage canals (to manage wet season floods) and artificial farm ponds (to retain water in the dry season). This landscape engineering enabled intensive, year-round maize monoculture and supported one of the most complex pre-Columbian societies in lowland South America. Ultimately, this 11-millennia history of niche construction leaves a profound, enduring human footprint, significantly contributing to the LM's current habitat heterogeneity and biodiversity.

## Oral presentations:

### **Quantifying Pre-Agricultural Anthrosols and Legacy Effects on Biodiversity in the Bolivian Amazon.**

Albert Gaitan Roca, Andrés Mejía Ramón, Kate Dudgeon, Umberto Lombardo

Universitat Autònoma de Barcelona (UAB)

We present a novel dataset comprising 112 high-resolution Digital Elevation Models (DEMs) that reconstruct the volume of Early and Mid-Holocene anthrosols in the seasonally flooded savannah of the Llanos de Moxos. These anthrosols are identified in archaeological mound sites known as Forest Islands (FIs). Occupation levels were identified in 86 of the 112 sampled sites through core perforations, which also validated deposit depth. The origin of the 26 remaining FIs will be determined through further sediment analysis. To scale up our dataset, we employed an automatic, AI-based polygonization of 6,643 pre-detected FIs using satellite imagery (Google Satellite WMS) and calculated the area of each island. Using this extensive dataset, we have quantified the minimum total volume of anthrosols forming FIs in the Bolivian Amazon. These metrics provide a novel baseline for reconstructing the social landscape of the Moxos region during the Early and Mid-Holocene. By quantifying the mass of deposited soil, we aim to measure the intensity of the transformation exerted by human populations on their physical environment. Framed within Historical Ecology, we interpret Forest Islands as anthropogenic ecological niches—viewing them as a domesticated landscape rather than a strictly engineered one. This process did not merely modify the physical space but transformed local biodiversity and resource availability, creating legacy effects in the savannah ecosystem that persist today.

## **Plant Remains from Tillage Levels as Windows into Arable Farming**

Mans Schepers<sup>1</sup>, Welmoed Out<sup>2</sup>, Stijn Arnoldussen<sup>1</sup>

<sup>1</sup> Groningen Institute of Archaeology

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Arable farming practices—such as ploughing, fertilizing, and harvesting—have long received substantial attention from archaeologists, who draw on a wide range of proxies including field observations of tillage levels, micromorphology, implement analysis, and stable isotope studies.

Within archaeobotany, the investigation of farming practices is a central theme. Archaeobotanists typically rely on material from settlement sites to infer cultivation methods, traditionally focusing on crop remains and associated field weeds. However, when reasoning from the perspective of the arable field itself, we argue that settlement sites can be regarded as off-site locations.

We introduce a model for interpreting botanical proxies from tillage levels, structured around three relative time phases: pre-cultivation (1), cultivation (2), and post-cultivation (3). Across these phases, plant remains are shaped by natural processes (n-transforms) and cultural processes (c-transforms). These processes can be grouped into four categories: plant remains entering the system (1), leaving it (2), undergoing physical changes (3), and being relocated within the soil (4).

We also provide a review of archaeobotanical studies of tillage levels across different periods and regions. In addition to identifying which proxies were used and how, we evaluate the types of arable farming practices inferred from these analyses. Using our model, we critically assess the validity and limitations of these interpretations.

Finally, we discuss the potential and constraints of studying botanical proxies from tillage levels. This includes reflecting on the relationship between botanical and non-botanical proxies, as well as comparing insights gained from tillage-level analyses with those derived from settlement sites.

## **Dynamics and continuity: settlement organization and duration in the Neolithic of the Southern Carpathian Basin**

Tamara Blagojević<sup>1</sup>, Jelena Jovanović<sup>1</sup>, Maja Kokanović<sup>1</sup>

<sup>1</sup> BioSense Institute, University of Novi Sad, Serbia

The region of the Southern Carpathian Basin represents an important geographic route for the spread of the Neolithic further to Europe in its initial phases and for the consolidation of Neolithic practices in the later phases. Numerous Starčevo, Vinča, and Sopot culture sites (~6200–4500 cal. BC) in the territory of Serbia and Croatia have been detected, only some of which were systematically excavated. Considering the Neolithic lifeways in this region, several assumptions have been made so far, mostly emphasizing the differences in economy and settlement mobility, where Early Neolithic communities are perceived as being more mobile and practicing an opportunistic lifestyle, adapting to the environment. On the other hand, Late Neolithic communities are considered to have consolidated their economic practices, providing a certain level of stability and a more sedentary lifestyle. This paper explores patterns of settlement organization and duration in the Neolithic, using radiocarbon data and different levels of contextual information to assess dynamics and continuity during the Early and Late Neolithic. A problem that emerges is a large variability in data precision, leading to various levels of settlement reconstruction. Therefore, our aim is, apart from presenting methodology and preliminary results, to stimulate discussion both regarding data variability and the processes of transformation during the Neolithic. This research was supported by the Science Fund of the Republic of Serbia, GRANT No. 7498, Moving across the plain: reconstructing the lifetime movements of farming pioneers and their successors during the Neolithic in the Southern Carpathian Basin-MOVE.

## **Lives from the Underground: Investigating the transformations of human-cave interaction patterns in Neolithic of the Eastern Adriatic Ionian region**

Konstantinos Trimmis

The Australian Archaeological Institute at Athens, the University of Sydney

Caves and rock shelters of the Eastern Adriatic–Ionian region constitute key yet unevenly explored contexts for understanding Neolithic lifeways. This paper examines how patterns of human–cave interaction transformed from the Early to the Late Neolithic, tracing shifting practices of habitation, subsistence, ritualisation, and landscape engagement across insular and coastal zones of the central Mediterranean.

Drawing on stratified archaeological sequences from cave sites in the eastern Adriatic and Ionian basins, the paper adopts a comparative, diachronic approach that integrates material culture, depositional practices, spatial organisation, and environmental data. In the Early Neolithic, caves frequently functioned as multifunctional spaces—used intermittently for habitation, herding, storage, and task-specific activities—often embedded within highly mobile settlement systems. Material signatures suggest flexible, short-term engagements closely tied to seasonal rhythms and emerging agro-pastoral practices.

By the Middle and Late Neolithic, however, patterns of cave use become increasingly differentiated and socially encoded. Evidence points to a gradual reconfiguration of caves as places of memory, ritualised deposition, mortuary activity, and symbolic boundary-making, coinciding with more permanent open-air settlements and increasingly structured landscapes. These transformations reflect broader shifts in social organisation, territoriality, and human–environment relationships, rather than simple functional abandonment or continuity.

The paper argues that Neolithic caves should be understood not as marginal or residual spaces, but as active arenas where changing social values, identities, and cosmologies were negotiated. By foregrounding subterranean contexts, this study contributes to wider debates on transformation, liminality, and the reworking of human–landscape relations in Neolithic Mediterranean societies.

