INTERNATIONAL OPEN WORKSHOP
Socio-Environmental Dynamics over the Last 15,000 Years: The Creation of Landscapes VI

Kiel University, March 11 – 16, 2019

PROGRAMME & ABSTRACTS

GRADUATE SCHOOL AT KIEL UNIVERSITY
human development in landscapes

ROOTS – Social, Environmental, and Cultural Connectivity in Past Societies

CRC 1266
SCALES OF TRANSFORMATION
INTERNATIONAL OPEN WORKSHOP  
Socio-Environmental Dynamics over the Last 15,000 Years: The Creation of Landscapes VI  
Kiel University, March 11 – 16, 2019

PROGRAMME AND ABSTRACTS

Editing:
Katharina Fuchs, Anna-Lena Heyn, Natascha Kipke, Romy Plath, Jennifer Schüle

Layout and illustration:
Carsten Reckweg

Contact:
Leibnizstr. 3
24118 Kiel
www.workshop-gshdl.uni-kiel.de
workshop@gshdl.uni-kiel.de

Title: Excavation of the Linear Pottery settlement at Vráble, Slovakia (Photo: N. Müller-Scheeßel)
Photo left: pixabay
Photo next page: “Freya”, pixabay
**A warm welcome to Kiel!**

In its sixth edition, the International Open Workshop “Socio-Environmental Dynamics over the Last 15,000 Years: The Creation of Landscapes VI” has attracted more than 330 active participants who will present their talks or posters. We are particularly delighted about the engagement that PhD students have shown in the workshop. They will not only present their research projects, but also chair and organize entire sessions. The same applies to the post-doctoral fellows, principal investigators and international partners of our good old Graduate School (GS) “Human Development in Landscapes”, of the new Cluster of Excellence “ROOTS – Social, environmental and cultural connectivity in past societies”, and of the Collaborative Research Centre “Scales of Transformation: Human-environmental Interaction in prehistoric and archaic societies” (CRC 1266). The workshop takes place against a background, where the German research landscape is experiencing some changes. In the case of Kiel, the successful application for the ROOTS Cluster of Excellence offers new possibilities to focus our research on past connectivity in respect to aspects, which are also relevant for our current societies: socio-environmental hazards; dietary intakes; innovation, cognition and technology; urban agency and perception; social inequalities; conflict and conciliation. The Cluster of Excellence has just started on the 1st of January 2019 and we are in the creative process to ‘construct’ the new research environment within the Johanna Mestorf Academy. Within ROOTS, the Young Academy as a successor of the former Graduate School “Human Development in Landscape” will play the important role to stimulate research in young new fields of interest and to continue our commitment for young researchers.

The workshop is co-organized by the CRC 1266 that takes the long-term perspective, from 15,000 BCE to 1 BCE, to investigate processes of transformation in a crucial period of human history, from late Pleistocene hunter-gatherers to early state societies. Funded by the German Research Foundation, the CRC combines research of around 60 scientists from eight institutions and the Johanna-Mestorf-Academy. Within ROOTS, the Young Academy as a successor of the former Graduate School “Human Development in Landscape” will play the important role to stimulate research in young new fields of interest and to continue our commitment for young researchers.

We would like to thank Jennifer Schüle, Katharina Fuchs and Carsten Reckweg as well as the office teams and student assistants for their commitment and support in realizing this workshop!

We wish you an inspiring, fruitful workshop.

*Wiebke Kirleis*
CRC 1266 “Scales of Transformation: Human-environmental interaction in prehistoric and archaic societies”

*Johannes Müller*
Excellence Cluster “ROOTS – Social, environmental and cultural connectivity in past societies” / CRC 1266

*Mara Weinelt*
Excellence Cluster “ROOTS – Young Academy”/GS “Human Development in Landscapes”
Practical information

WORKSHOP VENUES
Central venue
Leibnizstr. 1, 24118 Kiel

Icebreaker
Geological Museum
Ludewig-Meyn-Straße 12

Conference Dinner
Paddle Steamer “Freya”
Bahnhofskai (near main station)

Excursion meeting point
Leibnizstr. 1, 24118 Kiel

GENERAL INFORMATION
Helpdesk
Leibnizstr. 1, Room 104
Opening hours: 8:00 til 18:00

Wlan
Please ask at the registration desk

Childcare
Leibnizstr. 3, Room 123

Local transport
Taxi: +49 431 77070
Public transport: www.kvg-kiel.de
### Tuesday, 12 March

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<th>Session</th>
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<tbody>
<tr>
<td>8:30 –10:00</td>
<td><strong>SESSION 1</strong> Space, the final frontier – Transformation of social space in forager societies</td>
<td>Lecture hall</td>
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<tr>
<td>10:30 – 12:00</td>
<td><strong>SESSION 7</strong> Mediterranean Connections – how the Sea links people and transforms identities</td>
<td>CENTRAL KEYNOTE</td>
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<tr>
<td>13:30 – 15:00</td>
<td><strong>SESSION 16</strong> Trends, phases, events – Temporal scales in archaeological and palaeoenvironmental data</td>
<td>ROOM 105</td>
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<tr>
<td>15:30 – 17:00</td>
<td><strong>SESSION 12</strong> Archaeohydrology – natural water supply and cultural water demand in the past</td>
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<td>17:30 – 19:00</td>
<td><strong>SESSION 4</strong> A diversity of barrows? – Early earthen grave mounds between the Caucasus and the Atlantic</td>
<td>ROOM 204</td>
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<td><strong>SESSION 18</strong> Transformations in geophysical and geoarchaeological methods</td>
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<td></td>
<td><strong>SESSION 6</strong> Complexity in archaeology – Diachronic transformations of complex networks and theoretical aspects of complex systems</td>
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### Wednesday, 13 March

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<th>Time</th>
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<tr>
<td>8:30 –10:00</td>
<td><strong>SESSION 3</strong> Starting where they stopped to rest: Transformation of Stone Age burial practices between the Baltic and the Urals</td>
<td>Foyer/Pav.</td>
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<tr>
<td>10:30 – 12:00</td>
<td><strong>SESSION 7</strong> Mediterranean Connections – how the Sea links people and transforms identities</td>
<td>ROOM 105</td>
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<tr>
<td>13:30 – 15:00</td>
<td><strong>SESSION 19</strong> Scales of Transformation in Prehistoric and Archaic Societies</td>
<td>ROOM 106</td>
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<tr>
<td>15:30 – 17:00</td>
<td><strong>SESSION 18</strong> Transformations in geophysical and geoarchaeological methods</td>
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<td>ROOM 209</td>
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THURSDAY, 14 MARCH

8:30 – 10:00
SESSION 11
Social resilience to climate changes with perspectives on the past 5000 years

10:30 – 12:00
SESSION 7
Meditteranean Connections – how the Sea links people and transforms identities

13:30 – 15:00
SESSION 8
Territoriality in Europe in the Bronze and Iron Age

15:30 – 17:00
SESSION 3
Starting where they stopped to rest: Transformation of Stone Age burial practices between the Baltic and the Urals

17:30 – 19:00
SESSION 13
Human, beast and landscape. A diachronic study of hunting and human-animal-relationships in Northern Europe and in the Baltic Sea area

FRIDAY, 15 MARCH

8:30 – 10:00
SESSION 11
Social resilience to climate changes with perspectives on the past 5000 years

10:30 – 12:00
SESSION 17
Determinism in archaeology: What is it and why does it matter?

13:30 – 15:00
SESSION 8
Territoriality in Europe in the Bronze and Iron Age

15:30 – 17:00
SESSION 13
Human, beast and landscape. A diachronic study of hunting and human-animal-relationships in Northern Europe and in the Baltic Sea area
**Central Keynotes**

**MONDAY, TUESDAY & WEDNESDAY, Lecture hall**

**MON**

<table>
<thead>
<tr>
<th>18:00</th>
<th>HDR Laure Salanova, directeur de recherche:</th>
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<td>Interpreting Groups: the “Social” Archaeology</td>
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<td>French National Centre for Scientific Research</td>
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<td>Institut des Sciences humaines et sociales (INSHS)</td>
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**TUE**

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<tr>
<th>18:30</th>
<th>Prof. Tim A. Kohler: Socio-Environmental Dynamics and the Creation of Landscapes</th>
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<td>Washington State University, Archaeology and Evolutionary Anthropology</td>
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**THU**

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<tr>
<th>17:30</th>
<th>Prof. Christine A. Hastorf: Intimate Plants: Constructing Past Identities Through People’s Relationships with Their Plants</th>
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<td></td>
<td>University of California at Berkeley, Anthropology Department</td>
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<td>(Graduate School Human Development in Landscapes, Kiel University)</td>
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**ABSTRACTS**

**Interpreting Groups: the “Social” Archaeology**

*Prof. Laure Salanova*

‘Directrice de recherche au CNRS et Habilitée à diriger des recherches’

*French National Centre for Scientific Research | CNRS*

*Institut des Sciences humaines et sociales (INSHS)*

In her lecture, Ms Salanova will concentrate on the social sphere of past populations: How to approach and implement definitions and systems of social groups in archaeological contexts: **Interpreting Groups: the “Social” Archaeology**

Several authors have emphasised the great confusion spread by recent publications dealing with interpretation of material remains from past populations, which are often arbitrarily classified according to poorly defined systems. In the framework of this Congress, I will focus the discussion on the economic activities, trying to understand through the crucial differences observed in the field of the taxonomy on international scale what is due to cognitive development of researchers and what is due to their area of expertise.

**Socio-Environmental Dynamics and the Creation of Landscapes**

*Prof. Tim A. Kohler*

*Washington State University, Archaeology and Evolutionary Anthropology*

We are scaling up the questions we ask in archaeology to address questions about change in larger chunks of space and time. Inevitably we take some position on causation as we do so, though many of us hold deeply ambivalent and often largely unarticulated attitudes about causation in socio-natural systems that tend to be attached to theoretical predilections. This is manifested in many fancy indirect ways of talking about causation without really talking about it. I address questions of causation as they have presented themselves in the traditional inferential and the less-traditional, deductive/modeling approaches that we have pursued in the Village Ecodynamics Project in the US Southwest (and its follow-on projects) over the last two decades. These approaches raise many interesting open problems. If we cannot achieve clarity in our descriptions of causation then we have no lessons from archaeology to bring to our current problems and those we expect to face in the near future.

**Intimate Plants: Constructing Past Identities Through People’s Relationships with Their Plants**

*Prof. Christine A. Hastorf*

*University of California at Berkeley, Anthropology Department*

Plants have been the most common non-human set of species that people have engaged with over human existence. While most people speak of domesticating plants, they too have domesticated us. They have formed intimate relations with us, having convinced our ancestors to settle down and care for them. At times they have become kin, moving with us and sustaining us like a good grandmother. How can we see these intimate relationships with plants in the past, given that they are often scarce in archaeological sites? By thinking about plants in more social ways we can begin to get closer to people’s choices, values and engagements with plants as we accept that this has been an intimate relationship since the palaeolithic times.
Barbarians in the letters of Sidonius Apollinaris: a project report
Veronika Egetenmeyr (University of Greifswald)

Sidonius Apollinaris, a Gallo-Roman aristocrat and later bishop of Clermont-Ferrand, is one of the most fascinating personalities of fifth century Gaul. Through his nine books of letters, which are composed in the classical tradition of the Roman epistolography, he provides an insight into his daily life and offers his perspective on political, religious and social transformations. As the power of non-roman communities (e.g. Goths and Burgundians) rose in the Gallic provinces, he reveals in one of his epistles that he wrote under great anxiety since his town was surrounded by a “sea of tribes” (Sidon. Ep. III 4.1). Consequently, Sidonius emphasizes the importance to protect Roman culture, classical traditions and paideia, which he describes as threatened by the barbarians. His letters present an impression of a world in decline and struggle, in which education, apparently the only marker of nobilitas and therefore part of his identity, was fading away. As expected, he applied traditional stereotypes and prejudices in his depiction of barbarians, represented as uneducated, unaware of social customs and wild animals. Even though he adopted these specific topoi for their description, Sidonius's perception is not entirely restricted by classical conventions, but shows the transformation his own society was going through. In the light of the recent challenge regarding self-awareness and identity, I will focus on how Sidonius described “barbarians” in his letters and how he transformed the picture of the “barbaric other” in contrast to his own self-identification.

Chronologies and interrelations in the Corded Ware and Bell Beaker phenomena
Ralph Großmann (Kiel University)

This paper presents the results of the dissertation: “Das dialektische Verhältnis von Schnur-keramik und Glockenbecher zwischen Rhein und Saale”. The Late Neolithic Bell Beaker and Corded Ware complexes are commonly viewed as clearly bounded phenomena of burial rituals and material culture. Conversely, common traits and overlapping characteristics have also been pointed out, and have been interpreted as interrelations between two distinct groups of people. In this paper, this phenomenon is studied in two German regions – the Rhine Basin and the
Thuringia Basin. Here, it can be shown that burial customs and vessel decorations display considerable overlaps, especially in spatially and temporally close contexts. Furthermore, Corded Ware and Bell Beaker consist of sub-groupings and different vessel types. This phenomenon will also be regarded in relation to temporal and spatial aspects. This paper focuses also on the Bell Beaker and Corded Ware chronologies which base on vessels and absolute data. Moreover, changes concerning the spatial distribution of both phenomena will be pointed out.

Visualizing Lodovico Domenichi’s “Ragionamento nel quale si parla d’imprese d’armi, e d’amore” from 1574
Maren Biederbick (Deutsches Medizinhistorisches Museum)

Based on a Renaissance book from 1574 about identity signs the compilation of a catalogue of artefacts, displaying and analysing what 500 years ago two of its authors have described, was the starting point of the PhD-thesis about human inscriptions of identity into lands-capes. The emblem expertise gathered thereby opened the path to a curator’s traineeship in a mu-seum where 300 objects of various shape – coins, medals, badges, Militaria – spread over the vast depot waiting to be properly registered. Assembled now after two years they form as Medicina in nummis a special collection of that museum, adding thus another aspect to ist identity on an international scale. It is on medals indeed, where even in a small context identity can be preserved over a long time span. With a portrait on the obvers and a significant picture and a short motto on ist reverse the idea within is transferred more easily to a recipient since the Roman antiquities than through the lecture of a book. Today still identification takes places in images. We grasp pictures the instant we see them. Given this, another Renaissance text awaits its break through: The RAGIONAMENTO NEL QUELE SI PARLA D’IMPRESE D’ARMI, E D’AMORE by Lodovico Domenichi [1515- 1564]. Published as third part in the book above mentioned, this text has always been neglected in comparison to the first two parts. This might be due to the lack of illustration. While the signs described by namely Paolo Giovio and Gabriele Simeoni have been furnished with woodcuts, the editor Guillaume Rouillé printed Domenichi’s sign-descriptions just as plain text. The reason is not, that Domenichi wrote with less quality. A glimpse on the existence of these signs in applied emblems. What we know is that Simeoni draw the first passages of his text reveals that we find here the sign-documentation of other just as im-portant persons. A quick search in the respective material culture proves the existence of these signs in applied emblems. What we know is that Simeoni draw the first illustrating sketches for both – Giovio’s and his text. Unlike Rouillé Simeoni had no close contact to Do-menichi. Thus to him there was no reason to illustrate the work of his compatriot. In consequence of the bibliographic history of Domenichi’s text modern image-databases for emblem researchers do not include the signs described by him. As Domenichi adds in his text more corporate identity examples of northern Europeans, which so far were scarcely represented by Giovio and Simeoni, it is a worthwhile project to fill this gap with more in-formation. I would like to present how by 2D-Scans of the signs on material culture Dome-nichi’s text can be given reliable illustration. Once these will be entered into the existing databases like ICON CLASS they will by their visual presence finally have a chance of being respected in further picture analysis. And, who knows yet, they can be the missing link to the habit of northern pictural identity marketing in early modern times.

Roman Settlement Patterns in Southern Latium
Michael Teichmann

While my PhD research conducted at the University of Kiel had focused on the complex rela-tionship between men and landscape in south-western Latium in Roman Antiquity with an emphasis on geo-archaeological research questions and landscape transformation proces-ses, the present paper centers on the analysis of Roman settlement patterns in the same region. While initial research on Roman settlement patterns was already undertaken in my thesis for the southern Provincia di Roma as a case study, nine additional research areas were analyzed and embedded in the wider discourse on Roman settlement archaeology since than. The present paper applies quantitative analyses to improve our understanding of Roman settlement patterns in southern coastal Latium. Records for more than 5000 archaeological sites were gathered. One of the central research questions concerns the in-terdependence of landscape types (such as alluvial plain, coastline, volcanic hill or limestone mountain) and factors, which were decisive for locational choices. Descriptive site location analysis was conducted for different site types in respect to environmental and cultural parameters with a potential influence on the choice of site locations. These factors comprise variables derived from the elevation model such as altitude-de, slope or exposition, background geology, soils, the cost-distance to resources (rivers) as well as cost-distances to elements of the cultural landscapes such as roads, sanctuaries and towns. A comparison was undertaken for different site types in the same “micro-region” as well as for the same site type in different environmental settings. In a further step the patterns observed for the study area were compared with results of further published quantitative studies on Latium and Campania to identify similarities and differences. Additional analyses concerned site density distribution and intervisibility. The former analy-ses the spatial distribution of different site types in the study area, identifying centers of activity. The latter assesses the role of visibility for important elements of the cultural lands-cape such as villas, towns, roads and sanctuaries. Visibility may have been of relevance for aspects of social representation and a visual dominance of the landscape.
Beyond the Archaeosediment

Carolin Langan (Institute for Physical Geography, Goethe University, Frankfurt/M)

After completing my Diploma in Agricultural Sciences and Environmental Management, I saw a great opportunity to pursue my interest in geoarchaeological research at the Graduate School in Kiel. The Graduate School encouraged me to move beyond the frontiers of specific disciplines, to learn new techniques, broaden my knowledge and work interdisciplinarily. During my PhD I conducted geoarchaeological research on a multi-layered settlement structure which had persisted for several thousand years using a multiproxy approach. This research elucidated both natural and anthropogenic influences on the site formation and highlighted the enormous human impact on the environment. The acquired skills created the prerequisites for my PostDoc time in Frankfurt. I broadened my research collaborating in different geoarchaeological projects, always with the focus on the impact of historic settlers on their environment reflected within the sediments.