## **Developments in the use of space during the 5th mill. BCE in the Central European Loess landscapes – a micro- and macroscale perspective**

Anna Schick, Tanja Zerl, Astrid Röpke, Stefan Suhrbier, Silvine Scharl

Institute of Prehistoric Archaeology, University of Cologne

During the 5th mill. BCE, a transformation of settlement patterns, land use, and crop cultivation can be observed in the Central European loess landscapes. In an interdisciplinary research project, we have collected data on settlement sites as well as botanical macro remains from the Rhineland, Westphalia, and Northern Bavaria (Germany), to get a more detailed understanding of these processes on a regional scale.

The internal organisation of Middle Neolithic (c. 4900-4400 BCE) settlements reflects differences in social structures and economic activity compared to the Early Neolithic (c. 5300-4900 BCE). These are represented by the development of residential and functional architecture, collectively used pits, fences, ditches or palisades, as well as collective strategies for the storage of crops. The uniform structure of early neolithic settlements is no longer present in the 5th mill. BCE. Instead, areas on settlement margins are used collectively for daub collection and waste disposal. Furthermore, the residential architecture is enlarging, certain architecture is especially built for storage, and smaller areas for gardening or livestock are being enclosed by fences.

On a larger scale, we see an expansion of settlement areas and economic space into areas less favourable for agriculture. Simultaneously, the crop spectrum of the preceding Early Neolithic was broadened with naked barley and naked wheat. These new cereals made agriculture more complex, but also more flexible in terms of cultivation and labour organisation. According to our findings, these developments do not appear to have taken place simultaneously and with comparable intensity in the different regions examined.

## **The use of space of a late Linear Pottery village**

Arie J. Kalis<sup>1</sup>, Jutta Meurers-Balke<sup>1</sup>

<sup>1</sup> Universität zu Köln, Institut für Ur- und Frühgeschichte, Labor für Archäobotanik

On the northern periphery of the loess distribution in the Lower Rhine Basin lies a late Linear Pottery settlement where a 14-metre-deep wooden log well was found. After use, even during the time of settlement, the well shaft was filled with earth. The archaeobotanical analysis of the deposit yielded around 330 taxa, an unprecedented wealth of plant remains from a single archaeological object. However, the species composition proved to be enigmatic. In addition to the expected remains of cultivated plants with field weeds as well as ruderal plants from near the well, also aquatic and riparian plants were found. This is surprising, as there were no lakes or watercourses nearby, which was probably the reason for building the well. Even more remarkable were the findings of mountain plants, although areas above 400 m in altitude are only found 50 kilometres away. Our theory is that after it was abandoned, the well shaft was filled with earth from the settlement. This inadvertently also included the plant remains that had been deposited there by the inhabitants and their livestock. A plant-sociological evaluation of the identified taxa could provide insights into which plant communities the livestock grazed on. A comparison of these plant communities with the map of today's potential natural vegetation of the Lower Rhine area could provide a picture of the use of space by the inhabitants of this Linear Pottery village.

## **A Deeper Understanding of Neolithic communities in the Meuse Basin (Belgium): Radiocarbon Dating and multi-element Isotopic analysis on human remains.**

IJK van Hattum<sup>1</sup>, Elliot Van Maldegem<sup>2</sup>, Samuel Bodé<sup>1</sup>, Patrick Semal<sup>3</sup>, Christophe Snoeck<sup>2</sup>, Caroline Polet<sup>3</sup>, Philippe Crombé<sup>1</sup>, Isabelle De Grootte<sup>1</sup>

<sup>1</sup> Ghent University

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<sup>3</sup> Royal Belgian Institute of Natural Sciences

Due to the scarcity of settlement sites in the Belgian Meuse basin, funerary contexts are the primary source of information on Neolithic groups in the region. Natural rock-shelters and caves were widely used for the deposition of human remains. These sites often contain remains of multiple individuals, but artefacts and grave goods are generally sparse. Most skeletal collections were excavated in the 19th and early 20th centuries and lack information about stratigraphy and context. Consequently, the chronology of the sites is poorly understood. In addition, the skeletal remains are commingled, limiting what information we can gain from osteological analysis alone.

Three key sites in the region: Bois Madame, Maurenne Caverne de la Cave, and Sclaigieux, have gained much scientific attention because of their remarkably high minimum number of individuals (> 56 per site). Their chronology was poorly resolved, yet based on a few radiocarbon dates from previous studies, Maurenne was dated to the Middle – Final Neolithic period, and Sclaigieux and Bois Madame to the first half of the 3rd millennium BC (Final Neolithic). The understanding of the chronology of these sites is paramount for a better interpretation of previous research. Therefore, we performed an extensive radiocarbon dating study and multi-element isotope analysis (C, N, and S) on a total of 83 individuals from these three sites. Our study yielded only one date from the middle Neolithic, and points to use of the sites during the 3rd millennium BC. In addition, our isotopic data are indicative of a homogenous diet.

## **Dry Ground in a Wet World: Ecological Succession, Cultivation Potential, and Adaptive Land Use from Swifterbant S2 to IJsselmeer Coastal Transects**

Ana Smuk<sup>1</sup>, Elena Familetto<sup>2</sup>, Mans Schepers<sup>1</sup>, Kim Cohen<sup>2</sup>, Marco Madella<sup>3</sup>, Lucy Kubiak-Martens<sup>4</sup>, Hans Huisman<sup>1</sup>

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In the central Netherlands, a wetland shaped by rising sea level and meandering rivers formed the setting for early Neolithic crop cultivation. Small environmental variations had major implications for human activities, including settlement and farming. Elevated natural levees offered locally drier conditions and opportunities for land use. Using an integrated geoarchaeological and archaeobotanical approach, we examine spatial patterns of land use at the Swifterbant S2 settlement site and levees of surrounding channels extending toward downstream wetland margins.

Sediment stratigraphy and radiocarbon dating reconstruct local geographical and environmental development, while multi-proxy archaeobotany documents vegetation change and preservation across successive ecological stages. Indicators of stability and dryness increase inland, consistent with ecological succession from wetter coastal settings to better-drained inland micro-environments. At Swifterbant S2, cereal-derived phytoliths are confined to the archaeologically defined horizon and to zones with the highest cultivation potential. In the IJsselmeer area, soil micromorphology revealed signs of human activity throughout the upper meter of levee (charred material, sand-sized ceramic sherds). Tilling for cultivation spanning a few generations, and in-situ burning of non-woody plants at the river mouth were also found. Archaeobotanical signals support this pattern, suggesting that land management was concentrated where local hydrology and soil conditions were favorable.

These datasets strengthen evidence for sustained wetland land use, showing that Neolithic communities targeted locally favorable micro-topographic niches. We argue that depositional and botanical wetland succession structured land-use choices, with resilience reflected in concentrating cultivation on suitable grounds rather than uniformly cultivating, or avoiding completely the coastal margin.

## **A landscape of cultural transition: aspects of continuity and change in the Egå Valley, Eastern Jutland**

Henrik Skousen<sup>1</sup>, Rie Bloch<sup>1,2</sup>

<sup>1</sup> Moesgaard Museum

<sup>2</sup> Aarhus University

The Egå Valley near Aarhus (Denmark) provides valuable insights into the Mesolithic–Neolithic transition in eastern Jutland during the early fourth millennium BCE. Although continuous settlement from the Mesolithic Ertebølle Culture to the Neolithic Funnel Beaker Culture has not been documented at any single site, excavations by Moesgaard Museum reveal both foraging and farming traditions over approximately 1,500 years, enhancing our understanding of this transition.

During the Mesolithic, the valley offered an optimal environment for marine-based foraging communities. By the Late Atlantic period, sand deposition had narrowed the river mouth towards Aarhus Bay, likely reducing the area's economic potential. Consequently, some communities arguably adopted new technologies and subsistence strategies, by shifting from foraging to farming.

Notably, this transition appears to have occurred relatively early in the valley. Excavations at Robert Fultonsvej yielded some of the earliest radiocarbon dates for cultivated grain in Denmark (c. 3900–3700 BCE), yet the flint assemblage reflects the persistence of Mesolithic technologies. At Kildevang, ritual pits contained fragments of Volling pottery alongside the edge of a specialised core axe, demonstrating the contemporaneous presence of Mesolithic and Neolithic elements in a ritual context. These findings suggest that local individuals adopted certain Neolithic technologies while retaining aspects of their Mesolithic tradition and maintaining a strong local affiliation.

In this way, the Egå Valley constitutes a rather unique study area for the Mesolithic–Neolithic transition in eastern Jutland and beyond, highlighting the complexity of this process and the interplay of continuity and change between these two traditions.

**The Windplan Blauw -project. Assessment on different scales. Development-led research of early Neolithic land use in Swifterbant area.**

Axel Müller<sup>1</sup>, E. Schrijer<sup>2</sup>, F. Vermue<sup>3</sup>

<sup>1</sup> RAAP

<sup>2</sup> BAAC

<sup>3</sup> ADC ArcheoProjecten

A large wind turbine project in the north part of Flevoland, the Swifterbant area, led to archaeological research. The area is known for a complex landscape and related Late Mesolithic and Early Neolithic sites. As for the unique characteristics of this region, a different approach was chosen for the assessment and evaluation of sites. Instead of a predictive model for settlements (traditionally the preferred methods in CRM) we chose a landscape and land use model. This yielded interesting results about landscape dynamic and Early Neolithic land use.

In the presentation we want to show the different approach and the benefits of a landscape- and land use model and the very promising results of the multidisciplinary analyses. We also want to highlight the possibilities of synergy between different branches of modern archaeology (academia, commercial and governmental).

## **The role of river floodplains in the spread of crop cultivation**

Hans Huisman<sup>1,2</sup>, Kim Cohen<sup>3</sup>, Elena Familetto<sup>3</sup>, Axel Müller<sup>4</sup>, Mans Schepers<sup>1</sup>, Elma Schrijer<sup>5</sup> Ana Smuk<sup>1</sup>, Femke Vermeu<sup>6</sup>

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Studies on the adoption and spread of crop cultivation from the Balkans and Danube basin into Europe north of the Alpes tend to put a large emphasis on well-drained soils occurring widespread in loess-covered landscapes. Across Central and Eastern Europe, such landscapes repeatedly produced archaeological evidence for Early Neolithic agriculture, indicating that these soils appeared suitable for the type of early agriculture that was had its basis in the Levant. In this view, lower elevated, less-well drained, (non-loess covered) parts of the landscape, including floodplains of larger rivers, are often considered unsuitable, marginal landscapes: Too wet, too frequently flooded, vegetation too hard to clear, soil texture too cohesive to till all rendering crop cultivation less feasible. This is one of the reasons that agriculture is thought to have been introduced and adopted piecemeal from suitable into less suitable landscapes, over periods of centuries or millennia. This paradigm may have been promoted as well by limited accessibility of stone age horizons in river floodplains due to later lateral erosion and burial.

New data on the suitability of river floodplains for agriculture as well as the unveiling of archaeological traces of crop cultivation in numerous river and coastal floodplains in the Netherlands have altered this image. They indicate that crop cultivation was adopted widely here before 4300 cal. yr. BC. New evidence also shows intensive human interference with the vegetation during the Mesolithic and Neolithic, prior to the introduction of crop cultivation. This poses the question whether the introduction of crop cultivation in these landscapes was facilitated by existing forms of vegetation management (e.g. by burning) by the Mesolithic hunter-gatherers.

**Posters:**

**Unpublished prehistoric research in Sicily**

Angelo Vintaloro<sup>1</sup>

<sup>1</sup> UISPP Ages Commission

After studying the sites near the town of Corleone, we focused on the prehistoric area south of Roccamena, on the left bank of the Belice River. In Contrada Malvellolotto, in a semi-wooded area mixed with Mediterranean scrub, several rock-cut tombs typical of the Eneolithic period were discovered. The caves, which overlook both banks of the river, were originally dedicated to the Mother Goddess, where the flowing water symbolized the breath that gave rise to new life. This was all linked to a valuable natural environment, where specific pillars from the Metal Age were located.

The areas of Campofiorito, Bisacquino, Chiusa Sclafani, Giuliana, and Corleone display significant prehistoric human settlement, as they are located along the routes connecting the opposite Sicilian coasts. Many caves served as a gateway to transhumance. Of note is an imitation of the Neolithic Diana culture that deserves special attention.

## **Playing with Fire: Fire regimes, population dynamics and human impact during the Late Glacial period and Early Holocene in the Scheldt Valley**

Elliot Van Maldegem<sup>1</sup>, Philippe Crombé<sup>1</sup>, Koen Deforce<sup>1,2</sup>

<sup>1</sup> Ghent University

<sup>2</sup> Royal Belgian Institute of Natural Sciences

Understanding the complex interplay between human populations, environmental change, and fire regimes in prehistoric Europe and how hunter-gatherers used and structured their landscapes is crucial for gaining insight into hunter-gatherer lifeways. In Northwestern Europe, it is often assumed that significant human impacts on the environment began only with the introduction of farming during the Neolithic (ca. 5300 BCE). However, ethnographic studies demonstrate that hunter-gatherers actively modified their landscapes, notably through the use of fire for vegetation management. Despite this, little is known about fire regimes in the Final Palaeolithic (ca. 12,000–9500 BCE) and Mesolithic (ca. 9500–5300 BCE) periods, particularly in the sandy lowlands of Belgium and the southern Netherlands.

This poster introduces ongoing research that will reconstruct local and regional fire regimes through the analysis of micro- and macrocharcoal in peat deposits. The resulting data will be integrated with vegetation reconstructions, high-resolution chronological models, climate proxies, and palaeodemographic analyses to separate natural from human-driven fire events.

The results of these analyses will be placed in the context of earlier research on population dynamics in the western Scheldt basin, which used radiocarbon-based population modelling. The earlier work demonstrates population fluctuations, mobility shifts, and resilience in response to environmental pressures, and provides a framework for interpreting how fire may have functioned within broader strategies of land use, mobility, and resource management. By combining these perspectives, this project aims to better understand the role of hunter-gatherers in shaping landscapes during the Mesolithic and Final Palaeolithic.