Microscopic archaeosediment analysis often revealed vitrified material, which was assumed to be melted phytoliths. We conducted combustion experiments using different plant compartments of cereals exposing them to different temperatures. We found that plant compartments react differently to varying temperatures, yet all parts are completely molten at 800°C. Sediment analysis remained in my focus when comparing 6 different multi-element analysis methods. Evidence was provided that pXRFs, a quick and cheap method, is highly suitable for multi-element analysis in the archaeological context. Geochemical analysis was also applied to an early Holocene floodplain soil. The occurrence of the so-called “Black Floodplain Soil” (BFS) is a widespread phenomenon in Central Europe, yet its genesis is still poorly understood. In two different locations in Germany the BFS was analysed. These results reveal a complex milieu genesis.

3D and archaeology: the digital turn in the light of two research projects

Gianpiero di Maida (Neanderthal Museum)

To document the rock and mobile art record of Sicily (object of a PhD project), several digital methods have been implemented, chosen to fit the given peculiarities and to obtain the best results, case by case. Behind the application of such methods, the comparison with the old documentation, the theoretical reflection, the necessary upgrading process were all a constant presence. Even once realized, the products of this documentation’s process continued to pose new questions and challenges: the digital items give their best if implemented in a network, if they are given the possibility to be re-used, mixed, played with, which is often an impervious outcome, because of a general lack of infrastructures to host them.

The same focal points, the same questions, the same issues, if possible amplified by the larger number of items object of analysis and by the additional didactical perspective of the whole operation, re-presented themselves in the DISAPALE project (Digitale Sammlung Palaeolithischer Leitformen) hosted and supported by the Neanderthal Museum, financed by the Bundesministerium für Bildung und Forschung: this project aims at creating a 3D digital catalogue of Paleolithic lithic types from Europe. Lithic objects from different continental collections (starting from the one hosted by the Friedrich-Alexander Universität Erlangen-Nürnberg) will be scanned in 3D, organized in a catalogue according to typological categories, and finally made available for the final users on the NESPOS platform.

This lecture will briefly present the digital-documentation-related most relevant issues of the old and current project, trying to address some of the above-mentioned issues, combining them with a long-run perspective.

Neolithic and medieval virus genomes reveal the complex evolution of Hepatitis B

Ben Krause-Kyora1, Julian Susat1, Alexander Immel1, Felix M. Key2, Denise Kühnert2, Christopher Rinne1, Alexander Herbig4, Johannes Krause2, Almut Nebel1

1 Institute of Clinical Molecular Biology, Kiel University, Kiel, Germany
2 Max Planck Institute for the Science of Human History, Jena, Germany
3 Institute of Prehistoric and Protohistoric Archaeology, Kiel University, Kiel, Germany

Emerging and re-emerging infectious diseases are an important topic in modern health care. By connecting knowledge in history, anthropology and microbiology to describe the epidemic pathogens in ancient populations can provide relevant information concerning modern infectious diseases, such as the sources of pathogens and their routes of introduction and transmission among human populations in the long term. Due to advances in molecular analysis over the last two-decade ancient DNA (aDNA) of pathogens offers a new approach for the study of infectious diseases and host-pathogen interaction. Despite these advantages identification of authentic viral sequences from ancient material are still challenging. Here, we report the analysis of three hepatitis B virus (HBV) genomes from skeletal remains dated to the Neolithic (Karsdorf and Sorsum) and Medieval Period (Petersberg) in Central Europe. HBV is today one of the most widespread human pathogens, with one third of the world population being infected, and an annual death toll of about 1 million globally. The origin and evolutionary history of HBV is still unclear and controversial. Our results demonstrate that HBV already existed in Europeans 7000 years ago and that its genomic structure closely resembled that of modern hepatitis B viruses. Phylogenetic network analysis revealed that the two Neolithic genomes are most closely related to today’s African non-human primates. Although the two Neolithic strains were recovered from humans who had lived about two thousand years apart, they show higher genomic similarity to each other than to any other human genotype. The genome from the 1000-year-old Petersberg individual clusters with modern D4 genotypes.

3X3
Space, the final frontier – Transformation of social space in forager societies

TUESDAY March 12th & WEDNESDAY March 13th, Lecture hall
Session organizers: S. Grimm, D. Groß

TUE
08:30 Going Where No Archaeologist Has Gone Before: Testing A Polythetic Model Integrating Place, Landscape and Mobility with Material and Socio-Cultural Perspectives to Understand the British Mesolithic
Paul Richard Preston (Lithoscapes Archaeological Research Foundation)

08:50 Add now to here for nowhere. Reflections on Mesolithic short term camps and long distance networks
Guro Fossum (Museum of Cultural History, University of Oslo)

09:10 What to infer from lithic chaos? An example from Mesolithic southeast Norway
Daniel Groß (Centre for Baltic and Scandinavian Archaeology)

09:30 Exploring long-term variation in spatial organization in Mesolithic southeastern Norway, 11 400-9500 cal. BP
Keynote lecture: Steinar Solheim (Museum of Cultural History, University of Oslo)

10:30 Small Blades and Great Social Traditions
Sandra Söderlind (Graduate School Human Development in Landscapes)

10:50 The landscape-social-resource-space game. A sketch of some facets based on ethnoarchaeological data from the Evenk
Ole Gran (Dept. of Geosciences and Natural Resource Management, University of Copenhagen)

11:10 Defending the taiga? Complex enclosed Stone Age hunter-fisher settlements in Western Siberia
Henny Piezonka (Institut für Ur- und Frühgeschichte, Christian-Albrechts-Universität Kiel)

11:30 Lifeways at Star Carr and beyond: an evaluation of spatial organisation at different scales
Keynote lecture: Nicky Milner (Department of Archaeology, University of York)

13:30 Spatial organization and functional diversity of the Mesolithic settlement features from the area of central Poland
Grzegorz Osipowicz (Institute of Archaeology, Nicolaus Copernicus Univ. in Toruń)

13:50 In the heart of the Ahrensburgian – what do we actually know about the Final Palaeolithic hunter-gatherers in northern Germany?
Sonja B. Grimm (ZBSA / CRC 1266)

14:10 Lightening the load! Approaching Late Upper Palaeolithic human behaviour before the cold season
Markus Wild (ZBSA / University of Kiel / University Paris 1 - Panthéon-Sorbonne)

14:30 Reconstructing Hunter-Gatherer Paleoeconomy at a More Local Scale: the Langmahdalhe Faunal Assemblage as a Case Study
Gillian Wong (University of Tübingen)

14:50 Discussion

15:30 Abundance and seasonality – Untangling the organization of space among the mid-Holocene estuary populations of NW Finland
Satu Koivisto (University of Helsinki, Finland)

15:50 Complex architectural structures of the early Neolithic of the North of Western Siberia (based on materials from the ancient settlement Kayukovo 2)
Georgii Vizgalov (Surgut State University/ Institute of Humanities and Sport)

16:10 Approaching cultural meanings to natural spaces in the Mesolithic of Mecklenburg-Vorpommern
Felicitas Faasch (Universität Hamburg)
16:30 Ahrensburgian and Swiderian tanged points as indicators of a far reaching social network?
Katja Winkler (CAU Kiel/GSHDL)

16:50 Discussion

17:30 Mobility and land use during the Mesolithic in southern Scandinavia
Mathilda Kjallquist (National Historical Museums)

17:50 Mapping the social landscape of the Early Holocene settlement of Kerkhove-Stuw (BE)
Hans Vandendriessche (Ghent University)

18:10 Where was home? Inter-spatial land use by Late Quaternary hunter-gatherer populations in the central Narmada basin, India
Nupur Tiwari (Indian Institute of Science Education & Research, Mohali, Punjab, India)

ABSTRACTS

Space, the final frontier – Transformation of social space in forager societies

Keynote speakers: Nicky Milner (Department of Archaeology, University of York), Steinar Solheim (Museum of Cultural History, University of Oslo)
Session Organizers: S. Grimm, D. Groß

Besides time, spaces and spatiality are important measures in archaeology. Intra-site analyses are used to understand local processes, while inter-site comparisons help us to understand traditional spatial organisations of groups. We address local structures on a small scale, settlement systems or kinship networks on an intermediate scale, and trade routes and territories on a large scale. Hence, we essentially aim to identify social units and the social use of space in the past.

In contrast to well organised settlements of sedentary groups, spatiality becomes more complex when dealing with mobile forager societies due to the number of sites, their different functions, and the limitations of their identification. In this session, we want to address spatial aspects of prehistoric hunter-gatherer societies, and discuss our possibilities and challenges for identifying ranges, information networks, kinships, and identities. How do we identify social bonds and territories? Are the territories we identify the range of a family group or a larger information network? Are two very different sites an expression of different tasks, different purposes, different occupation time, different group sizes, or of different groups with different toolkits and/or coping strategies? Hence, we aim to discuss the social dimension of space and how we identify it in the archaeological record.

Assuming that the spatial behaviour of foragers is rather stable since it represents an adaptation to their environment and landscapes, we wonder when and why does this socio-spatial behaviour change? How can we identify substantial changes in socio-spatial behaviour that may be crucial for major transformations in the past like the Palaeolithic-Mesolithic transition?

Therefore, we welcome papers that in particular focus on aspects of transformation in relation to the social dimensions of space in forager societies.
**Going Where No Archaeologist Has Gone Before: Testing A Polythetic Model Integrating Place, Landscape and Mobility with Material and Socio-Cultural Perspectives to Understand the British Mesolithic.**

*Paul Richard Preston (Lithoscapes Archaeological Research Foundation)*

Going Where No Archaeologist Has Gone Before: Testing A Polythetic Model Integrating Place, Landscape and Mobility with Material and Socio-Cultural Perspectives to Understand the British Mesolithic. While interpretations are becoming more ambitious, several factors limit our ability to understand the Mesolithic occupation of the landscape. In particular, the polemic of the science wars has resulted in premature zero-sum rejections of approaches (irrespective of their value) due to an empiric/positivist or postmodern association. This leads to biased monothetic models with an over-concentration on specific aspects of human behaviour, one type of evidence (e.g. attributes, artefacts, contexts, or features), specific sites or regions, or the sole use of either a micro-onsite or the macro-offsite-landscape scale of analysis. Interpretations are limited further by a failure to distil theories into assumptions and testable hypotheses, inappropriate wholesale application of ethnographic analogies, a poor understanding of chaînes opératoires, and an inability to accommodate new discoveries. The net result is un-testable, non-replicable, incompatible, usually non-databased, and highly partisan interpretations. This paper takes the best of these approaches and proposes (as a proof of concept) an explicitly defined analytical model that is both scientifically rigorous as well as economically and socially engaged: The Sites, Landscape, Mobility, And Material-Culture Polythetic Model. Hypotheses derived from the model are tested using data from 792 Mesolithic sites in the Pennine region of Northern England. Consequently, it proposes a hitherto unappreciated narrative from this. By integrating these thoughts into the wider cultural framework, it will also be briefly reflected upon the emergence of long-distance networks and how we are able to trace them for understanding underlying communication networks.

**What to infer from lithic chaos? An example from Mesolithic southeast Norway**

*Guro Fossum (Museum of Cultural History, University of Oslo)*

Mesolithic sites are abundant along the Oslo fjord in southeast Norway. Due to the constant marine regression in the Oslo fjord area, shore bound sites from all prehistoric periods are located above present-day sea level. The glacio-istostatic rebound provides us with a unique chronological sequence of shore bound Mesolithic sites. These sites are poorly preserved in terms of organic remains, but are rich when it comes to lithic material. The lithic assemblage may be viewed as multi-temporal as it allows us to perceive past, present, and future actions at Mesolithic sites. In this paper, I will particularly focus on the future dimensions of lithic assemblages, and I will use minimum analytical nodule analysis (MANA) in order to discuss how the hunter-gatherers in southeast Norway planned and moved about in the landscape. The paper will focus on sites dated within the timespan 7000-5600 cal BC, but sites dated between 8000-7500 cal BC will be included as a frame of reference. MANA is a method for identifying the temporal and spatial patterns of the lithic technological organisation at the given sites. Further, it provides a basis for discussing landscape use and social networks in Mesolithic southeast Norway (and adjacent areas).
Questions of changes in demography and the spatial organization among hunter-gatherer groups during the Mesolithic is yet to be explored in detail for South Norway. In recent years, large-scale excavations in South Norway have provided a series of high quality lithic assemblages dated to the Early and Middle Mesolithic, providing better resolution for discussing long-term variation in socio-spatial behavior. Previous studies indicate that whereas the settlement system during the Early Mesolithic can be characterized as highly mobile, a more permanent settlement within specific landscapes and territories is suggested for the Middle Mesolithic. Moreover, compared to Early Mesolithic sites, the Middle Mesolithic settlement sites seem to represent different types and activities, varying from extensive residential sites where a variety of tasks were undertaken to sites focused on single tasks indicating short occupations and specialized use within a single settlement pattern. A parallel shift is also observed in material culture. Major changes in the lithic technology are demonstrated at the Middle Mesolithic transition, c. 10 300 cal. BP, with the introduction of pressure blade technology known in preceding centuries from the East European Plain. The leading hypothesis is that the technology was introduced to the region by migrating groups from the east. The relatively sudden appearance and rapid spread of the technology in southern Norway indicate a collapse of the existing technical system or even a demographic replacement. More detailed studies are however needed in order to understand if and in what ways these changes are related. By comparing long-term lineages and interrelated fluctuations in C14-data and site intensity along with intra-site studies of lithic remains (MANA), we explore the factors influencing long-term trans-formation in spatial organization in the Early and Middle Mesolithic of South Norway. We will argue that the changes observed in settlement system and lithic technology must be seen in relation to postglacial environmental settings, increased regionalisation and an transformation of established large scale social networks during the Early and Middle Mesolithic.

Small Blades and Great Social Traditions
Sandra Söderlind (Graduate School Human Development in Landscapes)

Social spaces and interactions between people during the Mesolithic are, for obvious reasons, difficult to study today. However, some types of interactions will produce physical traces. This is true for interactions that involve the teaching/learning of a material cultural tradition, such as flint knapping. When teaching or learning flint knapping techniques, two types of information must be transferred in order to maintain and/or spread a cultural tradition; a more theoretical knowledge and a more practical knowledge. The transmission of knowledge and how people learn from one another and because of that, technology can be studied as a social tradition. The use of pressure techniques, for producing blades, has been established to include a large amount of technological complexity. The reason for this is that pressure techniques comprise various technological steps, such as the making of related tools and devices, pretreatment of flint, special knowledge of body positioning etc., all of which can be seen as social arenas. Due to this technological complexity, implemented pressure techniques make good subjects for studies of transmission of knowledge and social interaction on a variety of spatial scales. In many Mesolithic forager societies in northern Europe, the use of a pressure technique for the production of small blades (microblades), was an important and prominent part of tool production. During the Late Mesolithic, this technique appears in several parts of the research area, included in a technological concept relating to a specific type of elongated, single-fronted core, known as a handle core or wedge-shaped core. Where the technology was invented, or introduced from, and how it spread over northern Europe remains unclear but is currently being researched in the scope of a PhD-project. As a part of this project, this paper will present and discuss how the handle core concept can be used for furthering our understanding of social interactions, the transmission of cultural traditions and the social use of space during the Late Mesolithic in northern Europe.

The landscape-social-resource-space game. A sketch of some facets based on ethnoarchaeological data from the Evenk.
Ole Grøn (Dept. of Geosciences and Natural Resource Management, University of Copenhagen)

Hunting-gathering cultures’ strategies for living in and exploiting the landscapes they inhabit can be seen as a game with the purpose of providing as nice a life for themselves as possible. The aim is to place yourself in a situation where you have access to an optimal amount of nice and varied food, comfortable living conditions, social interaction including love and sex, relaxation, a minimum of conflict, etc. Discussions with the Evenk demonstrated that they were able to develop new strategies matching new situations if basic elements in their applied strategies were changed. Obviously, their strategies were based on a detailed understanding of the dynamic and varying possibilities in their landscapes to a much higher degree than on traditional repetitive cultural strategic elements. In this ‘game’ storage of food as well
Defending the taiga? Complex enclosed Stone Age hunter-fisher settlements in Western Siberia

Henny Piezonka (Institut für Ur- und Frühgeschichte, Christian-Albrechts-Universität Kiel)
Co-authors: Natalya Chairkina (Ekaterinburg, Russia), Oleg Kardash (Nefteyugansk, Russia), Ekaterina Dubovtseva (Ekaterinburg, Russia), Georgii Vizgalov (Surgut, Russia), Dmitri Enshin (Tyumen, Russia), Ekaterina Girchenko (Tyumen, Russia), Lyubov Kosinskaya (Ekaterinburg, Russia), Svetlana Skochina (Tyumen, Russia), Viktor Zakh (Tyumen, Russia)

When do hunter-gatherers build fortifications? What are the reasons for the construction of complex enclosed settlements, and what role do they play in the negotiation and appropriation of space? These questions touch on a central but underexplored field in current anthropological debates on peace, war and the human nature. The emergence of fortified sites among Stone Age hunter-gatherers in the Western Siberian taiga in the 7th-6th millennium BCE is an outstanding and unique phenomenon in world prehistory. Although representing one of the earliest instances of communities enclosing and fortifying their settlements world-wide, the phenomenon has not been recognized beyond regional Russian archaeology and remains virtually unknown in the wider scientific community. The early enclosed sites in the taiga coincided with a range of other innovations that bear witness to substantial sociocultural and economic changes, among them the appearance of pottery vessels, the foundation of sacrificial mounds, and a rise in pit houses reflecting increased settlement density. It is unclear, however, what led to such complex hunter-gatherer life-ways with new enclosed complex settlement types. Did intergroup conflicts develop that were severe and foreseeable enough to necessitate the construction of defences? Did ritual or communal drivers lead to new forms of appropriating space and landscape? Which internal social and cultural mechanisms, external influences and environmental factors have been at play in these processes? Further peaks of fortification construction in the Siberian taiga occur in the Iron Age and in early modern times. Ethnohistorical and historic archaeological evidence in Western Siberia indicates that such defences were protecting hunter-fisher communities from raids of other foraging groups and of herding nomads from the steppe, taiga and tundra. The evidence also shows that complex agglomerated and partly subterranean architecture as of other objects plays a role, but seems to some degree to be misunderstood, because easy-to-pick-up resources with predictable concentrations in the landscape apparently play a role similar to ‘stored’ resources: you know exactly where to go to pick them up, if you need them. In this paper I shall attempt to sketch a number of different landscape/social/resource situations that can elucidate the degree of variation such cultural systems can represent.

Lifeways at Star Carr and beyond: an evaluation of spatial organisation at different scales

Nicky Milner (Department of Archaeology, The University of York)

Recent excavations at Star Carr have produced vast quantities of data and through mapping using 3D recording and GIS, combined with Bayesian modelling of radiocarbon dates, it is possible to examine the spatial patterning of activities of hunter-gatherers over an 1,000 year period. We can look at how structures on the dry land were used and the differences in their usage, as well as considering the activities that took place on the lake edge. Beyond Star Carr, work around Lake Flixborough can help us consider other types of site within the landscape which were probably contemporary with Star Carr, as well as some which are slightly earlier, and show very different ways of living. Finally, more broadly, the many artefacts and certain kinds of activities from Star Carr provide hints of links on a much larger scale, with other parts of the UK as well as in Germany and Denmark. These suggests networks, or perhaps trade routes and territories on much larger scales. This paper will present some of our new data and consider important questions around the social dimension of space and possible reasons for change.
Spatial organization and functional diversity of the Mesolithic settlement features from the area of central Poland
Grzegorz Osiopowicz (Institute of Archaeology, Nicolaus Copernicus University in Toruń)

In presentation will be presented the preliminary results of spatial studies conducted for several Mesolithic sites from Chełmno-Dobrzyń Lake District (central Poland). The research included results of technological, typological and traceological analysis of stone artefacts, find-dings made during the archeozoological, anthracological and palynological investigations, 14C dating and results of physical-chemical analyses of the substances sampled from stone and flint artefacts (mainly SEM-EDX and GC-MS). Studies have enabled observation of clear regularities in the internal organization of the analysed camps and the settlement structures identified within them, inside which one can distinguish repetitive systems of the various types of economic and utility zones. Differences in size, structure, probable duration and function of the individual structures were also recorded (including those from the same camps), which clearly indicates large variety and probable hierarchy of the settlement facilities used in Mesolithic. Taking into account results of the conducted studies, an attempt was made to classify such structures and to answer the question about their position in the mobility systems of the Mesolithic hunter-gatherer communities, in the context of contemporary ethnological and ar-chaeological concepts on the subject.

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In the heart of the Ahrensburgian – what do we actually know about the Final Palaeolithic hunter-gatherers in northern Germany?
Sonja B. Grimm (ZBSA / CRY 1266)
Co-authors: Benjamin Serbe, Moiken Hinrichs, Katja Winkler, Ingo Clausen, Sascha Krüger, Mara-Julia Weber, Berit Valentin Eriksen

The Ahrensburgian was defined in 1928 by Gustav Schwantes and in 1968 Wolfgang Taute published his seminal work on the tanged point groups of northern Central Europe including the Ahrensburgian. We used these anniversaries to have a closer look at our progress in un-derstanding these last Palaeolithic hunter-gatherer groups in northern Europe. At the foot of the eponymous site of the Ahrensburgian, the Ahrensburg tunnel valley was generally assumed as the core region of the Ahrensburgian. Furthermore, the Ahrensburgian was considered since as a specialised reindeer hunter society. However, based on the climatic development a retreat of hunter-gatherer groups from the northern areas during the Dryas 3 was occasionally suggested. Yet, for the earliest settlement of southern Scandinavian an ancestral relation with the Ahrensburgian is regularly discussed. In contrast, the origin of the Ahrensburgian is rarely dis-cussed and often assumed in the Bromme context. Hence, the review of the spatial distribution of the Ahrensburgian in northern Germany in combination with techno-typological and chronological considerations gives us enough food for thought about this last Palaeolithic society in northern Germany.

Lightening the load! Approaching Late Upper Palaeolithic human behaviour before the cold season
Markus Wild (ZBSA / University of Kiel / University Paris 1 - Panthéon-Sorbonne)

The settlement of Homo sapiens in northern Germany began around 14 500 years ago with the Hamburgian hunter-gatherers of Magdalenian tradition. While their ancestors were living in the mid-range mountain belt or even further south, the Hamburgian people were facing the wide and open landscape of the Lowlands. Despite the many sites that have been discovered within the last century, little is known about the behaviour of these people. A handful of sites brought – besides lithic remains – evidence of hunted fauna in nearby dump zones. Reindeer was the predominant species, which was not only exploited for its meat, fat and fur but also for its antler, which was used in the production of tools and projectiles. Of the few Hamburgian sites with the preservation of organic finds, the Classic Hamburgian sites of Stellmoor, Mejendorf and Poggenwisch, as well as the Havelte site of Slotseng, all point towards an au-tumn presence of hunter-gatherers. This season is of particular interest for analysing the behaviour of human groups that are at least partly dependent on reindeer, as it is the time of the great migration and the hunting of reindeer is particularly easy. Furthermore, during this period, the fur is of good quality, the fat reserves are close to being in prime condition and the antlers are fully grown and mineralised on all reindeer. However, it is also the time when Late Upper Palaeolithic people had to face the winter, which is thought to have been longer and colder than that of today. Therefore, the autumn was not only the season of opportunities but it was also the season of the highest risk of failure, which could end up in the starvation of the group. This paper presents the recent results of a technological study of antler working in the Hamburgian. In combination with zooarchaeological data, it is possible to decipher human social behaviour and unravel hunting and antler acquisition strategies in time and space. By including slightly older Magdalenian assemblages – in particular from the site Verberie (Buis-son-Campin) in the Paris Basin and also comparative data from...
Reconstructing Hunter-Gatherer Paleoecology at a More Local Scale: the Langmahdhalde Faunal Assemblage as a Case Study

Gillian Wong (University of Tuebingen), PhD student
Co-authors: Dorothée G. Drucker¹, Britt M. Starkovich¹, Nicholas J. Conard¹

1 Senckenberg Centre for Human Evolution and Palaeoenvironment at der Universität Tübingen, Germany
2 Eberhard-Karls-Universität Tübingen, Institut für Naturwissenschaftliche Archäologie
3 Eberhard-Karls-Universität Tübingen, Ur- und Frühgeschichte und Archäologie des Mittelalters

Germany has a long research history in late Upper Paleolithic human ecology, including regional-scale landscape use interpretations and paleoenvironmental reconstructions. In the Swabian Jura of southwest Germany, research has demonstrated that Upper Paleolithic hunter-gatherers used different local environments, specifically, the several river valleys in the region, in different ways. Intuitively, this is not surprising considering the variation in topography and local environments between each of these river valleys. To date, though, the resolution of archaeological data has very rarely allowed researchers to reconstruct things like human settlement patterns and landscape use at a scale smaller than the “Swabian Jura” or “southwest Germany,” despite the fact that hunter-gatherer mobility strategies likely depended, at least in part, on local-scale environmental conditions. We use the Magdalenian faunal assemblage from Langmahdhalde, a rockshelter in the Lone Valley of the Swabian Jura as a case study for evaluating human paleoecology at the local, as opposed to regional, scale. To do so, we use three methods: traditional zooarchaeology, stable isotopes on bone collagen, and microfaunal analysis. We use traditional zooarchaeological analysis to interpret human behavior and stable isotope analysis to evaluate the niches of the large ungulates exploited by humans: horse (Equus ferus), reindeer (Rangifer tarandus), and red deer (Cervus elaphus). Lastly, we use the microfaunal assemblage, coupled with the stable isotope results, to reconstruct environment-tal conditions. Our results allow us to discuss how this level of faunal analysis can be used to understand the local ecological context of Magdalenian hunter-gatherers in the Lone Valley of the Swabian Jura and how it may have influenced their decisions regarding landscape use. With this scale of data, we argue that interpretations of landscape use and settlement patterns can move beyond purely environmental explanations.

Abundance and seasonality – Untangling the organization of space among the mid-Holocene estuary populations of NW Finland

Satu Koivisto (University of Helsinki, Finland)

Fish have constituted an essential part of subsistence and diet among the prehistoric foragers and even later agrarian populations of coastal northern Ostrobothnia, NW Finland. A balanced subsistence strategy is dependent on several ecological, physical, and biological factors, which are governed by climatic and environmental circumstances. It has been suggested that the hunter-fisher-gatherer groups of northern Ostrobothnia have adapted their site location strategies to maximize fishing by the mouth and banks of the Ijoki River c. 5000-3000 calBCE. The prime resource for the forager/collector population equipped with the necessary mass-harvesting technological skills has consisted of migratory fish, specifically Atlantic salmon. The productive fishing grounds have probably been the prime motive for the initial stage of settlement in the area, beginning c. 5000 calBCE. Later, c. 4000-3500 calBCE, the occupation by the abundant fishing waters may have become more significant and the settlement pattern have approached semi or full sedentism. Changes in the settlement pattern from ca. 3500 cal BCE onwards may be seen as reflecting increased social complexity, which may have allowed joint initiatives in resource procurement, for instance mass-fishing. Riverbank housepit villages, especially the ones located by the rapids and islands, may be assumed to have been associated with mass-harvesting and/or processing locations of seasonally and spatially aggregated resources. The stability of the local resource base accompanied by the abundance and resilience of the main food resource may support the idea of socioeconomic competition, which may explain some characteristics of the sites, such as the clustering of housepits, the site locations, and the artefactual assemblages and materials.

Complex architectural structures of the early Neolithic of the North of Western Siberia (ba-sed on materials from the ancient settlement Kayukovo 2)

Georgii Vizgalov (Surgut State University/ Institute of Humanities and Sport)
Co-authors: Oleg Kardash, Svetlana Lips, Institute for the Archaeology of the North (Nefteyugansk, Russia), Henny Piezonka (Institut für Ur- und Frühgeschichte, Christian-Albrechts-Universitaet Kiel)

The ancient residential complex Kayukovo 2 was discovered in 1991. This settlement is located near the Punxii yurts of one Khanty family, so the archaeological site was named after their surname – Kayukov. Geographically, the object is located in the taiga zone of the West Siberian plain, on the watershed of the upper reaches of the Boshoy Salym river and the middle reaches of the Bolshoy Yugan river (left tributaries of the Ob river). Currently this territory refers to the Nefteyugansk region of Khanty-Mansi Autonomous Okrug-Ugra in Russia. Initially, on the surface the ruins of Kayuko 2 site looked like the remains of five indentations (pits) – grand central, linked by...
corridors with the other four. In plan the construction has a cross-shaped structure with a total diameter of about 35 m. Only after the excavations of 2000-2002 new data on the chronology, material culture and architecture of the site was obtained. A series of radiocarbon dates from two Russian centers (Novosibirsk, St. Petersburg) did not leave any doubt about the early Neolithic time of this settlement – the first half of the VI mill. BC. The investigations continued in 2018 by the international Russian-German expedition. In general, these investigations clarified the architectural features of the planning structure. First, we have found a moat or a corridor connecting the dwellings and encircling most of the site. A “western entrance” to the internal platform was marked with two fireplaces. The buil-dings are interpreted as square or rectangular dwellings-semi-dugouts, heated by central fire-place. On the basis of a complex of original features (planning organization of the settlement, architecture of residential buildings, as well as the original ceramics, specific form of stone tools) a new archaeological culture of the Neolithic of Western Siberia, Kayukovo culture, named after the archaeological site, was revealed. The construction of the residential complex Kayukovo 2 is unique and untypical for any settlements of Neolithic hunters and gatherers of the North of Western Siberia. Such complexes most likely can be associated with societies that had a more complex social organization. Certain analogies are found in the architecture of ancient pre-agricultural societies in Western Asia (southeastern Turkey), for example, Göbekli Tepe. There is no direct similarity, but there are 2 features: 1. An annular planning structure when the dwelling space is organized inside the circle 2. A spiral corridor along the outer radius. This archaeological culture and architectural tradition looks alien to the North of Siberia, and its appearance is more likely connected with the resettlement processes from southern territories. This year, about a hundred kilometers east, in the middle reaches of the Bolshoy Yugan river, a similar and synchronous archaeological site, Kachniasp 2, was also revealed. It allows us to speak not only about a particular site, but about a historical and architectural phenomenon. We present the first results of the investigations of early Neolithic archaeological sites of the North of Western Siberia, perhaps later they can be connected with the southern architectural traditions of Southern Siberia and Western Asia. We would like to indi-cate that in Siberian Neolithic could exist some social structures, intermediate between tribal-neighbor communities and chiefdoms.

Ahrensburgian and Swiderian tanged points as indicators of a far reaching social network?
Katja Winkler (CAU Kiel/GSHDL)
During the Younger Dryas and the beginning of the Preboreal the north European lowland was settled by forager societies defined as the Ahrensburgian and the Swiderian, which belong to the Tanged Point Technocomplex. The principal visible difference between the Ahrensburgian and Swiderian consists of tanged points without a ventrally retouched tang in the western part (the Ahrensburgian) and points with a ventrally retouched tang in the eastern part (Swiderian/Masovian). It is well known, that each type occurs far into the associated territory of the other. At many sites, the different types occur together. This is especially true for the area between the middle Elbe and the upper Warta river. The considerable technological and typo-logical similarities as well as the frequent appearance and distribution of the different tan-ged point types are raising numerous questions concerning possible interaction, information networks and spatial range of the Ahrensburgian and Swiderian as well

Approaching cultural meanings to natural spaces in the Mesolithic of Mecklenburg-Vorpommern
Felicitas Faasch (Universität Hamburg), PhD student
The PhD-project aims to improve the state of knowledge regarding the Mesolithic
about cultural identiﬁes. The talk will discuss this issues by the results of technological studies of the core-reduction process on ﬂint artefacts as well as morphological-typological studies on Ahrensburgian and Swiderian tanged points and the distribution of the different tanged point types in the area around the middle Oder river.

Mobility and land use during the Mesolithic in southern Scandinavia
Mathilda Kjallquist (National Historical Museums)
Co-authors: Lars Larsson, Lund University; Adam Boethius, Lund University

Mobility among ancient foragers is a pertinent research field and has, over the years, inte-rested a large number of scholars. Research concerning ancient mobility has traditionally used archaeological methods, such as cultural speciﬁc objects and technologi-cal traits, but has since the 1980s also involved the study of strontium isotope ratios. Ancient forager mobility has been examined and recently stone technology and Sr isotope ratios have been studied to facilitate interpretations of Early Mesolithic forager mobility and networks. However, most of the research using Sr isotope ratios has been done using bulk sampling methods, which gives great information regarding average values and thus where the individual has spent most of his/her time during the forming of the teeth, but not high-resolution data of speciﬁc whereabouts during the formation of each speciﬁc incremental growth line. Recently, new evidence has been presented indicating an emerging territoriality among foragers in southern Scandi-navia from the Early Mesolithic period and onwards. A territorial division of the Early Holocene landscape will have drastic implications for how mobility among these people can be under-stood and it is imperative that new strontium examination-study this. However, the study of forager mobility, within a context of territorial behaviour, requires a much higher data resolution than can be provided from bulk Sr studies. If considering what is known ethnographic from territorial foragers it is apparent that families and different societal groups had a pro-nounced territorial mobility, i.e. a mobility within the groups territory to facilitate different resource exploitations. This type of mobility has also been suggested among Early Mesolithic populations. The humans from Norje Sunnansund (an Early Mesolithic settlement from southern Sweden) have been suggested to have lived sedentary on a lakeside settlement close to the Baltic Sea. The evidence from the osteological material indicates that the humans lived sedentary on the site but ventured out to sea during winter to hunt seals and inland during summer to exploit big game resources. A recent study on bulk Sr isotope ratios on the human teeth from the site also indicates a limited mobility, but with large networks that enable raw material procurement and exchange. During the Late Mesolithic period evidence of territory-altity is further strengthened by e.g. territorial displays through burial customs, which have been considered as good evidence of territoriality and social complexity among foragers. Consequently, it is of interest to compare the strontium values from two different settle-ments, one Early (Norje Sunnansund) and one Late (Skateholm) Mesolithic, to further inter-pre the mobility signals and to better decipher how the suggested territories were construc-ted. Here we will investigate logistical mobility among ancient foragers from southern Scandi-navia. By analysing Sr isotope ratios on speciﬁc incremental growth-lines on human teeth from one Early and one Late Mesolithic archaeological site, where the humans have previously shown afﬁliations to the area they were found in, we wish to study territorial mobility. By relating high-resolution data, from human teeth to that of different animals, found in refuse as well as beads, we wish to study group territory and areas of resource procurement to in-vestigate forager territoriality, mobility and network in ancient landscapes.

Mapping the social landscape of the Early Holocene settlement of Kerkhove-Stuw (BE)
Hans Vandendriessche (Ghent University)
Co-authors: Colas Guéret1,2, Joris Sergant1, Annelies Storme1, Frédéric Cruz1, Luc Alle-meersch1, Kim Aluwé1, Wim Van Neer1, Philippe Crombé1.