## **New evidence for the use of Mesolithic pit hearths**

Hans Huisman<sup>1,2</sup>, Rian Lenting<sup>3</sup>, Carolina Mallol<sup>4</sup>, Hans Peeters<sup>1</sup>

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<sup>4</sup> AMBI Lab, University of Laguna, Tenerife

Mesolithic sites in the sandy regions of NW Europe are often characterized by the presence of large numbers of bowl-shaped pits with a dark, charcoal-rich infill, generally known as pit hearths or hearth pits. Apart from the charred material, the pits tend to be mostly devoid of artefacts or other anthropogenic remains. Interpretations as to their nature range from a natural origin (burnt ant nests) to an anthropogenic nature, involving uses such as drying, roasting or smoking meat or plant parts, flint heating and the production of wood tar.

A combination of soil micromorphology, Raman spectroscopy and lipid biomarker analysis on samples from hearth pits at the Kampen-Reevediep and Soest-Staringlaan sites (NL) show that the charred material in the pit was a mix of wood charcoal, charred humus and wood tar. No biomarker evidence was found for animal products. However, lipid biomarker analyses show transition from a base layer with mostly oak- or pine-derived charcoal to a fill with biomarkers of birch – which is mostly absent in the charcoal spectrum - a transition that is not apparent from macroscopical observations, charcoal composition and micromorphology. Based on this, we hypothesize that the pits were used for the production of wood tar from birch bark, using oak or pine as fuel. Based on radiocarbon evidence and the spatial patterning of phenomena, it is as yet not clear whether tar production occurred within or nearby dwelling locations. However, it is clear that particular places in the landscape have been used for such activity over generations, spanning several centuries up to 1.5-3 millennia. Such time depth is possibly connected to the long-term persistency of local vegetations including birch as an indispensable raw material for the production of tar.

## **The Late Mesolithic dwelling of Kampen-Reevediep: results of the spatial analysis with ring and sector method**

Marcel J.L.Th. Niekus<sup>1</sup>, Gijsbert R. Boekschoten<sup>1</sup>, Dick Stapert<sup>2</sup>

<sup>1</sup> Stone Foundation

<sup>2</sup> Retired

In the Netherlands only few Mesolithic flint scatters are known that are clearly associated with a dwelling structure. One of the best examples was excavated in 2019 at Kampen where one of the flint scatters was associated with postholes. We analyzed the distribution of flint artefacts with the ring and sector analysis method, and we could indeed confirm the presence of a Late Mesolithic sunken dwelling with a possible entrance at the southeast side. The results testify to the suitability of the ring and sector method for identifying Stone Age dwelling structures, even with spatial data per quarter square metre. Building upon these results we discuss, among other topics related, the organization of space within and outside the dwelling. Furthermore, we also briefly discuss a second extensive flint scatter from the Kampen site: are we dealing with a second dwelling or is this an open air site? Along with the results of the spatial analyses we also address some limitations and advantages of the ring and sector analysis method.

## **To go with the flow? The Neolithization process in a drowning landscape. Environmental insights from the Paleo-Vecht river valley, central Netherlands**

Max Mesman<sup>1</sup>, Kim Cohen<sup>2</sup>, Wim Hoek<sup>3</sup>, Michael Field<sup>1</sup>, Ilse Kamerling<sup>1</sup>, Hans Huisman<sup>4</sup>

<sup>1</sup> Leiden University, Faculty of Archaeology

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Earlier geophysical- and borehole studies (part of the NWO 'Finding Suitable Grounds' project) have exposed a buried downstream extension of the Vecht river underneath Lake IJssel. Multi-proxy studies have pinpointed features of human activity in the study area before postglacial flooding. The study area is situated 10 kilometers west of the well-known Meso- and Neolithic site complexes in the Flevo- and Noordoostpolder.

In this study, a high-resolution pollen record has been constructed from a new sediment core from the same locale to place the Neolithization process of the Paleo-Vecht valley inside an environmental and spatiotemporal context. Results indicate that the record originates from a buried and then submerged floodplain situated within a dynamic river landscape. Opportunistic and small-scale agriculture was practiced roughly around 4400-4000 cal. BCE in the area - possibly locally. Pollen and non-pollen palynomorph data indicate that rising sea- and groundwater levels must have played a substantial role in the development of the landscape.

Various levels contain substantial influx of microscopic charred plant remains and charcoal particles – possibly related to exploitation of the river valley by humans during the Late Mesolithic and Neolithic.

The findings from this study add to the collective understanding of the Neolithization process in the wetlands of the Dutch littoral zone, and underline with that the potential opportunities for future research.

Finally, the findings highlight the cultural and scientific importance of the landscape surrounding the Paleo-Vecht river, which should be considered during future industrial development in Lake IJssel.

## Session Migration and identity

*The Mesolithic and Neolithic are marked worldwide by human migration events. Identification of large-scale migrations based on palaeogenetic data leaves questions on how these migrations worked out on regional and local scales. And it raises questions on group identity, the nature of (artefact-typology based) cultures and on the representativity of the archaeological record of human remains.*

### **Key-note:**

**The Neolithic transition from a genetic perspective; how new methods helped to solve old questions and provide new insights.**

Eveline Altena

Dept. Human Genetics, Leiden University Medical Center

Analysis of ancient DNA has been around for some 3.5 decades, but especially the last 10 years it had a profound impact on archaeology, and not in the last place European prehistory and our understanding of the major cultural transformations that took place in this period. Where we had little more than mitochondrial and Y-chromosomal data of several dozens of individuals in the early 2000s, by now we have published genome wide data of several thousands of Mesolithic and Neolithic Europeans, and this collection keeps growing. This vast dataset allows us to answer longstanding questions, but also formulate new ones, on topics such as mobility, social structures and customs, identity, and ultimately human evolution.

The initial results allowed us to paint the broad picture in which we see that mobility towards Europe of people with genetic roots in Anatolia was a major part of the Neolithic transformation. However, the more data become available, the more we see regional and even local variations in this process, but also how this life style transition in the end affected our genomes, health, and evolution.

In this presentation I will briefly touch upon the development of the field and its impact on studies of European Neolithization, and give an overview of the current knowledge based on ancient DNA. Finally I will zoom in on the Lower Rhine-Meuse region, one of the areas that followed a unique trajectory in the Neolithic transformation.