At the transition from the Early to the Middle Mesolithic, two profound changes occur in the lithic assemblages of the Rhine-Meuse-Scheldt area. At the one hand, hunting equipment changed radically around 9.3 cal BP with the replacement of steeply retouched microliths by invasively retouched points and small backed bladelets. On the other hand, this typotechno-logical change is accompanied by a shift in raw material procurement. The use of Wommer-som quartzite intensiﬁes and its distribution expands in western direction, covering the entire Scheldt basin (Crombé 2018). As both these changes operate on a regional scale, they are believed to reﬂect diverse and complex socio-cultural phenomena involving transformations of the territorial ranges and the social boundary defence systems of one or more hunter-gatherer groups. Although the circumstances triggering these regional changes are not straight-forward to interpret, some of these probably constitute a response to major environmental changes occurring during the late Boreal, such as the inundation of the North Sea basin and the reduced availability of freshwater resources in lowland Flanders at a time when ﬂuvial dynamics came to a standstill and the forest canopy became more and more dense (Crombé 2018, in press). At Kerkhove-Stuw, a wetland-site in the Upper-Scheldt basin, recent excavations yielded 17 artefact loci comprised of both Early and Middle Mesolithic contexts, thus pro-viding the perfect opportunity to evaluate the impact of these regional changes of the “social landscape” on an inter- and intrasite...
Where was home? Inter-spatial land use by Late Quaternary hunter-gatherer populations in the central Narmada basin, India

Nupur Tiwari (Indian Institute of Science Education & Research, Mohali, Punjab, India)

Research carried out over the last four years (2015-2018) in two districts – Hoshangabad and Sehore - of Madhya Pradesh (central India) yielded a large number of microlithic sites in open air contexts (the author’s doctoral work). These sites were found in the Vindhyan and Gond-wana foothills, and Narmada floodplains (north and south of the river Narmada, respectively). The presence of abundant rock shelters at near most of the open air sites suggests dynamic and intense land use patterns. The distance between the rock shelters and spatially associated open-air sites is variable. Many of these rock shelters are adorned with rock art of various styles and designs and use of different pigments. The landscape movement of the hunter-gatherer populations is evident through a large number of microlithic occurrences found. This distribution also signifies regular mobility to acquire fine-grained raw materials for tool manufacture. The preliminary technological analyses of the microlithic assemblages demonstrate a high assortment of debris that is a by-product of prominent manufacturing be-haviour. The open-air areas must have been used as manufacturing locations and rock shelters for other functional and behavioural purposes. This dynamic land use dichotomy in the Late Quaternary period of the central Narmada Basin shows continuous movement on the lands-cape for tool manufacture, raw material and tool transport, and associated subsistence beha-viours. The role of both spaces has a significant function of its own, which is best understood through an inter-site analysis including artefact density, scatter sizes, contextual data, and technolog-ical attributes. Using all these different parameters, I aim to reconstruct a picture of habitat and mobility patterns amongst these populations.

POSTER SESSION: The material culture of Kayukovo 2 settlement of the early Neolithic in the context of hu-man resettlement in the North of Western Siberia

Ekaterina Girchenko (Institute of Archaeology and Ethnography SB RAS (Novosibirsk, Russia))

Co-authors: Oleg Kardash, Institute for the Archaeology of the North (Nefeyugansk, Russia); Georgii Vizgalov, Surgut State University/ Institute of Humanities and Sport (Surgut, Russia); Nataliya Chair-kina, Institute of History and Archaeology, Ural Branch of RAS (Ekaterinburg, Russia), Ekaterina Dubovtseva, Ural Federal University (Ekaterinburg, Russia).

From the early Neolithic (the VII-VI mill. BC) a great amount of settlements appeared in the North of the West Siberian Plain and this number did not decrease until the Middle Ages, which means the formation of a stable population on this territory. This investigation re-presents the material culture of one of the early Neolithic archaeo-logical sites – Kayukovo 2, located in the Nefeyugansk region of the Khanty-Mansi Autonomous Okrug - Ugra. This sett-lement is characterized by many original features, in particular, by the complex architectural and planning organization of space and original ceramics and stone tools of a specific shape. These characteristics are the basis for the uncovering of a new archaeological culture. Accord-ing to radiocarbon analysis, the settlement functioned at the first half of the 6th mill. BC. It was discovered in 1991, was investigated in 1999–2002, and in 2018 the excavations were continued by Russian-German expedition. Kayukovo 2 is a single-layer archaeological site that existed for a short uninterrupted period of time. The cultural layer extends beyond the living zone and is saturated with artifacts, including tools, which indicates the use of the periphery for economic activity. The collection consists of 1170 artifacts; mostly they are fragments of ceramic vessels. The main typological group: spheric vessels with a wide open neck and a cylindrical flat bottom. The rim is slightly profiled, the walls are thick, characterized by a loose structure. During the investigations, we have found vessels of atypical shape, but iden-tical ornament – these are pots with a pointed and rounded bottom. All flat bottoms are or-namented, as it seems, by symbolic images, the disclosure of the semantics of which is likely to make it possible to accurately determine the origins of the population who left this archaeo-logical site. Often such
bottoms do not find the corresponding fragments of the hollow body or neck, perhaps the bottoms due to the symbols applied, for example, a solar cross in a circle, were kept even after the vessel was broken. Ornamentation often covers the entire outer surface of the vessel, these are small depressions, nail impressions, repeating rows of receding or splitted rods, prints of toothed comb stamps, etc., arranged vertically, horizontally, or as “fish scales”. A special finding is a fragment of a vessel rim with a vertical paste in the form of a “snake”. Some vessels were painted with ocher. Ocher ornamental compositions are widely spread in Siberia and can find analogies in the Neolithic of Western Asia on painted ceramics. Also fragments of ceramic sharpening stones (polishers) and volumetric sculptures, presumably of birds, were found. There are not many stone tools, but they represent the steady types characteristic mainly for this archaeological site. These are adzes with a longitudinal gutter and sickle-shaped knives made of rare for the North types of stone by grinding. Forms are extremely specific and different from the ones that were used previously. The special form and ornamentation of vessels and tools, specific architecture are obviously connected with the resettlement from the southern territories to the North of Western Siberia. A number of features suggest a probable connection with the cultures of Western Asia, but the directions of possible migration flows require further research.

2 Transformation as a human response to climate and environmental change?

Thursday March 14th, Room 209

**THU 08:30**
Demographic developments and issues of scales: Human population estimates for Europe and western Germany during the Late Pleistocene and the earliest
Birgit Gehlen (University of Cologne)

**08:50**
Lateglacial environments inferred from zooarchaeological assemblages
Hazel Reade (University College London)

**09:10**
Climate and environmental change at the border of Pleistocene and Holocene on the Upper Volga and human response to it
Keynote lecture: Mikhail Zhilin (Institute of Archaeology of Russian Academy of Sciences)

**09:40**
Surviving through the latest Bølling, Allerød and the beginning of the Younger Dryas: Federmesser groups on the North European Plain
Iwona Sobkowiak-Tabaka (Institute of Archaeology and Ethnology Polish Academy of Sciences)

**10:30**
From function to socio-economical organization. New research on the late Azilian site of Le Closeau and implication on the Azilianisation process in the center of the Paris basin
Mevel Ludovic (CNRS, UMR 7041 Nanterre)

**10:50**
From shoulder to tang – Do Havelte points represent an adaptation to environmental change?
Mara-Julia Weber (Centre for Baltic and Scandinavian Archaeology)

**11:10**
Palaeolithic and Mesolithic flint assemblages from the Baruthian Ice Marginal Valley und Valley of the Nuthe-River
Stefan Pratsch (Landkreis Teltow-Fläming, Sachbearbeiter Archäologie)
ABSTRACTS

Transformation as a human response to climate and environmental change?

Keynote speaker: Mikhail Zhilin (Institute of Archaeology of Russian Academy of Sciences)

The Weichselian Lateglacial of the Northern Hemisphere represents a period of multiple, often rapid, and sometimes substantial climatic changes. In Northern Eurasia, these induced environmental changes that correspond to a succession of tundra/steppe, light forest, and again tundra/steppe ecotopes with regional variations. Since the beginning of the Holocene, forest environments have been spreading over large areas. How this succession correlates exactly to the succession of the Late Upper and Final Palaeolithic traditions between the Paris Basin and the eastern Baltic, remains a matter of debate. In general, these traditions are assumed to represent the result of adaptation to changing environments. This allows a contribution to the on-going debate about human responses to climate change that can be addressed from a deep-history approach. In particular, hunter-gatherer societies have to adapt their way of life to their natural surroundings. For instance, hunting strategies depend on visibility and, hence, vegetation cover that again partially influences the available prey and its behaviour. Likewise gathering and fishing depend on seasonal availability. Thus, the annual rounds and/or the mobility patterns had to be adjusted to these time windows, possibly resulting in altered settlement systems and a different spatiality. Yet, how people did this and whether they really exploited the full potential of a landscape remained a choice that might have been influenced by cultural traditions, beliefs, and norms. Perhaps, the experience of significant fluctuations also gave rise to inert behavioural complexes that helped to remain resilient over shorter periods of climate change.

In this sense, hunter-gatherers and their landscape form an example of complex adaptive systems or networks during the Weichselian Lateglacial.

In this session, we therefore aim to investigate these transformative processes: Does combined palaeoenvironmental and archaeological data support these transformations as adaptations? What was the reaction of hunter-gatherers to changing climate and environmental conditions? How and to what extent did these factors influence their behaviour? Is there evidence for alternative explanations of archaeological transformations from the onset of the Lateglacial Interstadial to the transition to the Postglacial? Papers exploring these questions on Lateglacial palaeoarchives in northern Eurasia are particularly welcome in this session.

Demographic developments and issues of scales: Human population estimates for Europe and western Germany during the Late Pleistocene and the earliest

Birgit Gehlen (University of Cologne)
Co-authors: Isabell Schmidt, Andreas Zimmermann

Demographic developments and issues of scales: Human population estimates for Europe and western Germany during the Late Pleistocene and the earliest Holocene

Birgit Gehlen, Isabell Schmidt, Andreas Zimmermann

The present study investigates the demographic developments during the Late and Final Palaeolithic and Mesolithic (Bølling/Allerød – Younger Dryas – Preboreal), dating roughly between 14.2 and 10.6 ka cal BP with special emphasis on the Pleistocene-Holocene transition. The demographic estimates were obtained using the “Co-logne Protocol” approach, adjusted to hunter-gatherer context and already being applied to several periods of the Upper Palaeolithic.

Our research (project D4 and E1, CRC 806, University of Cologne) provides site-distribution and demographic data at different scales and resolutions: for Late Pleistocene periods at a pan-European scale, and for the Mesolithic data at a scale comprising the northern German Rhineland and from Westphalia. We will stress issues on scales and data quality in our approach, possible sources of biases and errors, and present our findings on diachronic developments of human populations for the period under investigation. Dimensions and distributions of major settlement clusters are contextualized with climatic factors and paleogeography, and potential changes in landuse will be discussed.

Lateglacial environments inferred from zooarchaeological assemblages

Hazel Reade (University College London)
Co-authors: Jennifer Tripp (University College London), Kerry Sayle (Scottish Universities Environmental Research Centre), Tom Higham (University of Oxford), Sophy Charlton (Natural History Museum, London), Ian Barnes (Natural History Museum, London), Rhiannon Stevens (University College London)
While the general pattern of Lateglacial climatic change and subsequent environmental developments are relatively well known for northern Europe, it is widely acknowledged that these processes were asynchronous in their timing and precise manifestations. Regional differences in topography, distance from the coast, proximity to the ice sheet margins, soil structure, and hydrological dynamics produced local scale responses to global scale events. Many questions therefore remain about the local landscapes Late Upper and Final Palaeolithic communities would have experienced and utilised, and to what extent the natural environment influenced the choices and cultural traditions represented in the archaeological records of the region. Here we present new environmental data directly derived from zooarchaeological assemblages from northern Europe. We consider the data in relation to existing palaeoenvironmental archives and explore patterns of environmental and ecological change in comparison to pat-terns of change observed in the archaeological record. We discuss the complexities of produ-cing integrated environmental interpretations that are of a spatial and temporal scale relevant to exploring the relationship between Late Upper and Final Palaeolithic populations and their environment.

Climate and environmental change at the border of Pleistocene and Holocene on the Upper Volga and human response to it.

Keynote lecture: Mikhail Zhilin (Institute of Archaeology of Russian Academy of Sciences)

The proposed paper is focused on climate and environmental changes in the center of Euro-pean Russia – the basin of the Upper Volga at the border of Pleistocene and Holocene and human response to it. Existing data show that cold and dry climate of the Younger Dryas gradu-ally became more humid and warm by the end of this period. Sparse forests replaced perigla-cial landscapes, but open landscapes were widespread over the area under study. Reindeer and Bison Priscus were recognized from faunal remains of the bottom layer of Zolotoruchye 1, dated to 10240 BP. Substantial increase of warmth is observed in the very beginning of the Preboreal period. Dense taiga forests were spread in river valleys and lake depressions while open landscapes were preserved at watersheds. Faunal remains from Early Mesolithic sites show dominance of forest species with elk and beaver being the main hunted mammals. Rein-deer is absent in the bottom layer of Stanovoye 4, and makes less than 1% of mammalian bones in the bottom layer of Ivanovskyoye 7. Not a single bovine bone was found at Mesolithic sites of the Upper Volga. Final Palaeolithic population had to adapt to new environment. This process took about 300 years, and if we count in ge-nerations of hunter gatherers it was rather slow, evolutionary, and no traces of any catastro-phe or crisis can be observed. Environmental changes were the same in the region, but ways of adaptation of different groups in the same region were determined mainly by cultural tra-ditions.

Surviving through the latest Bølling, Allerød and the beginning of the Younger Dryas: Federmesser groups on the North European Plain

Iwona Sobkowiak-Tabaka (Institute of Archaeology and Ethnology Polish Academy of Sciences)

Co-author: Aleksandr Dianchenko (Institute of Archaeology of the National Ukrainian Academy of Sciences)

For a long time, hunter-gatherers had been perceived as communities fairly uniform and lar-gely dependent upon the environmental conditions. Even if these assumptions are not en-counter in the literature anymore, still the tendency to looking for reasons of cultural changes in transformations of economic systems is observed. This problem is especially valid in refers to Federmesser groups, inhabiting the vast area of North European Plain during almost entire Late Glacial and witnessed numerous climatic and environmental shifts. In order to explore this issue in details we analyzed the dynamics of Federmesser groups regarding to the possi-bility and degree of influence of environmental factors on their subsistence strategies, mobi-lity and cultural behavior. Considering the distribution of radiocarbon dates combined into chrono-
logical ranges within corresponding chronozones and location of archaeological sites on the North European Plain, our study have found a strong correlation between climate change and modifications of subsistence strategies and intensiveness of logistical mobility. Causal relationship between climate shifts and culture change is not obvious. Moreover, Federmesser communities reacted in different ways to the climate and environmental changes which had occurred over time and applied various strategies for the survival. The increase of internal diversity of Federmesser is observed in course of time, especially in the last stages of its development. For this reason also factors not influenced by natural surroundings should be considered. On the one hand, this issue requires to examine the cultural transmission, raising questions about the scale of cultural changes, range of errors occurring over the transformations, factors accelerating or slowing down these processes. On the other hand innovation as the basis of cultural change is explored.

From function to socio-economical organization. New research on the late Azilian site of Le Closeau and implication on the Azilianisation process in the center of the Paris basin

Mevel Ludovic (CNRS, UMR 7041 Nanterre)
Co-Authors: Jérémie Jacquier (UMR 6566, CreAAH, Rennes), Pierre Bodu (CNRS, UMR 7041, ArScAn, Ethnologie préhistorique)

Le Closeau (Rueil-Malmaison, Hauts-de-Seine, France) yielded 79 loci occupied by Azilian groups between the end of the Bolling interstadial and the beginning of the Younger Dryas. A majority of the concentrations are contemporaneous with the Allerød interstadial. They are characterised by an expeditive “chaîne opératoire” for the lithic production, the scarcity of retouched tools and their typological monotony (often dominated by curved backed points). The numerous (but not exhaustive) reffittings carried out on the locus 36 demonstrate that this locus did not function as a simple lithic workshop where lithic products would have been strictly used outside the knapping area. Indeed, if all the produced blanks were not intended to be used on site (absence of blanks demonstrated through reffittings), the majority of the blanks were abandoned in the unit neither been transformed into a tool. Also, why bring such a quantity of flint (over 42 kg) inside this unit? The Azilian did not settle directly on the flint outcrops, but a few hundred meters away, suggesting the transportation of blocks to this place for their activity. The techno-economical data and the results of the functional analyses shed new light on the functioning of locus 36 and a few others (locl 20, 26, 41). They allow to question the evolutionary trajectories of the last Azilian societies. Indeed, the functional analyses have shown the presence of unretouched tools, impossible to determine without this kind of analysis. These tools were mainly used for processing plant/wooden materials. However, un-less we see a difficulty in predetermining the desired morphologies, these scant tools appa-rently choose a posteriori for certain morphological features, it cannot explain alone the a-bundance of the flint exploited. While the projectile points production may have been an im-portant objective of the knappers, the flexibility of the Azilians in the selection of blanks makes it difficult to quantify this production. Although the absence of this type of analysis in the contemporary context of Allerød confers on these results a novelty for the Late Azilian in NW Europe, they encourage us to especially question the relation between the apparent functio-nal specialisation of these concentrations and the weakly invested character of the lithic “chaîne opératoire”. These expeditive lithic productions have often been perceived as the wit-ness of a final episode of the Azilian in the Paris basin. But, on the contrary, should we not rather perceive them as specialised functional units integrated in a larger network? A larger network which, at Le Closeau, is still difficult to define in the form of a camp? Other concent-rations with the same technological signature have provided fairly similar results on the func-tional level. Also, we question the relation between these loci with expeditive debitage and specific vocation, with concentrations presenting a more important blade component, located in the southern part of the site (locl 14, 19, 41). Rather than perceiving technical variability as the marker of a diachrony during the Azilian can we not rather consider it as the result of functional variability? This paper aims to present the details of the first results acquired and to considerate the technical and chronological segmentation of the Azilian of northern France and the economical organisation of these Azilian societies.

From shoulder to tang – Do Havelte points represent an adaptation to environmental change?

Mara-Julia Weber (Centre for Baltic and Scandinavian Archaeology)

Havelte tanged points represent an anomaly in the succession from Magdalenian or Hamburger-shouldered or angle-backed points to the curve-backed points of the Azilian or Federmesser-Gruppen. Since they occur on the western and northern edge of the distribu-tion area of the Hamburger in a developed phase of the Meindorf interstadial (GI-1e), the question arises if they reflect an adaptation of the Hamburger hunting equipment or hunting circum-stances to a changing environment. It has been suggested that the increase in vegetation den-sity could be at the origin of this new type of lithic projectile implement. We will therefore investigate the evidence of botanical studies for a development of the vegetation cover during GI-1e between the Netherlands and Denmark but also look for other characteristics in the natural environment these areas have in common during the Early Lateglacial Interstadial. In a second step, we will discuss alternative explanations for the occurrence of the Havelte tan ged points, such as a technical evolution or social reasons.
**Palaeolithic and mesolithic flint assemblages from the Baruthian Ice Marginal Valley und Valley of the Nuthe-River**

Stefan Pratsch (Landkreis Teltow-Fläming, Sachbearbeiter Archäologie)


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**The reinvestigation of Aukštumala peat bog: a Swiderian habitation site on a former lake island on the coastal area of Lithuania**

Tomas Rimkus (Klaipėda University, Institute of Baltic region history and archaeology)

Co-authors: Algirdas Girininkas, Miglė Štančikaitė, Jolita Petkuvienė, Linas Daugnora

Aukštumala bog is one of the largest wetlands with peat deposits in the Nemunas river delta, in the territory of today’s Lithuania coastal area. Since the 19th century this place was not only the main surveys subject for European bog researchers but as well as for German ar-chaeologists. During the 20th century the bog has undergone multiple drainage works, most of it was connected to commercial peat exploitation. Only in 2004 the first reveals of the Stone Age habitation were discovered in this area, once the archaeological research was restarted. The site was found on the fluvio-glacial island of the former lake, on its western and eastern shores, with the flints representing the final stage of the Palaeolithic – Early Mesolithic. About several years ago, some technological investigations on the previous archaeological material went wrong and was misleadingly interpreted, however, in 2018 in the frameworks of the ongoing research project „Mesolithic-Neolithic and the Baltic Sea communities. Ancient coasts and settlements under the Sea and in the present coastline area“, the reinvestigations were launched in Aukštumala. The area of 50 m² was investigated and new sites discovered during the surveys. All data shows that this island was occupied by people who used the willow leaf-shaped points technology of the Swiderian culture. In addition to the excavations, palaeobotanical, geochemical, AMS dating, microwear and residues analysis of flints were used to explore habitation and human interaction within the environments of the palaeolake and is-land with its neighbour landscape. Current data shows that this place is the earliest Stone Age site on the current coast of Lithuania and one of the few with possible organic remains buried in lake sediments.
Starting where they stopped to rest: Transformation of Stone Age burial practices between the Baltic and the Uralss

Wednesday March 13th & Thursday March 14th, Room 204/207
Session organizers: Anastasia Khramtsova, Harald Lübke, Henny Piezonka

WED 08:30 Introduction

08:40 The long and short of it: the temporality of burial in the large cemeteries of Lake Baikal and northeast Europe
Keynote lecture: Rick Schulting (School of Archaeology, University of Oxford)

09:10 Tradition or transition? The Mesolithic cemetery of Groß Fredenwalde and the first farmers in NE-Germany
Andreas Kotula et al. (Niedersächsisches Landesamt für Denkmalpflege)

09:30 The Zvejnieki burial ground over the millennia
John Meadows (Centre for Baltic and Scandinavian Archaeology (ZBSA)

09:50 Discussion slot

10:30 Late Mesolithic - Early Neolithic Burials in the North of West Siberia
Andrey Pogodin (Research and Analytical Center of Problems for Preservation of Cultural and Natural Heritage “AV COM”)

10:50 Trans-Ural Neolithic-Eneolithic burial complexes
Nataliia Chairkina (Institute of History and Archaeology, Ural Branch of the RAS (Russia, Eka-terinburg))

11:10 Filling the old gaps: rediscovery of the Early Neolithic burials in the territory of the East European Plain forest zone
Ekaterina Kashina et al. (State Historical Museum, Moscow)

11:40 Emerging diversity. Hunter-gatherer mortuary practices in Eastern Baltic 7th to 3rd millennia cal. BC
Mari Tõrv (Department of Archaeology, Institute of History and Archaeology, University of Tartu)

13:30 Finnish Stone Age hunter-gatherer burials and the material culture death
Marja Ahola (University of Helsinki)

13:50 New burials from the sphere of Estonian Corded Ware
Kerko Nordqvist et al. (University of Helsinki)

Adomas Butrimas et al. (Vilnius Academy of Arts Institute of Art Research)

14:30 Discussion slot

THU 08:30 The Riņņukalns shell midden, Latvia: Research history
1873 – 2016

08:50 The Rinnukalns shell midden, Latvia: the new excavation and discovery of further burials
Valdis Berzins (Centre for Baltic and Scandinavian Archaeology; Institute of Latvian History, University of Latvia)

09:10 Anthropological examination of the two new Stone Age burials 2017/01 and 2018/01 at Riņņukalns, Latvia
9:10-9:30 Ute Brinker et al. (Centre for Baltic and Scandinavian Archaeology)

09:30 Perched on the edge of eternity: Fish and funerary rites at Riņņukalns, Latvia
Kenneth Ritchie et al. (Centre for Baltic and Scandinavian Archaeology (ZBSA))

09:50 Discussion slot

10:30 What’s left after death... Taphonomic processes within a mesolithic burial from the Oder Valley and their archaeological interpretation
Maha Ismail-Weber (Brandenburgisches Landesamt für Denkmalpflege und Archäologisches Landesmuseum)
10:50 Microarchaeological analysis of soil samples - a new method to study the uses of birds in Mesolithic burial practices
Tuija Kirkinen (Osteoarchaeological Research Laboratory, Stockholm University)

11:10 Stone Age Companions: Human-animal relationship expressions at hunter-gatherer cemeteries in the Eastern Baltic and Central Russia
Aija Macane (Gothenburg University)

11:30 Dating prehistoric burials in the north-east forest zone
John Meadows (Centre for Baltic and Scandinavian Archaeology (ZBSA) and Leibniz-Labor für Altersbestimmung und Isotopenforschung, Kiel University)

11:50 Discussion slot

13:30 Kits for afterlife. The evolution of burial assemblages from the Mesolithic to the Early Metal Age between the Baltic and the Urals
Anastasia Khramtsova (Graduate School “Human Development in Landscapes”, Kiel University)

13:50 “Ritualized” technology? blade arrowheads in the Late Mesolithic contexts of Karelia and Karelian Isthmus
Dmitriy Gerasimov (Peter the Great Museum of Anthropology and Ethnography / Kunstka-mera/ Rus.Acad. Sci.)

14:10 Burials with weaponry in Neolithic-Eneolithic burial grounds of the Upper Don River region
Elizaveta Yurkina, Roman Smolyaninov (Lipetsk State Pedagogical University, Russia)

14:30 Life and death on the rapids (Stone Age Cemeteries of the Lower Dnieper region)
Natalia Mykhailova, Oleksandr Yanevich (Institute of archaeology of National Academy of Sciences of Ukraine)

14:50 Corded Ware Warriorhood – a „pan-European“ monolith or a set of local traditions?
Rafal Skrzyniecki, Mateusz Cwalinski (University of Adam Mickiewicz in Poznan)

15:10 Discussion slot & conclusions

3 ABSTRACTS

Starting where they stopped to rest: Transformation of Stone Age burial practices between the Baltic and the Urals

Keynote speakers: Rick Schulting (School of Archaeology, University of Oxford); Ekaterina Kashina (State Historical Museum, Moscow)
Session organizers: A. Khramtsova, H. Lübke, H. Piezonka)

Burial practices, as a type of ritual activity, consist of many steps, represented archaeologically by different types of burial objects and features, which quite often reflect and clarify cultural distinctions. From this standpoint, the Northeast European forest zone from the Baltic to the Urals is of great interest in the Early and Mid-Holocene. Besides a considerable cultural diversity connected to hunter-gatherer communities, the territory is characterized by a generally favorable preservation of organic materials, including human skeletal remains. Nevertheless, the area has remained virtually a terra incognita from a comparative perspective, assessing cultural links and chronological trajectories between Later Stone Age burial sites on a supraregional scale. It is of particular interest also from a Western perspective, due to the sequential, and regionally very diverse appearance of “Neolithic” traits such as first pottery and early agriculture within this Eastern hunter-gatherer sphere. With respect to the application of a modern multi-proxy spectrum of methods to the information and materials from previously excavated sites, targeted analyses of existing finds as well as new excavations at several key sites are currently changing this picture.

All these factors and developments shape our current understanding of the cultural processes in the above-mentioned time and space. Therefore, the session provides a forum for scholars who are working with materials from different burial sites. Based on these contributions, variations, discrepancies, and similarities should become transparent across the outlined area. This will lead to a better understanding of the transformation of burial practices as well as the ritual sphere and its role in the lifeways of the communities.

Crucial problems to be presented and discussed may be divided into the three topics:
1. New data, results of recent excavations, application of new, interdisciplinary cutting-edge desktop and field methods in burial research;
2. The structure of burial sites, the significance and interconnection of burial objects;
3. The socio-cultural interactions between hunter-gatherer communities as well as between forager and farmer societies and how they can be traced on the basis of archaeological information from burial sites.
A thorough and multi-dimensional investigation of mortuary rites within the session will bring us closer to the understanding of both the evolution of mortuary practices, and the nature of burial rites that played a role in the late forager societies of the north-east European forest zone within their wider Eurasian frame. We cordially invite experts and young specialists in the field of burial archaeology as well as the archaeology of hunter-gatherers to contact us directly with a brief abstract of the proposed topic according to the issues to be discussed within the session.

The long and short of it: the temporality of burial in the large cemeteries of Lake Baikal and northeast Europe

*Keynote lecture: Rick Schulting (School of Archaeology, University of Oxford)*

The systematic use of AMS radiocarbon dating directly on human bone from Stone Age burials is providing the potential – once reservoir effects are taken into account – for increasingly high precision chronologies. Cemeteries in particular provide excellent opportunities to explore the temporality of burial. Recent work in the Baikal region of southern Siberia demonstrates the considerable variability in the temporal density of burials made at sites including Shamanika II, Lokomotiv, Khuzhir-Nuge XIV and Fofanovo. These results may be compared with those from the large Stone Age cemeteries of Zvejnieki and Olennii Ostrov in northeast Europe. Such an exercise clearly demonstrates the very different histories of these sites, even though the end result may look superficially similar, i.e., a large burial ground with a variety of burial forms and grave offerings, etc. This paper first addresses some of the difficulties encountered in constructing high precision chronologies, before comparing the temporality of Stone Age burials across two regions within the vast expanse of northern Eurasia.

Tradition or transition? The Mesolithic cemetery of Groß Fredenwalde and the first farmers in NE-Germany

*Andreas Kotula (Niedersächsisches Landesamt für Denkmalpflege)*

*Co-Authors: Thomas Terberger, Bettina Jungklaus, Henny Piezonka*

Discovered in 1962, the multiple burial of Groß Fredenwalde in the Uckermark region of nor-theasterm Germany has long been neglected. It was not before the late 1980s that the detect-tion of the Mesolithic burial of Strøby Egede on Zealand, Denmark, raised more attention also on the site, leading to a detailed publication by B. Gramsch and U. Schoknecht in 2003. New research since 2012 has yielded evidence for a unique set of Mesolithic burial traditions, and today Groß Fredenwalde is suggested to be the oldest cemetery in Germany. Most of the graves date to the early Atlantic period and are definitely related to late hunter-gatherers (c. 6.500 to 5.900 calBC). The grave of a young man who was probably buried in an upright position is dated about 1000 years younger (c. 4.900 calBC), indicating that this individual had been living side by side with the early LBK farming communities of the Uckermark. Up until now, at least ten individuals from the site are known, originating from at least five graves in an area only covering a few square meters on top of a morainic hill. It is expected that more graves are preserved on the site, including those covering the period of neolithization. The well-preserved human skeletons make the Groß Fredenwalde assemblage one of the most important series of Mesolithic individuals of Central Europe. There are four adult and 6 infant individuals, among them a baby burial found in 2014. They provide the opportunity to gain new insights in the late Mesolithic population and its lifeways, especially with the health status of children being most sensitive to the living conditions. In 2019 a new project financially supported by the Deutsche Forschungsgemeinschaft starts to further investigate the extension of the burial site. Already by now there is preliminary evidence of at least one more grave. The setting of the cemetery in the landscape is another important aspect which will be addressed by pollen analysis within a novel interdisciplinary approach. The well-preserved skeletons provide excellent conditions for isotope studies to better understand the economic and spatial context of the population, and aDNA-studies will help to characterize the Mesolithic population before and after the advent of the first farmers in the region. The talk will present the outstanding insights and potentials of research at the Groß Fredenwalde site including the better understanding of the territoriality and mindset of a late hunter-gatherer community witnessing the change of their world.

The Zvejnieki burial ground over the millennia

*John Meadows (Centre for Baltic and Scandinavian Archaeology (ZBSA), Schloss Gottorf, D-24837 Schleswig)*

*Co-author: Dr. Iīga Zagorska (Institute of Latvian History, University of Latvia, Kalpaka bulv. 4, Riga, LV-1050, Latvia)*

The Zvejnieki archaeological complex – a burial ground and two settlement sites, partly con-temporaneous with it, are well known in Stone Age research history. Excavations by F. Zagorskis at 1960s and 1970s (Zagorskis, 2004), as well as by L. Larsson, I. Zagorska and V. Bērziņš in 2005-09 (Larsson et al, 2017), gave an extraordinary rich archaeological and anthropological assemblage, investigated by a wide range of specialists (Back to origin, 2006). Re-search on this material has continued in recent years (L. Nilsson-Stutz, L. Larsson, J. Meadows, I. Zagorska), giving insights into ancient hunters-gatherers’ attitude to their environment, their way of life and mortuary practices over a long period, spanning much of the Mesolithic and Neolithic (approximately 7500-2600 cal BC). To understand the structure and development of
burial ground over the millennia more profoundly, to show continuity or changes in a mortuary practices and world views of ancient people, we will focus on the chronological division of the graves, following earlier studies on radiocarbon fresh-water reservoir effects in this material (Meadows at al, 2016, 2018). We will discuss long-term trends in the incidence of burials, their locations, in mortuary practices and associated material culture. As most of the 325 burials have not yet been dated directly, these are still tentative suggestions rather than robust patterns, but our presentation will provide some indication of the potential value of such a rich and continuous archive to understanding Stone Age burials in a Northern European context.

Late Mesolithic - Early Neolithic Burials in the North of West Siberia
Andrey Pogodin (Research and Analytical Center of Problems for Preservation of Cultural and Natural Heritage "AV COM")
Co-author: Tatiana Klementjeva (KlementjevaT@yandex.ru, Research and Analytical Center of Problems for Preservation of Cultural and Natural Heritage "AV COM – Heritage", Institute of History and Archaeology, Ural Branch, Russian Academy of Science, Yekaterinburg, Russia)

The study is devoted to the burial practices and mortuary rites adopted by the population of the North of Western Siberia in the Late Mesolithic – Early Neolithic periods (ca. 8200–4200 cal BC). As of 2018, 126 burial sites have been investigated. All of them are located near the Konda tributaries, whose basin covers the south-western part of the northern areas. Several individual burials of the Late Mesolithic period were found right in the ancient encampments. For example, one was discovered under the floor of a dugout shelter in Leushi 9 settlement. It was a rectangular pit with the dimensions of 0,96×0,3×0,2 m, and N-S orientation. A skull of an adult male was buried in it. Based on radiocarbon dating (14C), the burial time was 7590±80 BP. In Satyga XVI burial ground, the ancient cremation burial rites were studied. There were three bone clusters lying at the depth of up to 0.34 m and forming a circle or ovals with the dimensions of 1.6×1.2 m and N-S and SE-SW orientation. Stone and bone artifacts with the traces of thermal desquamation and burnt animal bones were found among the hu-man cremated bones. 3 burials were excavated in Bolshaya Umytya 100 necropolis. Based on radiocarbon dating (14C), the estimated ages of two of them were 8600 ± 150BP and 8123 ± 150BP, respectively. The dead were buried in circular pits Ø – 1.2 m, 1.5-1.7 m deep. In two graves ochre traces were found. A stone scraper was discovered in one of the burials. 103 burials in Bolshaya Umytya 100 necropolis date back to the Early Neolithic period. Their estimated ages calculated by radiocarbon dating (14C) were 7090±60BP, 6079±70BP and 6050±80BP. The grave pits were rectangular or oval, with a depth of 0.15-1.9 m, oriented SE-NW, E-W and SW-NE. Ocher was used in burials. Human remains and grave goods were found in 31 burials. If the deceased was inhumed, the body was laid in a pit in the extended position, face up or down. The head was placed at the northeast, northwest or west end of the grave. The body was lying flat with arms and legs straight. Cremation of a dead body was carried out at a temperature exceeding 500°C. Then the bones were laid mainly in the pit center. The grave goods were usually placed near the head (polished adzes, scraper), but sometimes near the waist (small bifaces). A cylindrical bead necklace made of resin produced by conifer trees was found in one of the graves close to the deceased’s neck. There were not many ceramic items: in one burial a whole vessel was found, while 48 different fragments of pottery were scattered among the other graves. Extensive studies conducted in other early Neolithic ceme-taries were targeted at investigating cremation and inhumation rituals. In the Late Mesolithic – Early Neolithic periods the dead were buried either within the limits of the settlement they had lived in, or in the burial grounds. There were two principal modes of interment: inhumation and cremation. The ancient necropolises were located on river terraces. The burial pits were oriented north or N-W. Ocher was used as part of the burial ritual. It is possible that the bodies were shrouded. The cremated remains were also buried in pits. The grave goods were represented by tools used in everyday life. In the Konda basin, similar burial rites were preva-lent practices until the second half of the 3rd millennium BC.