## Orsal Presentations:

### **The Genomics of the first identified Irish Mesolithic Community**

Corey Alwell, Lara Cassidy

Trinity College Dublin

Continuous human occupation of Ireland began around ten thousand years ago, when hunter-gatherer populations from Europe made their way to Irish shores. Despite being the sole human settlers on the island for 40% of its occupation, extremely little is known about these people. Only two genomes of individuals from this Irish Mesolithic have been sequenced, both from near the end of this era. Here, we present whole genome sequences for four novel Irish Mesolithic individuals from Killuragh Cave in the south of the island, increasing the total Irish dataset from two to six genomes and containing likely the oldest Irish genome ever sequenced. The individuals buried in Killuragh share highly inflated levels of identical-by-decent (IBD) segments with one another, relative to an Irish Mesolithic genome from Sramore Cave in the north, making this the first Mesolithic kin group genetically characterised in Ireland or Britain. No evidence of strict patrilocality or matrilocality is observed, as both Y chromosome and mtDNA diversity are high. In the European context, IBD data show greatest connection with Western Hunter-Gatherer individuals of North-Western and Northern Europe, rather than Atlantic coastal regions, suggesting a continental, and not Atlantic, initial migration to Ireland. Using new software HapNe-IBD, we show that the island population these individuals belonged to was small, and experienced a bottleneck coinciding with the 8.2kBP cooling event, and underwent a period of extreme and extended isolation, resulting in some of the greatest degrees of Runs-of-Homozygosity (RoH) and shared allelic drift identified in any pre-Neolithic population.

## **Demic and cultural diffusion in the spread of the Neolithic: comparing the eastern to the western Mediterranean**

Joaquim Fort<sup>1</sup>, Joaquim Perez-Losada<sup>2</sup>

<sup>1</sup> Universitat de Girona and ICREA

<sup>2</sup> Universitat de Girona

The spread rate of the Neolithic along the western Mediterranean has been quantified in recent work. In contrast, the spread rate along the eastern Mediterranean is poorly known. Here we estimate it by using linear regression for the first time. We have collected the oldest reliable Neolithic date in each of 16 regions along the northern Mediterranean coast and estimated the spread rate separately for the eastern and the western expansions. We show that the spread rate is extremely slow in the eastern Mediterranean, as compared to the subsequent spread in the western Mediterranean. By comparing the radiocarbon dates to results from numerical simulations, we also estimate the dispersal distance per generation in both the eastern and the western Mediterranean. As expected intuitively, the dispersal distance per generation is much shorter in the East than in the West. We also perform genetic simulations and compare them to an ancient genetic cline. In this way we quantify the percentage of farmers who interbred with hunter-gatherers in the East and in the West separately. Finally we estimate the relative importance demic and cultural diffusion in both areas. The results establish the overwhelming importance of demic compared to cultural diffusion for the coastal spread of the Neolithic in Europe using realistic dispersal distances for the first time, both for the eastern and the western Mediterranean. This work also showcases the potential of combining archaeological and ancient DNA data.

## **Unconstrained agent-based models of Linearbandkeramik (LBK) dispersal outpace the archaeological record in the European loess belt**

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The advent of the Neolithic encompassed major demographic changes with increases in population density, changes in life expectancy and mortality patterns. The demographic feasibility of proposed archaeological scenarios to account for the expansion of past societies has been debated. We present a heuristic, grid-based agent-based model, specified according the Overview, Design concepts, and Details protocol (ODD), that simulates the dispersal of LBK communities as groups of farming households moving annually across a loess-only landscape under simple demographic (birth and mortality) and settlement rules. From a central European point of origin, our model takes Dutch Limburg as the destination. We evaluate previous estimates of the speed of dispersal and examine how these demographic variables and organisational principles affect the expansion of the LBK. Using systematic parameter sweeps and replicated simulation runs, we identify parameter combinations that produce large-scale front speeds but we fail to match the empirically inferred timing of LBK arrival in the Dutch loess sequence as constrained by radiocarbon chronologies. In our simulations with plausible settings for the relevant characteristics, LBK arrival in Dutch Limburg most frequently outpaces the observed archaeological reality. We review potential explanations for the observed patterns.

## **Challenging Dichotomies: Fishing and Identity across the Mesolithic–Neolithic Transition**

Daniel Groß<sup>1</sup>, Satu Koivisto<sup>1</sup>, Sofie Hellerøe<sup>2</sup>, Ulrich Schmölcke<sup>3</sup>, Bente Philippsen<sup>4</sup>, Harry Robson<sup>5</sup>

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<sup>5</sup> Department of Archaeology BioArCh, York University

In Denmark, one of the most significant cultural transformations occurred around 4000 cal BCE with the transition to the Neolithic. Archaeological and genetic studies indicate that this period coincides with both the emergence of the Funnel Beaker Culture and the appearance of new human genotypes. While debates often focus on material culture or biological change, this presentation explores a less tangible dimension: the archaeological potential for reconstructing human self-conceptions and identities.

Using datasets from the Syltholm Fjord (Lolland, Denmark), we examine the role of non-cereal resources and highlight the significance of understudied materials. Our results demonstrate a broad-spectrum subsistence strategy in the Late Mesolithic as well as the Neolithic, with shifting proportions of wild and domestic fauna and resilient food-acquisition strategies such as intensive fishing.

Set against long-standing dichotomies applied to the period around 4000 cal BCE, these findings illustrate how our interpretations risk bias and oversimplification. On this basis, we explore the concept of a 'fishing identity' among the inhabitants of the Syltholm Fjord and argue that a diachronic, resource-focused dataset can help illuminate more intangible aspects of past lifeways.

## **Transforming Traditions: Technological Change in Neolithic Norwegian Cord-Stamped Ware**

Helene Rennesvik Robinson<sup>1</sup>

<sup>1</sup> University of Bergen, Norway

Early interpretations of Norwegian cord-stamped ware relied on Danish and Swedish typologies due to the limited number of local sites. These frameworks have since been criticised, and current consensus recognises Norwegian cord-stamped vessels as products of hunter-gatherer groups. This shift is central to broader debates on subsistence change in southern Norway, particularly whether the introduction of agriculture reflects migration or local innovation. At Kotedalen, locally produced cord-stamped pottery appears alongside debated evidence of cereal cultivation in the Middle Neolithic A (MNa), illustrating the complexity of transitional subsistence strategies.

My dissertation contributes to discussions of identity, interaction, and technological choice. Both Kotedalen and Porsvika used local clay sources, but Kotedalen potters involved a diverse use of tempers, indicating greater experimentation. While both sites used the N-technique for forming, Kotedalen shows an additional forming method and a broader decorative repertoire, contrasting with the selective cord-stamping at Porsvika.

A chronological shift at Kotedalen in stratigraphical layers reveals changes in joining methods and increasingly complex decoration, aligning with wider regional developments. Yet similarities in forming and tempering indicate continuity and knowledge transfer. The presence of pitted and cord decoration further situates Kotedalen within broader Scandinavian ceramic traditions. Overall, the ceramic assemblages illuminate how technological practices intersect with questions of subsistence and identity during the Neolithic. They reflect communities negotiating dynamic environments while maintaining connections to the wider sphere, balancing local innovation with shared stylistic norms.

## **Not So Linear After All: Early LBK Variability in the Ammer Valley (SW-Germany)**

Jonas Sprißler

University of Tübingen

The southwesternmost settlements of the earliest Linear Pottery culture (LBK-I) are situated along the Ammer, a 23 km-long tributary of the Neckar. Unlike earlier studies, which often combined large datasets from broad regions and included charcoal samples prone to the old-wood effect, the Ammer Valley represents a compact study area that was sampled very intensively using a targeted <sup>14</sup>C strategy based solely on short-lived materials. To mitigate distortions associated with the calibration-curve plateau, the dates were modelled in accordance with archaeologically defined phases.