Trans-Ural Neolithic-Eneolithic burial complexes
Nataliia Chairkina (Institute of History and Archaeology, Ural Branch of the RAS (Russia, Eka-terinburg))

The burial complexes of the Neolithic-Eneolithic located in the Trans-Ural, in the forest-steppe zone of the Lower Tobol region; and in the taiga zone of the North of Western Siberia despite certain variations had a number of characteristics in common, which, in all probability, were associated with the cultural specifics of the societies which left those interments. Spatial lo-calization Single and joint interments of the Trans-Ural region were located in the territory of or outside the settlements area, on ritual sites, in rock shelters and caves. The burial sites were positioned on lake islands and river banks. The surface structures were not numerous and consisted of flooring, stone piles or intentionally arranged stones beds; and a stone “box”. The shape of the graves was oval or sub-rectangular, rarely boat-shaped and, same as in case of the grave size, any variations were insignificant. Only several interments had significantly larger dimensions or pit depth. The predominant orientations of the grave pits were NE-SW, NW-SE, the bodies orientation was heads to the NE and NW with some bias to the W or the E. Another characteristic attribute was a partial or practically full cremation
Filling the old gaps: rediscovery of the Early Neolithic burials in the territory of the East European Plain forest zone

Keynote lecture: Ekaterina Kashina (State Historical Museum, Moscow)
Co-Authors: Anastasia Kravtsova (Graduate School “Human Development in Landscapes”, Kiel); Kristiina Mannermaa (University of Helsinki, Finland)

Notwithstanding the fact, that over 100 Stone Age single burials and burial sites have been excavated on the extensive territory of the East European Plain, the chronology of hunter-gatherers’ mortuary sites still includes a voluminous hiatus in the form of Early Neolithic hürı-als (6th–5th millennia BC). Multiple factors such as the multi-layered character of almost all sites, poor preservation of organic materials, taphonomic processes at some sites, lack of both the burial goods and grave pits’ contours, along with the absence of absolute dating, are the cause of this hiatus. All these issues have substantially complicated the process of identifying the chronological and cultural attribution of graves in this particular period. The given millen-nia are of great research interest from a different perspective, being the era of first ceramics appearance and dissemination all over the forest zone along with the increase of sedentarism and associated population growth. Also, in the beginning of the 5th millennium the general change of ceramic traditions together with the replacement of blade by the flake and the bi-facial technology took place. The explanation of obvious lifestyles shift only in terms of Atlantic climate conditions doesn’t seem ample. These processes could have had some deeper reasons, which might be hidden in ritual life of Early Neolithic communities as well. The results of AMS C14 dating coupled with a new precise analysis of body positioning as well as burial goods, bioarchaeological research, and stratigraphical observations made on the basis of field recordings and published data let us to assume the Early Neolithic age of some burials which used to be treated as more recent graves. Within the talk, we will argue that a combination of different aspects, including grave orientation along the river, seldom but stable occurrence of body prone position with hands under the pelvis as well as more usual extended position on the back, the close arrangement of bones as if a body was tightly wrapped, making of grave pits in intact soil alongside the intentional fragmentation of burial goods, might be considered as the Early Neolithic burials’ indicator. The obtained results will be particularly useful for analysing the material from burial grounds that were used in long time span, searching for potential parallels within the Baltic region, and tracing further the evolution of hunters-gatherers-fishers’ mortuary rites in the territory of the East European Plain. Moreover, these results raise the wider discussion on communication networks in time and space, being presumably the driving force of shifts, reflected so distinctly in the material culture of the Neolithic Eastern European forest zone.

Emerging diversity. Hunter-gatherer mortuary practices in Eastern Baltic 7th to 3rd millen-nia cal. BC

Mari Tõrv (Department of Archaeology, Institute of History and Archaeology, University of Tartu)

Traditionally, hunter-gatherer mortuary rituals are described homogenous with only primary inhumation in the repertoire. Recently, however, different studies have presented more di-verse and complex picture regarding the ways of depositing the dead in the Eastern Baltic and beyond. Among others this paper unravels these diverse ways by re-examining old excavation data – both intact skeletons and loose human bones – from present-day Estonia. Mortuary practices were observed through the lens of post-excavational archaeoanthropology. It is de-monstrated that primary inhumation was not the only way of handling the dead among and within hunter-gatherer commu-
nities. On the contrary, a range of practices was present. Does the diversity emerge due to temporal differences as 4 millennia or 160 generations are re-presented in the sample? Do we see variability due to the fact that mortuary practices differed among hunter-gatherer communities? Could the diverse practices still reflect common under-lying values or norms shared by hunter-gatherers in the Eastern Baltic region?

Finnish Stone Age hunter-gatherer burials and the material culture death

Marja Ahola (University of Helsinki)

Finnish territory lies at the northern fringe of the European boreal zone. Although nearly 200 Mesolithic and Neolithic hunter-gatherer burials have been excavated from this area, the ma-terial is still largely unknown outside the Finnish borders. In contrast with the well-preserved burials of neighboring areas, Finnish Mesolithic and Neolithic hunter-gatherer burials are a challenge for archaeological research because perishable materials – including human remains – are generally not preserved. However, even if the burials lack perishable materials, they nevertheless contain large numbers of burial objects made of unperishable materials. In this presentation, I will give an overlook on the Finnish Stone Age hunter-gatherer burials and focus especially on the preserved material culture of death. Aside observing the burial objects from the angles of change and continuation, I will also set my gaze on how and why certain materials and artefact types were used – or not used – in the mortuary practices of these ancient hunter-gatherers.

New burials from the sphere of Estonian Corded Ware

Kerkko Nordqvist (University of Helsinki, Finland)

Co-authors: Alvar Kriiska (University of Tartu, Estonia), Liivi Varul (University of Tallinn, Estonia)

Corded Ware burials have been known in Estonia for more than 100 years. However, most of them have been excavated before the 1950s. The only exception are the two graves investi-gated at the Narva-Jõesuu Iib site (north-eastern Estonia) in 2013–2014. Unfortunately, due to the local soil conditions no bones were preserved. Still, the size of the structures and the unearthed artefacts (battle axes, beakers, an amber pendant, etc.), as well as some tooth ena-mel found in the graves give grounds to propose that one of the graves was a double burial of an adult and a juvenile, whereas the other one was apparently a singular burial. This presen-tation will introduce these newly-dis-covered burials and explore them in the context of burials known in the area of the so-called Estonian Corded Ware (northern Latvia, Estonia, southern and south-eastern Finland, as well as western Leningrad Oblast in Russia). Furthermore, as the grave goods from Narva-Jõesuu indicate similarities and contacts not only to the south, but rather to the east and south-east, the position of the burials and their material culture on the transitional east-west-axis is also discussed.


Adomas Butrimas (Vilnius Academy of Arts Institute of Art Research)

Co-authors: Marius Irsenas, Tomas Rimkus, Gvidas Slab, John Meadows, Kristiina Manner-maa

The excavations of Donkalnis and Spiginas burial sites in the surroundings of Lake Biržulis in the western part of Lithuania which took place from 1981 to 1986 revealed 17 Mesolithic and Neolithic graves. The materials associated with these excavations were published between 2012 and 2016. The research continue to this day. Twenty-three radiocarbon dates have been established. A use-wear analysis of flint objects found in the graves have been performed. Also, biotechnological analyses of animal teeth from the burials were carried out. The bone material found in Donkalnis grave 1 has been re-evaluated: traces of the bones of a 7.5-8 month fetus have been identified. Genetic analyses of the graves have been carried out. The latest study performed is a micro-archaeological analysis of the ochre from Donkalnis grave 2. All this data contributes greatly to our understanding of the mortuary practices that took place in the surroundings of Lake Biržulis.

The Riņņukalns shell midden, Latvia: Research history 1873 – 2016

Harald Lübke (Centre for Baltic and Scandinavian Archaeology (ZBSA))

Co-Authors: Ilga Zagorskā², Valdis Bērziņš¹,², Ute Brinker¹, John Meadows¹,³, Kenneth Ritchie¹, Mudite Rudzite¹, Ulrich Schmöcker¹

¹ Centre for Baltic and Scandinavian Archaeology (ZBSA), Schleswig-Holstein State Museums Foundation Schloss Gottorf, Schlossinsel 1, D-24837 Schleswig, Germany
² Institute of Latvian History, University of Latvia, Kalpaka bulvāris 4, Riga LV-1050, Latvia
³ Leibniz Laboratory for Radiometric Dating and Stable Isotope Research, Christian-Albrechts-Universität zu Kiel, Max-Eyth-Str. 11–13, D-24118 Kiel, Germany
4 Museum of the University of Latvia, Kravu iela 6, Riga LV-1010, Latvia

Riņņukalns, in northern Latvia, is unique in the context of Baltic Sea prehistory. The excavations of Donkalnis and Spiginas burial sites in the surroundings of Lake Biržulis. New Data.
the Eastern Baltic. However, this interpretation was contradicted by then leading Baltic prehistorians and the age of the presumed Stone Age graves remained in dispute.

New research on this important site started in 2011 in a close cooperation between the Institute of Latvian History, Latvia, and the Centre for Baltic and Scandinavian Archaeology, Germany. Excavations demonstrated that significant parts of the midden were still preserved intact, despite extensive excavations during the 19th and early-mid 20th centuries. In addition it was possible to re-identify the human remains excavated by Sievers at Riņņukalns. He gave them to the famous German researcher Rudolf Virchow for his anthropological collection in Berlin, where they survived the chequered history of the 20th century until today. New osteological, stable isotope and radiocarbon investigations on these remains resolved the old re-search dispute. It is proven now that at least two burials were of Prehistoric age. They belong according to the East European Terminology to the Eastern Baltic Middle Neolithic. Nevertheless, stable isotope δ13C and δ15N values show that these people were still fishermen, hunters and gatherers and not farmers. The paper will give an overview of the most important results before the start of the new research project in 2017.

The paper offers an overview of the results obtained so far, providing a background to discussion of the burial evidence, and proceeds to examine the newly discovered burials. In the course of the new excavation, a 15 m long trench was placed across the midden; detailed photogrammetric re-cording allowed the individual midden layers to be traced systematically. Within the area already excavated in the 1870s the midden itself had largely been removed, whereas the organics-rich deposit underneath had survived largely undisturbed, and excavation of this deposit has shed light on the site’s earlier history of occupation. The major programme of flotation and wet sieving has yielded an extensive corpus of fish and mammal remains, mollusc shell and plant macrofossils, contributing a wealth of new information to the current picture of Stone Age subsistence in the region. In addition to the two confirmed Stone Age burials unearthed by Sievers in the 19th century, the new excavation revealed a further two intact graves: an adult male burial associated with a hearth as well as remains of an unusual funerary structure, and, in a different part of the trench, an infant burial. Both interments were revealed directly underneath the lowermost midden layers. Separate human bones in and under the midden represent a number of additional individuals for analysis. Also pertinent to the discussion of Stone Age burials is the plentiful evidence for ochre processing – a previously unexplored dimension of the site.

**The Rinnukalns shell midden, Latvia: the new excavation and discovery of further burials**

Valdis Berzins (Centre for Baltic and Scandinavian Archaeology; Institute of Latvian History, University of Latvia)

Co-authors: Harald Lübke1, John Meadows1,2, Ulrich Schmölcke1, Ilga Zagorska1, Ute Brinker1, Aija Cērīna2, Mārcis Kalniņš3,4, Kenneth Ritchie1, Mudīte Rudzīte1

1 Centre for Baltic and Scandinavian Archaeology (ZBSA)
2 Institute of Latvian History, University of Latvia
3 Leibniz Laboratory for Radiometric Dating and Stable Isotope Research, CAU
4 Faculty of Geography and Earth Sciences, University of Latvia
5 Faculty of History and Philosophy, University of Latvia
6 Museum of the University of Latvia

Following a very long interruption, research on the unique Rinnukalns freshwater shell midden in northern Latvia resumed in 2010–2011, and has continued since 2017 within the frame of a three-year interdisciplinary project funded by the German Research Council (DFG), enabling a comprehensive investigation of this classic Stone Age site by the Centre for Baltic and Scandinavian Archaeology (Germany) in collaboration with the Institute of Latvian History, University of Latvia. This research has not only given a new picture of subsistence activities and hunter-fisher lifeways at the shore of Lake Burtnieks – it has also led to the discovery of further burials, providing new opportunities for comprehensive study of human remains and burial practices. Following two seasons of excavation in 2017 and 2018, a wide-ranging assessment is being undertaken of the newly recovered and previous material from this site.

**Anthropological examination of the two new Stone Age burials 2017/01 and 2018/01 at Riņņukalns, Latvia.**

Ute Brinker (Centre for Baltic and Scandinavian Archaeology)

Co-authors: Aija Macane2, Mari Tür4, Elina Petersone-Gordan4, Jörg Nowotny1, Dietmar Meine1, Mārcis Kalniņš1,2, and the Rinnukalns Research Group1,4,5,7

1 Centre for Baltic and Scandinavian Archaeology (ZBSA), Schleswig-Holstein State Museums Foundation Schloss Gottorf, Schlossinsel 1, D-24837 Schleswig, Germany
2 Gothenburg University, Department of Historical Studies, Eklandagatan 86, 412 61 Gothenburg, Sweden
3 University of Tartu, Department of Archaeology, Jakobi 2, 51005 Tartu, Estonia
4 Durham University, Department of Archaeology, South Rd, Durham DH1 3LE, Great Britain
5 BAM Federal Institute for Materials Research and Testing, Division 8.5 ‘Micro NDE’, Unter den Eichen 87, D-12205 Berlin, Germany
6 Faculty of History and Philosophy, University of Latvia, Aasapazjas bulvaris 5, Rīga LV-1050, Latvia
7 Institute of Latvian History, University of Latvia, Kalkopa bulvaris 4, Rīga LV-1050, Latvia

An interdisciplinary research project, financially supported by the Deutsche Forschungsgemeinschaft (German Research Foundation) since 2017, has engaged in the excavation and analysis of the Rinnukalns freshwater shell midden in northern Latvia. The ongoing research by the Centre for Baltic and Scandinavian Archaeology (Germany) and the University of Latvia has uncovered two new burials, allowing intensive interdisciplinary investigations of the hu-man remains and providing new insights into the burial practices. The burials are that of an adult man in crouched...
Perched on the edge of eternity: Fish and funerary rites at Riņņukalns, Latvia

Kenneth Ritchie (ZBSA)

Co-authors: Harald Lübke1, Ulrich Schmölcke2, John Meadows1,2, Valdis Bērziņš3, Mārcis Kalniņš3, Ute Brinker1, Ilga Zagorska2, Aija Ceriņa, Mudite Rudzīte

1 Center for Baltic and Scandinavian Archaeology (ZBSA)
2 Institute of Latvian History, University of Latvia
3 Leibniz Laboratory for Radiometric Dating and Stable Isotope Research, CAU

The famous freshwater mussel shellmidden at Riņņukalns, Latvia continues to reveal life in the Stone Age of the eastern Baltic. A long history of excavation beginning already in 1874 has revealed two Stone Age burials as well evidence for the lives of those interred and others who lived at the locality. Recent investigations beginning in 2010 have sought to clarify the research history of the site and led to a three-year project aiming for a more complete understanding of what occurred there using modern scientific archaeological methodology funded by the German Research Council (DFG), enabling a comprehensive investigation of this classic Stone Age site by the Centre for Baltic and Scandinavian Archaeology (Germany) in collaboration with the University of Latvia. Two additional burials were discovered during excavations in 2017 and 2018 and, intriguingly, one of them appears to have been accompanied by a grave offering of fish comprised almost exclusively of numerous very small individuals from the perch family (number of identified specimens = 1534, including at least 11 individuals of perch, Perca fluviatilis; and 23 ruffe, Gymnocephalus cernua from a matrix sample totaling just 0.12 liters). Although analysis is ongoing, preliminary results suggest both that small fish were an important component of the overall subsistence regime during the site’s occupation – and that this particular de-mortis is unusual because of the overwhelming predominance of very young fish and the preeminence of the perch family. Interpreting this deposition accompanying the grave is challenging, not least because fish remains are seldom recovered in funerary contexts in the Stone Age. Zvejnieki, Latvia; Skateholm, Sweden; and Popovo, Russia are some notable exceptions where fish are a part of the mortuary process itself (Grünberg 2013, Zagorskis 2004). Our investigations at Riņņukalns emphasize the role of fishing in life and death for these prehistoric hunter-gatherers.

Literature:

What’s left after death... Taphonomic processes within a mesolithic burial from the Oder Valley and their archaeological interpretation.

Maha Ismail-Weber (Brandenburgisches Landesamt für Denkmalpflege und Archäologisches Landesmuseum)

Co-author: Bettina Jungklaus (Anthropologie-Büro, Weiβwasserweg 4, 12205 Berlin)

The discovery of a late Mesolithic burial on the north-western edge of the Oder Valley near Rathsdorf (Märkisch-Oderland, Brandenburg) was a particular stroke of luck for the study of Mesolithic burial customs. The feature was partly excavated on site before the complete grave was lifted as a block. The grave contained a half-sitting/lying individual who had been buried, together with a single bone tool, three flint artefacts and numerous animal teeth, in a reddish sediment. The grave goods were relatively well-preserved, whereas the skeletal remains were mostly in such a poor state that they could not be simply removed from the feature. For this reason, and in order to thoroughly investigate the burial, it was decided to continue excavation in the laboratory. Thanks to funds from the German Research Foundation, it has been possible to “reverse excavate” the grave from below. This paper presents the first results of this innova-tive work and describes the taphonomic processes within the feature in more detail.

Microarchaeological analysis of soil samples - a new method to study the uses of birds in Mesolithic burial practices

Tuija Kirkinen (Osteoarchaeological Research Laboratory, Stockholm University)

Stone Age burial sites in various parts of Europe have revealed rich materials of animal bones, teeth and antlers and artefacts derived of them. Such material provides extremely important information about uses of animals in the burial practices and human-animal relationships. These are macrofinds that in suitable circumstances (e.g., calcium rich soils) can have a very good preservation. However, very little evidence of uses of soft organic materials like fur, hide and feather have been reported
in Mesolithic burials. In fact, hair, feathers and plant fibers belong to the “missing majority”, which is absent in archaeological record but which we can assume to have once been of importance. For example, uses of feathers in paraphernalia and ritual costumes and everyday clothing are described in various ethnographic and anthropological sources. We also know that feathers were loaded with meanings, for example, for the Tuva shaman, a headdress decorated with feathers and plumes symbolized the shaman’s ability to journey to the upper world. Such uses may have a complete wing attached, or they may consist of just the feathers. In archaeological contexts the use of feathers or wings has been revealed through the wing bones, either found in burials and used as part of the ornamentation, or as part of bone assemblages. However, the evidence of the prehistoric uses of feathers is still extremely scarce. In this paper, we present preliminary results from the animal originated fibers and feathers from Mesolithic burials in northern Europe. Our research is based on microscopical analysis of soil samples from prehistoric burials. We suggest that microarchaeology can bring new evidence, for example of the materials used for wrapping the bodies or feather used in paraphernalia or ceremonial dresses.

Stone Age Companions: Human-animal relationship expressions at hunter-gatherer cemeteries in the Eastern Baltic and Central Russia
Aija Macane (Gothenburg University)

The hunter-gatherer cemeteries around the Baltic Sea reveal complex burial practices. Animal remains, particularly animal teeth (mainly incisors and canines) have been extensively used for personal adornments at hunter-gatherer cemeteries around the Baltic Sea. However, other body parts, like jaws, phalans, astragalus, antlers, claws have also been found within hunter-graver burial. This presentation focuses on new, interdisciplinary research of animal remains discovered in hunter-gatherer burials at Sakhtysh cemeteries (central Russia), Zvejnieki cemetery (northern Latvia) and Skateholm (southern Sweden). New analysis of animal tooth pendants discovered in hunter-gatherer burials at Sakhtysh cemeteries in the Upper Volga region of central Russia will be presented in more detail, along with some additional examples from Zvejnieki and Skateholm. The variation in the burial practices, and the role animal remains play in them, serves as a departure for a discussion about hunter-gatherer cultural encounters and their expressions, especially in the eastern part of the Baltic, where Latvia is situated in cultural crossroads, where influences from south as well as north and east are melted and expressed with some local variations. This study is part of the dissertation project that investigates the Holocene hunter-gatherer relationship with the animal world and surrounding environment, how animal and human worlds co-existed, confronted, affected and used one another during the Stone Age. The theoretical framework of this project is anchored in the growing field of environmental humanities and related theoretical approaches including posthumanism, relational ontologies, which all in different ways aim to decentralize human dominance and assign more active roles to other participants of the multi-layered relations between humans and animals.

Dating prehistoric burials in the north-east forest zone
John Meadows (Centre for Baltic and Scandinavian Archaeology (ZBSA) and Leibniz-Labor für Altersbestimmung und Isotopenforschung, CAU)

Intact burials, and even loose human bones, are perhaps our richest sources of information about past human life. Whatever aspect we are interested in (e.g. diet, mobility, health, mortuary practice, etc.), accurate dating can transform our understanding of the archaeological record, revealing temporal trends in practices or contemporaneous diversity, and allowing possible linkages to other regions and external events to be investigated. Wherever possible, therefore, we sample prehistoric human remains for AMS 14C dating. Obtaining a 14C age from a bone or tooth is seldom sufficient, however, particularly when dealing with prehistoric hunter-gatherer-fisher populations in north-eastern Europe. The risk of spuriously old dates due to dietary reservoir effects is now well-known, and contrasting approaches to mitigating this risk will be compared, using published examples. Secondly, the use of Bayesian chronological modelling to improve the dating of single graves, cemeteries and archaeological phenomena (such as mortuary practices) will be demonstrated. Finally, the issue of what dating pre-cision is actually useful will be considered, again using case studies, to see where better pre-cision is essential, and where it might be redundant.

Kits for afterlife. The evolution of burial assemblages from the Mesolithic to the Early Metal Age between the Baltic and the Urals
Anastasia Khramtsova (Graduate School “Human Development in Landscapes”, Kiel, Germany), PhD student

Grave assemblages as an essential material testimony of burial rites can mirror a wide spectrum of socio-cultural and economic aspects of past communities. In the East European forest zone, the Early and Middle Holocene period is characterized by the persistence of hunter-gatherer-fisher communities. The entangled environmental, technological, and cultural changes over this period are to some extent also reflected in the transformation of mortuary ritual. Material evidence for this is provided by the burial kit in terms of its contents, arrangements, and ways of representation. Tracking changing patterns in the burial assemblages in a broader spatial, diachronic
perspective can provide us with keys for understanding tendencies in the development of mortuary rites. Such a broad assessment can also help to identify the chrono-logical and cultural attributions of the graves through a range of relevant characteristics. To date, no comprehensive analysis of Stone Age burial assemblages from the territory in question has been conducted, neither in a wider temporal and geographical scale nor in a complex way. The comparative analysis of various parameters such as the morphology of artifacts, their location within the graves and their association with other features such as ochre distribution, fireplaces, pits and platforms, and the placement of the human remains themselves, therefore, is an important desideratum in current Stone Age archaeology of Northeast Europe. This paper presents the first results of a diachronic, comparative study on the Mesolithic to Early Metal Age hunter-gatherer burial assemblages in the East European forest zone. Although the uneven quality of field methodology and a dispersed and heterogeneous storage of collections and archives sometimes complicates the research process, a thorough assessment of the original field recordings, an analysis of burial goods from a technological perspective and the application of multivariate statistics provide valuable new insights which already at this stage help to better define the relative chronology of the burials and to better understand the socio-cultural developments forming and transforming the late forager societies of the Northeast European forest zone.

“Ritualized” technology?: blade arrowheads in the Late Mesolithic contexts of Karelia and Karelian Isthmus. 
Dmitriy Gerasimov (Peter the Great Museum of Anthropology and Ethnography /Kunstkamera/ Rus.Acad. Sci.)

Tanged arrowheads on flint blades were wide-spread in Eastern Europe forest zone in Prebo-real and Boreal time, during the Early Mesolithic period. Some after 8000 BC the interregional communication network that previously existed on those territories disintegrated, and in the territories with no natural flint sources (Eastern Fennoscandia and Karelia) lithic industries transformed in raw-material strategy, so they become to be based on use of local and easily accessible lithic materials – mainly quartz and slate. This consequently changed the lithic technology – mainly bipolar knapping was used for quartz processing. Flint artefacts including blade tanged arrowheads are practically not presented in the Late Mesolithic contexts in Finland and Karelia. This situation produced a hypothesis that the Late Mesolithic population of Karelia “forgot” or “lost” certain technological knowledge, and even was considered as an evidence of “cultural regression” in comparing to the Early Mesolithic period. Only during the last two decades new discoveries on Karelian Isthmus revealed materials that are evidence of surviving of blade and microblade production technology in the Late Mesolithic traditions of the discussing territories. But those finds are presented by technological waste, and there are practically no completely made artefacts from the settlement contexts. At the same time a large collection of tanged arrowheads on flint blades, as well as microblades, presented in materials of the famous Late Mesolithic burial ground on Yuzhny Oleniy Ostrov in the Onega Lake, Karelia. The composition of the artefact assemblage from the burial ground is very different from the surrounding contemporaneous archaeological contexts – which can be explained by the site specific function. Also the activity related with blade and microblade production is documented for contexts of Oleniy Ostrov 1 and 2 sites next to the burial ground, which were considered as funeral crew camps. One of the rear finds of a tanged arrowhead on a flint blade came from Raisala Joksemajarvi W site on Karelian Isthmus. Late Mesolithic context was discovered there on a former shoreline, and a flint tanged point was penetrated in sub-vertical position to the surface some 2-3 meters below the shoreline, that was covered by water during the time when the Mesolithic settlement was functioning. So it can be supposed that someone shut an “exotic” arrow made of rare imported flint to the air under the water. This hardly can be a result of fish shooting – otherwise such finds will be presented more often in the Late Mesolithic contexts. More probably here we have a result of some “offering”. Those cases are evidence that flint tanged arrowheads are known in the Late Mesolithic tradition in Karelia and Karelian Isthmus. But the use of these “exotic” tools was more probably related not with day-by-day activities, but with certain ritual practice. This talk was prepared within the project “Bioarkeologiset menetelmät esihistoriallisien yhteisöjen maailmankuvan ja ihmisen ja eläinten suhteiden tutkimisessa – pilotitutkimuksena Oleniostrov kivilauluksen kalmiston löytöaineisto” supported by Kone Foundation.

Corded Ware Warriorhood – a „pan-European” monolith or a set of local traditions?
Rafal Skrzyniecki (University of Adam Mickiewicz in Poznan)
Co-author: Mateusz Cwalinski

The recent archaeological comeback of the concept of late-Neolithic migration from the East raises many new-old questions about the nature of interaction between past communities representing old, agrarian and new, pastoral-oriented way of life at the turn of the 4th and 3rd millennium BC. The appearance of a new cultural phenomenon – the Corded Ware Culture – and quickly growing number of single graves of male individuals buried with their weapons, marked a major change in conceptualisation of violence. According to H. Vandkilde (2006), the inclusion of weaponry into funerary rituals was a result of institutionalization of war and its main actors, i.e. – warriors. At the beginning, Corded Ware warriorhood was symbolised by a shaft-hole battle
axe made of stone. It became a status object and most probably also a pri-mary shock weapon used by Corded Ware people. But was it the only one? The aim of this article is to present results of comparative analysis of the so-called warrior graves in different CWC regional groups. Preliminary results of author’s research have shown that communities from different parts of the CWC oikumene did not share a universal concept of warriorhood, but instead followed their own, local patterns of warring and commemorating idealized war-rior identities. In total, 228 graves from Lesser Poland, Carpathian Foothills, Sokal Ridge, Lublin Upland and Greater Poland – Kujavia Plain were examined using statistical tools. Conducted analyses included variables such as: differences in grave structure, sex and age of deceased, arrangement of lower and upper limbs, body orientation, types and quantity of weaponry and other grave goods, as well as their location in the burial pit. The last trait was assessed accord-ing to the scheme published by Bourgeois and Kroon (2017), which allowed comparisons with their results for the Corded Ware communities from Bohemia, Germany, Netherlands and Denmark. By assessing the level of correspondence between abovementioned features, it was possible to determine main types of female and male burials, presumably reflecting real-life identities of the CWC community members. As a general remark, it needs to be stressed that CWC warriorhood was a strictly male-oriented social identity. By observing the development of a “warrior” construct in various provinces of the CWC from diachronic perspective, several observations could be attained. The dominant symbolism of battle-axes had had been a com-mon cultural trait in the first half of the 3rd millennium BC, but shortly after its significance began to wane, especially among eastern CWC communities, which adapted more steppe-like way of fighting with bows. Nevertheless the tradition of close-range combat “survived” and even flourished in the west, especially in Bohemia and Moravia, where additional types of shock weapons, such as stone maces, were deposited in graves.

Burials with weaponry in Neolithic-Eneolithic burial grounds of the Upper Don River region

Roman Smolyaninov (Lipetsk State Pedagogical P.Semenov-Tyan-Shansky University)
Co-authors: Elizaveta Yurkina (Lipetsk State Pedagogical), P.Semenov (Tyan-Shansky Univer-sity)

Burials occure quite rare at the territory of the forest-steppe Don River region. In the Don River basin only six Neolithic-Eneolithic sites contained burials. At three of them single graves (Glinische, Lobovskaya, Universitetskaya 3), and at three more -- burial grounds (Ksizovo 6, Vasilyevsky Kordon 17 and 27) were found. From the total of 51 graves only in 16 weaponry artifacts are present. The burial grounds are situated either at floodplain outliers or at extre-mities of low fluvial terraces above floodplain. At the Lobovskaya site a single burial was made in oval pit of 15 cm depth and contained human bones. According to the report of A.T. Sinyuk, the large bone barbed point was in it, the pit was surrounded by middle size sandstone boul-ders and contained red ochre remains. At Ksizovo 6 seventeen skeletons (six men, five women and six children) from fifteen graves were discovered. The burial ground with inhumations contained graves of two cultures – Lyalovo (dated the first quarter of the Vth mill. cal BC) and Srednestogovskaya (mid IVth mill. cal BC). Weaponry objects were found only in five graves, two of a child and the rest of adult men aged more than 45 years old. In all three burials sandstone boulders and bone weapons of different kind were detected, and also one flint spear point. At Vasilyevsky Kordon 17 site weaponry objects were discovered in four single burials and in the collective one, where bodies were placed extended or crouched on the back in oval pits. One flint spear point and seven flint arrowheads were found there. Collective burial (№2) contained three skeletons placed in the round pit dated the first half of IVth mill. BC. At Vasilyevskiy Kordon 27 site four burials were discovered. In two of them the projectile weaponry objects were found. In the first one two arrowheads made of quartzite and flint were put together with 138 ceramic beads and one of copper, in the second burial (dated mid IVth mill. BC) – the fragmented flint arrowhead. The typological diversity of all these bone and stone weaponry objects points at the multidimensional economics of Neolithic-Eneolithic communities of of the forest-steppe Don River region. Weaponry had seemingly not only uti-litarian function (hunt, war) but also the spiritual one. Intact flint spear points and arrowheads were put into burials, probably reflecting the high social rank of buried persons. Weaponry objects in the child burial may witness the inherited social rank of the diseased.
A diversity of barrows? – Early earthen grave mounds between the Caucasus and the Atlantic

Tuesday March 12th, Room 207
Session organizers: J. Brinkmann, M. Furholt, R. Hofmann, M. Shatilo

TUE 08:30 Artificial mounds and the beginning of monumentalities from western France in the Vth mill. BC
Keynote lecture: Luc Laporte (French National Centre for Scientific Research, UMR 6566 CReAAH "Centre de Recherche en Archéologie, Archéosciences, Histoire)
09:15 The Many Facets of Early Burial Mounds
Keynote lecture: Volker Heyd (University of Helsinki)
09:50 Discussion

10:30 Chronology? Environment or ...? The diversity of the TRB non megalithic monuments in the area between the Oder and the Bug River in Central Europe
Dariusz Krol (Institute Archaeology Rzeszow University)
10:50 Modelling the emergence of barrows a case study of burial mounds in the Northwest Azov
Alisa Demina (National University of Kyiv-Mohyla Academy, Kyiv, Ukraine)
11:10 Stone cold crazy: Megalithic tombs and flint axe heads as materialization of the changing socioeconomic structures in the TRB-complex
Maria Wunderlich (Institute of Pre- and Protohistoric Archaeology, Kiel University)
11:30 Who were these barrows for? Grave mounds from the III mill. BC in Polish Lowland
Marzena Szmyt (Adam Mickiewicz University, Poznan, Poland & Poznan Archaeological Museum)
11:50 Discussion

13:30 The choice of erecting individual burial mounds or not – the west-east bipolarity in the southern Cimbrian Peninsula in the early third millennium BC
Sebastian Schultrich (GSHDL Kiel University)
13:50 Did ‘Tripolians’ build the first kurgans in the North-Pontic steppe?
Mila Shatilo (Kiel University, Institute for Prehistoric and Protohistoric Archaeology)
14:10 What was inside?
Jan Piet Brozio (Institute of Pre- and Protohistoric Archaeology, CAU Kiel)
14:30 Social memories and site biographies: construction and perception via burial mounds
Johannes Müller (Institute of Pre- and Protohistoric Archaeology, Kiel University)
14:50 Discussion

15:30 Danubian vs. Megalithic burial traditions in Neolithic and Early Bronze Age in SE Poland
Slawomir Kadrow (Institute of Archaeology, Rzeszow University, Poland)
15:50 The social contexts of early European burial mounds
Martin Furholt (University of Oslo, Institute for Archaeology, Conservation and History)
16:10 Subkurgan sacred spaces in eneolithic of north-west pontic space
Svitlana Ivanova (Doctor of Historical Sciences, Main Researcher, Institute of Archaeology, National Academy of Science)
16:30 Eastern facades with and without earthen long barrows in southern Sweden
Lars Larsson (Professor emeritus)
16:50 Discussion

17:30 Architecture for the Dead – Mound Construction and Use in the 4th millennium BC
Maykop culture (North Caucasus, Russia)
Sabine Reinhold (Eurasia Department, German Archaeological Institute)
4 ABSTRACTS

A diversity of barrows? Early earthen grave mounds between the Caucasus and the Atlantic

Keynote speakers: V. Heyd (University of Helsinki, Department of Cultures); L. Laporte (French National Centre for Scientific Research)

Session organizers: J. Brinkmann, M. Furholt, R. Hofmann, M. Shatilo

In the 4th millennium BC the practice of burying the dead under or in an artificial earthen mound appeared in Europe from the Caucasus to the Atlantic seaboard. This phenomenon is associated with different communities, including the Northern European TRB, North Pontic pastoral groups, or some late Tripolye sites. It has been described with the use of various terms: kurgans, humke, høje, megalithic tombs, and non-megalithic long barrows. The idea to build soil constructions above burials that remained visible in the landscape could reflect specific changes in the worldview common to these different Neolithic and Chalcolithic societies. Nevertheless, distinct research traditions draw clear lines in the geographical distributions of burial mounds and connect them with the local developments rather than widening the scope. For a better understanding of the topic we want to examine the ‘barrow tradition’ as a whole, looking beyond the borders of archaeological cultures and traditional research foci. We would like to discuss several questions:

• What are the social and cultural contexts under which the practice of burial mound construction is starting, and can we identify ideological patterns in the burying communities?
• Are specific subsistence practices, and forms of social organisation connected to burial mounds, and is the common association of burial mounds with rising social stratification justified?
• Are burial mounds connected to a distinct cultural “package” (g. mound, complex stone architecture, specific burial rites like collective graves), and if so how are they evolving over time?
• Are there distinct or diverse relations of barrow placements and settlement patterns, and how do burial mounds impact the cultural landscapes?

All these questions evolve around the main theme of this session, namely as to how far the appearance of these different mound-building practices can be explained by a reaction to the same or similar processes of factors, whether they reflect a shared ideological background (artificially divided by research schools), or if those barrows represent different, unconnected stories and independent ideas. We would like to invite colleagues who are interested in this topic and are open to rethinking the traditional narratives/interpretations, and who are willing to engage in a transregional discussion about this large-scale European phenomenon.