Current evidence indicates that LBK occupation in the Ammer Valley commenced no earlier than around 5300 calBC. This temporal placement diminishing the likelihood of direct interaction during the Late Mesolithic-Neolithic transition. Nonetheless, the fine-grained chronological resolution achieved, particularly when ceramic decoration is considered, shows a notable overlap between the LBK-I and the subsequent phase Flomborn (LBK-II). In this initial period, settlement development does not always appear to have been strictly unilinear or synchronous, even though such a pattern might be expected in a relatively small region like the Ammer Valley and within a culturally cohesive phenomenon such as the LBK.

These observations prompt a re-evaluation of regional LBK land-use strategies at the onset of the Neolithic, with the aim of elucidating the local dynamics underpinning the transition from initial house construction to the establishment of more enduring settlement structures. From this analytical perspective, new inferences can be drawn regarding the plausibility and potential nature of Late Mesolithic–LBK contact within the emergent settlement pattern.

## **Same pots, different people? Exploring the dual burial custom of Westphalia's Funnelbeaker culture**

Lea Kopner

LWL-Archäologie für Westfalen

In the Late Neolithic, the groups of the Funnelbeaker culture (TRB) were the first farming communities to populate the North European Plain where they erected thousands of megalithic tombs. The Westphalia region in western Germany is located on the southwestern periphery of the TRB-groups.

From the turn of the 4th and 3rd millennia, TRB burials in Westphalia also appeared in so-called flatgraves. This dual burial custom reflects the beginning of a cultural transformation: While the monumental megalithic tombs were used for collective burials, inhumations in flatgraves focused on the individual. Compared to more central TRB regions, Westphalia has a relatively high density of known flatgrave sites, while megalithic tombs only occur sporadically. This tendency towards spatial separation suggests that the flatgraves might be the expression of a separate group that made the transition to individual burials particularly early.

To date, no clear qualitative differences between the inventories of flat and megalithic graves have been identified. The aim of this PhD project is to investigate the extent to which cultural differentiation can be retraced behind the two burial phenomena. In order to do this, a comprehensive catalogue of all Westphalian flatgraves and their grave goods is created and analysed, focusing especially on the pottery. Furthermore, the area is examined from a landscape archaeological perspective in order to uncover possible differences in site selection. Finally, an ethnological digression will offer insights into possible explanations for pottery distribution to contextualise the findings of the previous analyses.

## **On the transformation of funerary rites in the North Rhine Region from the 6th to the 3rd millennium BC**

Robin Peters<sup>1</sup>, Kerstin Schierhold<sup>2</sup>, Leo Klinker<sup>1</sup>

<sup>1</sup> LVR-State Service for Archaeological Heritage

<sup>2</sup> LVR geSCHICHTEN Rheinisches Revier

The Northern Rhineland forms a corridor between the Central European Uplands and the coastal regions and, at the same time, is at the crossroads of eastern and western cultural spheres in the Neolithic. While the research on Neolithic settlements has a long-standing tradition, funerary archaeology was sidelined due to the poor preservation conditions for bones on the acidic loess soils. In light of recent discoveries and with regard to supra-regional developments, we investigate how funerary rites transformed in this region between 5300 and 2000 BC. While our understanding of the burial customs of the LBK and Post-LBK is slowly improving, the burial customs of the late Neolithic remain elusive. A look at neighbouring regions could perhaps give us an idea of what is currently still lacking in the North Rhine region. With the emergence of Corded Ware and Bell Beaker burials in the final Neolithic, the sources become more apparent. Nonetheless, we must be aware that our view of Neolithic burial customs in the Rhineland is seriously hampered by several preservation biases. This is precisely why we stress the importance of a careful analysis of funerary remains and of the representativity of the archaeological record, as they form the backbone of most studies on identity and mobility.

**Posters:**

**Practices on the move. A second look at transformations in the funerary record of the Mesolithic and Neolithic of Northwestern Europe**

Atze Sijtsma

University of Groningen

This study investigated transformations in the funerary record of the Mesolithic and Neolithic (ca. 8000-2750 cal BC) of Northwestern Europe. In prehistoric archaeology, changes in funerary practice are generally understood through the framework of cultural groups, which are largely defined on the basis of artefact typology. This reflects an implicit assumption that changes in disparate cultural traits are expected to necessarily coincide. In other words, cultural groups are envisioned as bricklike monothetic entities. By contrast, this study departs from a polythetic point of view. Material culture and funerary traditions may not always coincide and can instead be tied to separate communities of practice and aspects of identity.

This study re-examined (dis)continuities of funerary practices at 52 sites in the IJssel-Vecht-Eem and Rhine-Meuse regions on the basis of excavation reports and the most recent dating of find contexts. The analysis indicates that changes in funerary practice do not always coincide with previously defined cultural groups. The general diversification of funerary practices, however, does coincide with the advent of non-local individuals and genetic heterogeneity. Practices themselves are not exclusive to either local or non-local individuals or individuals with particular genetic ancestry. Accordingly, it may well be argued that transformations in the funerary record of the Mesolithic and Neolithic are tied to mobility and migration rather than the communities of practice that define traditions in material culture.

## **Hunter-Gatherers, Farmers and Everything in Between. Revising the Archaeological discourse behind the Mesolithic-Neolithic transition**

Iris van Bommel

University of Groningen

The Mesolithic-Neolithic transition has been the topic of debate over the last few decades. Although many scholars disagree on the exact course of this transition, the dominant discourse regards the Neolithization as a quick process. The case of the Dutch wetlands - situated in a highly diverse environment- questions this leading discourse, proving to be prolonged and more complex. The current discourse fails to accurately describe this complex transition, due to its goal-orientated, unilinear approach towards farming. Taking the Dutch wetlands as a case study, both subsistence strategies and mobility patterns are investigated, resulting in two different stable states during the Mesolithic-Neolithic transitional period. Based on these stable states, a set of four definitions of identity has been introduced, refining the current archaeological discourse, being: fully-hunter-gatherers, semi-hunter-gatherers, semi-agrarians and fully agrarians. By introducing this broader scope of identities, the semantic discussion regarding hunter-gatherers and farmers can be solved and the unilinear approach minimized. The outcome of the transition does not have to be fully-agrarian, but can be everything in between for a prolonged period of time, allowing for more complexity and variability. This study has shown that, in order to accurately describe complexity, our simple models and definitions of identity have to be revised when forming a hindrance for our interpretation of the past.



## Session Subsistence and diet

*The Mesolithic-Neolithic transition is equated with a change from hunter-gatherer to agricultural subsistence. Fully understanding what this entailed requires knowledge of pre-agricultural (hunter-gatherer) diet and food procurement, understanding of agricultural practices and use of non-agricultural food sources by agriculturalists.*

### **Key-note:**

#### **Transformations? Plants and people in northwestern Europe**

Welmoed Out

Archol BV (Archeologisch Onderzoek Leiden)

Changes in plant subsistence are a key aspect of the neolithization process in many parts of the world. Although multiple aspects of Mesolithic and Neolithic plant subsistence and the introduction of crop plants remain unknown, continuous data collection, incorporation of new methods and new cooperations have allowed to book progress in our understanding of various aspects of plant subsistence in northwestern Europe. This contribution looks at the neolithization process in the Netherlands from three points of view, focussing on transformation of plant exploitation, transformation of our understanding, and transformation of methods.

### Orral presentations:

#### **Roots, Hazelnuts, Fruits and Berries: New Insights into Mesolithic Plant Diet through the Archaeobotany of Almere Stichtsekan, The Netherlands**

Lucy Kubiak-Martens<sup>1</sup>, Femke Vermue<sup>2</sup>, Elma Schrijer<sup>3</sup>, Axel Müller<sup>4</sup> and Wouter Smith<sup>5</sup>.

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Studies of Mesolithic subsistence in north-western Europe have long focused primarily on animal and fish resources. This is largely due to the abundance of bone remains and artefacts associated with hunting and fishing found at Mesolithic sites. In recent years, however, a growing interest in more holistic approaches to hunter-gatherer foodways has begun to change this perspective.

The recently excavated site of Almere Stichtsekan in the Netherlands exemplifies this change, mainly thanks to extensive and systematic sampling for plant remains, which was integrated into the excavation strategy. Findspots with high concentrations of charred plant remains were selected for further excavation. This strategy and radiocarbon dating are significant for Mesolithic sites located on sandy soils with poor stratigraphy and a lack of well-defined archaeological features.

The excavations revealed the diversity of plant foods used at the site throughout its occupation, which spanned the Early to Late Mesolithic (c. 8550-5200 BC). Assemblages of charred plant food remains are dominated by abundant hazelnuts, alongside evidence for the use of acorns, roots and tubers, fruits, and berries. Some plant food remains were identified for the first time in the European Mesolithic context, including charred berries of rowan (*Sorbus aucuparia*). The presence of roots and tubers contributes significantly to the growing body of evidence highlighting the importance of starch-rich foods as a dietary energy source in hunter-gatherer diets.

Here, we present the initial analysis of this rich assemblage of charred plant food remains and highlight the significance of these results within the broader context of European Mesolithic subsistence.

## **Submerged subsistence: preliminary archaeobotanical results from the early-mid 6th millennium BCE pile-dwelling site, Lin 3 (Lake Ohrid, Albania)**

Molly Delaney Jones

University of Oxford

When organic materials that normally do not preserve archaeologically are deposited in waterlogged environments, the gentle sedimentation helps to preserve more botanical species than are typically found at dryland archaeological sites. Lakeshore sites have outstanding preservation of botanical material, and the assemblages do not suffer from the same preservational biases as dryland sites, which typically only yield charred plant remains. This creates a bias in botanical assemblages towards species that commonly come into contact with fire. Thus, the botanical data from lakeshore sites can help to shine a light on human-plant relationships that may be invisible in typical charred assemblages.

This presentation will present preliminary archaeobotanical results from the early-mid 6th millennium BCE lakeshore site, Lin 3, located on the western shore of Lake Ohrid in Albania. Lin 3 is the oldest known pile-dwelling site in Europe and so offers key insights into subsistence of early agriculturists at this transitional time in the European Neolithic. The species included in the assemblage include cereals and pulses, as well as categories that are not frequently present in charred assemblages, such as fruit seeds, oil-seed crops (including flax (*Linum usitatissimum*) and poppy (*Papaver* sp.)) and weed seeds. The densities of fruit seeds are evidence of their importance as a non-agricultural food source that was exploited during the earliest known occupation of the site. The preliminary archaeobotanical results from Lin 3 paint a rich picture of farmed species supplemented by a diversity of gathered species which points to a broad-spectrum approach to subsistence.

## **Ancient Birch Tar Mastics Offer New Insights into Oral Microbiome Evolution and Health**

Anna White, Theis Jensen, Maja Søjtofte, Liam Lanigan, Jonas Niemann, Hannes Schroeder

Globe Institute, University of Copenhagen

The human oral microbiome comprises around 700 taxa and plays a crucial role in human health. Changes in oral microbiome composition have been linked to oral diseases, but also systemic diseases such as cancer, cardiovascular disease, and type 2 diabetes. The oral microbiome is influenced by various factors, including our diet and oral hygiene practices, which can alter its composition, making it essential to study these influences to better understand its evolution. One of the most profound dietary transformations in human history occurred during the transition from Mesolithic hunter-gatherer societies to Neolithic farming communities. Until now, studies of the human oral microbiome have primarily relied on ancient dental calculus, or calcified dental plaque. However, it remains unclear how representative dental calculus is of the oral microbiome, as it reflects a long-term deposit of the microbiome that accumulates over a lifetime. In this study, we analysed DNA extracted from over 100 ancient mastics from archaeological sites in Europe to characterise the oral microbial composition of Mesolithic and Neolithic populations. Using this novel substrate, we characterised the oral microbiome and performed functional analyses on a community level. We found that the oral microbiomes derived from ancient mastics resemble modern salivary profiles more closely than those derived from ancient dental calculus in both diversity and functional potential. As the microbial composition of ancient mastics appears to be more comparable to modern oral microbiomes, this material opens up new possibilities for studying the evolution of the human oral microbiome, changes occurring during the Neolithic transition and its impact on human oral and systemic health.

## **Early Neolithic diet based on studies from coprolites**

Marjolein van der Linden<sup>1</sup>, Lucy Kubiak-Martens<sup>1</sup>, Arjen de Groot<sup>2</sup>

<sup>1</sup> BIAx Consult Biological Archaeology & Environmental Reconstruction

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Coprolites are often referred to as the missing links in our knowledge of prehistoric diet and health. They offer direct evidence for dietary diversity and the consumption of food. They can also reveal aspects of the health of ancient societies. A multidisciplinary approach including microscopic analysis of pollen, non-pollen palynomorphs, plant tissues, SEM images and intestinal parasites was applied to study the early Neolithic human diet. To establish the producer fecal steroid and aDNA analyses were performed. Coprolites from sites in the Netherlands Tiel-Medel de Roeskamp and Nieuwegein-het Klooster formed an extensive source of data for prehistoric dietary diversity giving insights in the way of living of Early Neolithic people.

## **Where the wild things were: how the rise of farming changed human-wildlife relationships**

Nathalie Brusgaard

Leiden University

The introduction of farming transformed human-animal relationships. Humans now owned, cared for, and depended on domestic animals, while these animals, in turn, relied on humans. Research on the Neolithic transition has therefore focused strongly on the domestication of animals as well as plants, especially in western Europe where there are persisting uncertainties about the transition to farming. The change in the existing relationship between humans and wildlife has not been systematically studied. Even after hunting and gathering ceased to be the primary subsistence strategy, people continued to interact with wild animals. What is more, these interactions were now shaped by humans' need to protect animals and crops in their care. This paper introduces the new ERC-funded project WILDERFARM, which investigates how the emergence of farming impacted human-wildlife relationships in western Europe. It reviews current knowledge on these transformations, focusing particularly on the Swifterbant culture in the Netherlands and zooming in on the interactions between humans and beavers. This paper argues that approaching the Mesolithic–Neolithic transition through the lens of wildlife offers fresh perspectives on this pivotal period and outlines how WILDERFARM will advance this discourse.

## **Hunting in the wetlands: a morphometric approach to human-red deer relations**

Lara La Iacona, Laura Llorente-Rodriguez, Gerrit Dusseldorp, Nathalie Brusgaard

Universiteit Leiden

For millennia, red deer (*Cervus elaphus*) has been one of the most important prey species for humans in the Netherlands. As the Mesolithic-Neolithic transition includes a change from primary reliance on hunting to animal husbandry, a profound change in the human-wild animal relationships can be considered a key characteristic. In particular, variability in exploitation intensity and strategies in relation to the timing of the adoption of agriculture are of interest. To address this topic, new red deer morphometric data from three Dutch Neolithic sites was collected: Hellevoetsluis-Ossenhoek, Hazendonk and Hekelingen III. These measurements were compared to published data of Dutch Mesolithic and Neolithic sites and supplemented with archaeozoological data concerning age-at-death and anthropic bone surface modifications, to assess to what extent red deer populations were impacted by hunting activities, and whether any changes occurred with the availability of agriculture. More specifically, if significant changes in body size during the transition are observed, we will investigate whether they are likely to be caused by (the release of) hunting pressure due to human overexploitation, or whether humans and red deer rather engaged in sustainable relationships. Preliminary results from the three sites suggest that there was hunting pressure on red deer populations.

## Tracing Early Cattle Domestication: Evidence from the Neolithic Site of Bouqras

Ayse Atas Hooglugt<sup>1</sup>, Canan Cakirlar<sup>2</sup>, Hylke Buitenhuis<sup>3</sup>

<sup>1</sup> Istanbul University

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<sup>3</sup> Senior specialist Archaeozoology (retired)

The transition from hunting to animal husbandry represents one of the most transformative shifts in human history. The origins of cattle domestication are generally placed within the early farming communities of the Fertile Crescent in Southwest Asia, particularly during the Early Pre-Pottery Neolithic B (PPNB) of the ninth millennium BCE, when animal population management practices became more systematic. Bouqras, a Neolithic settlement in modern-day Syria, belongs to this PPNB horizon (7200–6500 BCE) and offers a crucial case study for understanding the early phases of cattle management. Excavated in the 1970s by the Groningen Institute of Archaeology (GIA), the site is one of the few well preserved settlements from this period and provides an exceptional faunal assemblage suitable for comprehensive analysis. Within this broader spectrum of exploited species, cattle occupy a distinct position in terms of both their proportional representation and their economic significance to the community.

This study applies zooarchaeological methods to reconstruct husbandry strategies at Bouqras. By examining age-at-death profiles, biometric measurements, pathological indicators, and species distributions within the faunal assemblage, we evaluate how cattle were incorporated into subsistence practices. Pathological analysis—particularly oral and locomotor lesions offers additional evidence for identifying management-related stressors and early signs of captivity. Preliminary findings, including indications of sexual dimorphism in distal extremities, suggest that the inhabitants of Bouqras had begun to exert selective control over cattle reproduction, culling strategies, and aspects of herd management. These emerging practices represent an important stage in the long-term trajectory toward cattle domestication in Southwest Asia.

## **Middle Neolithic pastures and ruminant diet. A dental microwear approach**

Nadine Nolde

University of Cologne

During the Middle Neolithic period, various agricultural transformation processes took place in Central Europe, based on the Early Neolithic Linear Pottery culture. In addition to archaeology, natural science methods such as archaeozoology, archaeobotany, stable isotope, lipid and faecal analyses are used to understand the agricultural system of the Neolithic period. Further insights are gained through dental microwear analysis, which uses microdefects on the occlusal surface of teeth caused by food particles to enable a specific reconstruction of dietary practices in livestock farming. It provides a reliable picture of individual grazing and feeding strategies as well as short-term regional or seasonal proxies in the animals' dietary behaviour.

On a small scale, the microwear profiles of different sites indicate locally varying vegetation conditions and herd management strategies, as well as increasing heterogeneity of pasture conditions, which was closely linked to local environmental factors, seasonal resources and different forms of landscape use.

## **Transitions of Physical Behaviour from the Later Stone Age to the Neolithic in Northwest Africa**

Glauke Wylin<sup>1</sup>, Louise Humphrey<sup>2</sup>, Isabelle De Groote<sup>1</sup>

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The shift from hunting and gathering to food production is regarded as one of the most impactful human lifestyle transitions. The current research focusses on this transition in Northwest Africa where it is characterized by three consecutive groups: the Iberomaurusian, Capsian and Neolithic. Recent research has highlighted the interrelation of migrating farmer groups from Iberia and pastoralist groups from the Sahel, together with long-term population continuity with local groups adopting Neolithic practices. This transitional phase is addressed here from the perspective of physical behaviour. Cross-sectional parameters of the humeri, femora and tibiae are measured to quantify strength adaptations and reconstruct habitual behaviour. The results point to unimanual loading in hunter-gatherer males, commonly linked to hunting strategies, while females show more equal arm loading possibly related to food processing activities. A change to symmetrical humeral strength in the Neolithic reflects intensified and diverse bimanual activities. The lower limbs demonstrate a pattern of consistent high levels of mobility across all three populations, related to long-distance traveling during hunting and gathering, and to the introduction of herding. These observations show both behavioural continuity and adaptations to activities, already initialised during the Iberomaurusian, which contributes to our understanding of the impact of subsistence change on physical behaviour.

## Posters:

### **Plant use and plant economy in the Kleine Gete LBK settlements**

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Along the Kleine Gete river lies a cluster of three Linear Pottery Culture (LBK) settlements. It is regarded as a pioneer cluster at the edge of LBK distribution in Belgium, being rather small and most probably short-lived. As part of a revision of the sites, macrofossil remains of charred seeds and fruits from two of the settlements (Wange-Damekot and Overhespen-Sint-Annaveld) were analysed to obtain a better understanding of plant use and plant economy during the Early Neolithic settlement period. The analysed assemblage showed exceptional preservation, allowing for detailed identification of both cultivated and wild plant taxa. In addition to typical LBK wheat crop species many plant taxa of field weed species were identified, with *Bromus arvensis*, *Lapsana communis*, and *Fallopia convolvulus* being the most numerous. Furthermore, the assemblage is characterised by a rich collection of wild resources, including wild apple (*Malus sylvestris*), stone fruit (*Prunus sp.*), hazelnut (*Corylus avellana*) and strawberry (*Fragaria vesca*). Charred bark of birch trees (*Betula sp.*) was also found, suggesting it was collected from the environment but with the exact use still unclear. Based on these results, we managed to obtain a more detailed view of the agricultural practices and use of wild resources in the surrounding habitat of the settlement.