Artificial mounds and the beginning of monumentalities from western France in the Vth mill. BC

Keynote lecture: Luc Laporte (French National Centre for Scientific Research, UMR 6566 CreAHH “Centre de Recher- che en Archéologie, Archéosciences, Histoire)

Session 4 of this meeting focuses on “Barrow traditions”, understood as beginning during the investigate questions of the same order as those proposed by the organizers. From a more continental point of view, two sequences have drawn particular attention, one located in the center of the París Basin and the other on the banks of the Gulf of Morbihan. Reviewing these examples in a wider context, which stretches from the Channel to the Gare- ronne estuary, changes the perspective. The results of recent rescue excavations, especially in Normandy, as well as taking into account previously published but somewhat unnoticed data, offer a renewed panorama for the emergence of these first monumentalities between 4700 and 4300 av. n.e.

Trapezoidal (and not-sepulchral) monuments with walls made of wood or earth, and circular huts housing an individual burial secondarily covered by an earthen mound (or even perhaps some small and round dry-stone structures that already have an access corridor), appear at about the same time as this curious idea of erecting very large blocks pointed towards the sky or moving a few others for the staging of some funerals. In the whole sector, elongated ditched structures surround a high diversity of funerary constructions.

Such separate elements at the beginning will gradually aggregate - differently in each place - , thus reserving for the dead a clearly demarcated area, sometimes hidden, above the same of the land through parcel features seem to appear a little later, interrogating the emergence nium, the detailed analysis of construction sites suggests the existence of real specialists, ma- sons, perhaps even itinerant.

As the next millennium progresses, when similar traits develop in both the British Islands and Northern Europe, it is likely that these traditions will no longer be built in western France. Other megaliths - other practices - will replace them in Brittany, as well as in the París Basin around 3300 n.e., which this time undoubtedly present strange parallels with the contempo- rary monumentalities of continental and northern Europe.
The Many Facets of Early Burial Mounds

**Keynote lecture: Volker Heyd (University of Helsinki)**

Burial mounds are a world-wide phenomenon, spanning the last 6500 Years and connecting Continents not only of the ‘Old World’ but also including the Americas. In Europe, they seem –following current understanding– to have their origins in two different geographical regions: 1) In the west, that is Atlantic France and here particularly Brittany; and 2) in the east, that is the Caspian-Pontic steppe and here the lower Volga-Don steppe. In both regions the dates may be as early as the mid-5th millennium BC and one wonders if there is a link in one way or another between the two? Whatever, my presentation will mostly focus on the eastern branch in which we observe an expansion of idea of erecting a monument over the burial of one (or several) particular individual(s).

As far as we can follow, the round mound custom reaches the west of the Black Sea already in the late 5th millennium BC, and regions further to the west up to the Elbe river catchment then in the mid 4th millennium, with monumental mounds also erected roughly contemporary in the Caucasus. However, it remains open whether Central Europe was influenced rather from the east, or the west, or by both! At least from the later 4th millennium, we see the custom getting speed, and round burial mounds are now becoming a wider phenomenon in the steppes of eastern and southeastern Europe, the Balkans, and the Carpathian basin, with a question mark of their extension towards the west as there is now clearly an interference with the Megalithic world. In any case, this success story is then culminating in the 3rd millennium, when mounds are now mushrooming virtually everywhere in Europe.

At least from the 3rd millennium BC the burial mound is not only serving as a monument but also an ideological, social and perhaps political marker, and my lecture will highlight its multi-ple functions and links beyond their spread. It will also, however, make aware of the dire sit-uation and the ongoing destruction of mounds particularly in the Southeast of Europe.

**Chronology? Environment or ...? The diversity of the TRB non-megalithic monuments in the area between the Oder and the Bug River in Central Europe**

**Dariusz Krol (Institute Archaeology Rzeszow University)**

TRB communities spread over large areas from the Netherlands in the west to western Ukraine in the east are primarily well-known for the construction of intriguing monumental burial structures. They were responsible for building typical megalithic (ie. dolmens, passage-graves), as well as non-megalithic forms. While the structures of the first of these types were undoubtedly significant of the north-western areas of TRB range, the second was very com-mon in the eastern “world” of this cultural phenomenon – mainly to the east of the Oder on the territory of Poland. So far, over 250 cemeteries with relics of TRB non-megalithic architecture have been recognized there. However, in this case not the general amount of data is the most quantity, but rather the puzzling morphological diversity of discussed structures. Apart from model trapezoidal monuments with large stone kerbs, often referred to as kuyavian long barrows, there were also completely different monuments. There are known cases that only clay and/or timber were used for their construction, while stone material was omitted. In addition, there are also numerous variants of TRB non-megalithic structures that are difficult to clearly define. How can we explain this diversity? Is this only a reflection of regional specificity and environmental properties – the availability or absence of various types of stone materials? Or maybe we should perceive this diversity in a more complex way? As a result of the variability of architectural preferences over time and/or alternative functions and social meanings? The presented studies will show the most meaningful results of the spatial and chronological analyses of these non-megalithic burial structures in the context of various environments and settlement networks in eastern “world” of TRB.

**Modeling the emergence of barrows: a case study of burial mounds in the Northwest Azov.**

**Alisa Demina (National University of Kyiv-Mohyla Academy, Kyiv, Ukraine)**

Burial mounds have become the definitive feature of Northern Azov landscape. The abundance and diversity of sites provide insightful opportunities for investigating the effect of environmental factors on the regional differentiation of the barrows. This study is particularly focused on the role of both natural resources and preceding burial mounds in the formation of the barrow systems in the Northwest area of Azov sea coast. Multivariate statistical analysis has been used to explore the data as a complex phenomenon on the artifact, site and landscape levels. The application of agent-based modeling for hypothesis testing enabled us to look beyond the static representation of data and analyze the decision-making strategies. The results showed the high resilience of the barrow system. The construction patterns, although characterized by general effectiveness, had been strongly influenced by ritual requirements. This research contributes to the studies of burial mounds and archaeological data analysis.

**Stone cold crazy: Megalithic tombs and flint axe heads as materialization of the changing socioeconomic structures in the TRB-complex**
The rise of monumental architecture within the TRB-complex must be seen as a long-standing progress, in which’s course the understanding of ‘monumentality’ and the specific constructions functioning as grave chambers became common later on. While this process started with the erection of non-megalithic long barrows, different kinds of megalithic constructions functioning as grave chambers became common later on. In the light of these diverse and long-term developments, a broader examination of the accompanying phenomena is crucial to understand the underlying social mechanisms and behavioral choices behind the erection of burial mounds. The praxis of erecting burial mounds in the TRB region is accompanied by a slow introduction of grain cultivation. The cultivation of land was intensified at the same time as megalithic tombs became common. This framework, covering the EN (4100–3300 cal BC) as well as the earliest MN (3300–3100 cal BC), was also characterized by an intensive practice of depositing different kinds of objects, mostly flint axe heads. Megalithic tombs and flint axe heads can equally be seen as important materializations of processes ongoing in the TRB societies. This is referring to the high investment of labor force and time investment into the construction of the graves respectively the production of flint axe heads. Both (non-)megalithic burial mounds, as well as flint axe heads could be interpreted as an expression of the changing social structures which required, with the ongoing intensification of agricultural activities, the establishment of communal and cooperative networks. With our talk, we will address the aforementioned questions. We will focus on work calculations connected to the construction and production of megalithic tombs, burial mounds and flint axe heads. In connection to that the gradually accompanying creation of cultural landscape with the help of monumental building and deposits will be discussed. We seek to understand the entanglement of diverse spheres, such as ritual-economy, competitive and cooperative frames or interaction.

Who were these barrows for? Grave mounds from the III mill. BC in Polish Lowland

Marzena Szmyt (Adam Mickiewicz University, Poznan, Poland & Poznan Archaeological Museum)
Co-author: Czebreszuk Janusz, Adam Mickiewicz University in Poznan, Poland

Barrow graves were built in the Polish Lowland during the first half of the 3rd millennium BC and at the end of this millennium. In terms of the archaeological taxonomy they were created and used by people linked to the Globular Amphora culture, Corded Ware culture and Unetice culture. The barrows of these three cultural contexts have some similar traits and at the same time they differ in many aspects. We intend to examine both similarities and differences but focus our attention primarily on the social contexts of the barrow graves.

The choice of erecting individual burial mounds or not – the west-east bipolarity in the southern Cimbrian Peninsula in the early third millennium BC

Sebastian Schultrich (GSHDL Kiel University)

Although the area of today Schleswig-Holstein is geographically very small, in prehistory it is characterized by the appearance of huge cultural differences. A well-known example for this is the dissemination of Younger Neolithic (YN, also Single Grave/ Corded Ware Culture, c. 2850 – 2250 BC) burial mounds. In the early phase (c. 2850 – 2600 BC) such monuments predominantly occur in the western part of this region whereas they are almost completely absent in the eastern part. Classically, it is assumed that, as time moves on, the bulk of Younger Neolithic culture shifts from west to east. Interestingly, a similar chrono-spatial shift from west to east shall be present in the subsequent Late Neolithic (LN) as well. The object of this presentation is to show that for both periods this assertion is not true. This is demonstrated by the fact that certain (status) items of early YN and early LN actually are to be found as single finds in great numbers in the east of the investigation area. Moreover, considering pollen profiles, it clearly has been shown that the eastern areas were occupied by humans constantly. Indeed there are differences in-between west and east but they are not determined chronologically, rather they are of a general validity, as a similar spatial dissimilarity also has been recognized in the Middle Neolithic (MN). In the ensuing MN many developments are initiated that characterize the following YN period. In the eastern part of the southern Cimbrian Peninsula the erection of hundreds of MN megalithic tombs is directly linked to an intensive land-use. Contrary, in the western part no link between the building of MN monuments and land-use is observed and the number of megalithic tombs is comparably lower. The building (and utilization) of these monuments and the linked land-use is regarded as displaying collective efforts. Accordingly, one possible interpretation of this geographical contrast is a dissimilar perception of the individual and the collective sphere. With this in mind, it might not be astonishing that in the early 3rd mil. BC the new and super-regional shared sign of burial mounds highlighting the individual became adopted much more intensive in the west. Here the preconditions for displaying individual status/social role were more suitable for this novelty than in the east. In LN this bipolarity is substantiated by the distribution of flint daggers. They also are to be found frequently as single finds everywhere but rarely in burial contexts in the east. Furthermore, in LN bronze artefacts appear which share the significance according to their contexts – in the west
they are buried with the death, in the east they have been deposited as single finds or even in multi-object hoards. This shows that the social practise of how to deal status objects and attached to this the choice to erect burial mounds or not is a reflection of certain cultural rules which kept validity for centuries. From the MN to the LN, this very small region at the edge of Central Europe is characterized by a bipolar situation, demarcating the western, in-land, and the eastern, coastal communities. This realization supports recent trends in research that do not regard the spread of the Corded Ware in the 3rd third mil. BC as one unchangeable package, one ideology that can only be articulated in one way. Rather, there appear to be huge and locally rooted differences in the choice of which attributes were adopted and which were not.

Did 'Tripolians' build the first kurgans in the North-Pontic steppe?
Mila Shatilo (Kiel University, Institute for Prehistoric and Protohistoric Archaeology)
Co-author: Robert Hofmann (Kiel University, Institute for Prehistoric and Protohistoric Archaeology)

The topic regarding the early kurgans in the North-Pontic region, despite a “substantial” amount of research, is still relevant. Of primary importance is the much discussed question of dating the earliest burial mounds and their cultural context. The topic is rather difficult to study due to the fact that the archaeological cultures have been split up and frequently re-named. As a result, one group of sites sometimes has up to seven different “labels” depending to a particular author’s preference. Such a situation characterizes well enough the specifics of the region, the archaeological material of which is extremely heterogeneous. Thus, some burial sites of the North-Pontic Steppe zone sometimes contain pottery and figurines that are typical for Tripolye. In this connection, the meaning of these artefacts is the topic of discussions in literature: from the presumptions that they could indicate the “Tripolye population” being in the steppe to the presumptions that the findings could point to exchange and a channel of the first steppe pastoral groups’ enrichment. Here, the analyses of different social contexts and comparing them is important - for example, the individual burials in the Steppe as a sign of the beginning of “individual character perception” and the absence of any traces of such in Tripolye settlements. The most examined “Tripolye trace” in the Steppe are Usatovo sites, the mounds of which contain such a set (or a package) of finds as individual (both central and lateral) burials, tripolye pottery, monumental architecture, stelae and traces of cult activities. Not so well pronounced, but not less important, are the sites of the Zivotilovsko-Vovchanskiy and Serezlievskiy types, which also have “Tripolye finds”. We can conclude, that in our opinion, the role of Tripolye in the appearance of the early kurgans needs to be discussed one more time.

What was inside?
Jan Piet Brozio (Institute of Pre- and Protohistoric Archaeology, CAU Kiel)
Co-authors: Jan Weber, Johannes Müller, Lorenz Schwark

What was inside? Lipid residue analyses of funnel-beaker pottery from a megalithic tomb in comparison of a contemporaneous domestic site in Eastern Holstein, Northern Germany. In the fourth millennium BCE, a development of a cultural landscape associated with the construction of monuments in the form of tombs and enclosures took place. Within this phenomenon, besides changes in grave architecture, a change in burial practices can also be observed. The construction of passage graves for several individuals is connected with grave goods in-ventories in which ceramic vessels played an important role. In addition to their function as a means of social expression, the vessel objects are interpreted as containers for food. Organic residue analysis (ORA) has been applied to archaeological studies to determine the original contents of pottery vessels, the use of different types of vessels and to reconstruct ancient dietary patterns. Here, we present ORA of vessels from a megalithic tomb in Eastern Holstein, Northern Germany, and provide for the first-time insights into the organic composition of grave goods from various burial phases in a passage grave between 3300 and 2900 BCE. The results are in contrast to the results of further samples from vessels of a simultaneous funnel-beaker-temporal domestic site 4 km away. The comparison between a burial site and a domestic site refers to different social practices in the handling of food in the ritual and profane areas, a distinction that can be traced both in the material culture and in the design of the cultural landscape.

Social memories and site biographies: construction and perception via burial mounds
Johannes Müller (Institute of Pre- and Protohistoric Archaeology, Kiel University)

Institutional knowledge in non-literate societies is transferred via different avenues from generation to generation. One of the most important media for memory transformation is their materialization at focal places of these societies. Biographies of European Neolithic burial mounds and places offer diverse rhythms in the creation of such ancestral and social memories. Examples from barrows and megaliths display this materialisation and the active roles that these monuments play in such transformation processes.
Danubian vs. Megalithic burial traditions in Neolithic and Early Bronze Age in SE Poland
Slawomir Kadrow (Institute of Archaeology, Rzeszow University, Poland)

Neolithic and Early Bronze Age funeral practices at SE Poland can be classified under two main traditions: Danubian and megalithic one. However, this division does not include burials of Globular Amphorae culture. Their appearance and development in the considered area, especially in the early and middle Eneolithic, can be treated as an effect of globalization processes. The older, Danubian process developed from the beginning of the Neolithic to the beginnings of the Eneolithic, i.e. for about two thousand years, reaching the culmination at the end of the 5th millennium BC. In the last stage of development, the Danubian funeral rite took the form of ‘gender-differentiated’ ritual practices, also known in the cultures of Hamangia/Varna and Tiszapolgár/Bodrogkeresztúr. The TRB expansion from the west and north west has put an end to the Danubian cultures in SE Poland. It was sometimes accompanied by a megalithic rite, which can be regarded as a clear manifestation of the globalization (megalithization) processes that spread from Brittany in France. The farthest east these processes reached the eastern borders of present Poland. Despite the complete disappearance of the Danubian cultures in the discussed area, the tradition of ‘gender-differentiated’ ritual practices known here from the Lublin-Volhynian culture, representing in Poland the youngest stage of the development of the Danubian world, was continued in Corded Ware and Mierzanowice cultures. There are frequent cases of destruction of the graves of Danubian cultures caused by the TRB population. The rule, however, is the continuation of the use of TRB’s places of memory (cemeteries) by later CWC and Mierzanowicka culture, despite the lack of connections in the funeral rite of these cultures. The processes cited above indicate a complicated course of the cultural process in SE Poland. The sequence of cultural change is not always accompanied by the appropriate sequence of funeral rites and the use of ‘sites of memory’. An important role modifying the image of burial traditions was played by globalization processes, including, first and foremost, the spread of copper metallurgy on the one hand and megalithization on the other.

The social contexts of early European burial mounds
Martin Furholt (University of Oslo, Institute for Archaeology, Conservation and History)

In this paper I want to explore and compare the forms of social organization connected to different traditions of early burial mounds in different parts of Europe. Here, the most striking contrast is that between the Northern Pontic regions and the Atlantic megalithic traditions. The relative contemporaneity of these phenomena could be interpreted in terms of idea transmission, or convergent social processes. The latter is an especially intriguing proposition given the widespread emphasis on the supposedly stark cultural and social differences between the Northern European farmers and Eastern European pastoralists. These labels probably obscure a much more complex set of social factors, some of which probably highlight clear similarities between these communities. The perspective taken here will highlight a bottom-up approach, taking a start from mound building activities and connected ritual practices, which will then be related to the monumental functions of these building in an overall social context.

Subkurgan sacred spaces in eneolithic of north-west pontic space
Svitlana Ivanova (Doctor of Historical Sciences, Main Researcher, Institute of Archaeology, National Academy of Science)
Co-author: Dmytro Kiosak, PhD, assistant professor, Odessa I.I. Mechnikov National University

Early radiocarbon dates of many tumuli of the Ponto-Caspian steppe are connected with other objects which are older than the burial mounds - sanctuaries (45-40 centuries BC). And the first barrows are appearing not earlier than 38/37 centuries BC. The phenomenon of soil sanctuaries of the Early and Middle Eneolithic, may have arisen under the Central European influence. Neo-eneolithic interactions between the steppe and the world of early farmers are also documented by the genetic and anthropological analysis of ancient populations.

Eastern facades with and without earthen long barrows in southern Sweden
Lars Larsson (Professor emeritus)

Until about 20 years ago the early Neolithic earthen long barrow was not known in Sweden as a burial type despite a large number of excavations of Early Neolithic settlement sites. However, a considerable number of earthen long barrows have been identified in nearby Denmark. This was a reason why a project was initiated to find out whether earthen barrows actually existed in southernmost Sweden. The eastern parts of two long barrows, regarded as long dolmens, were excavated and both presented features such as a facade similar to Danish earthen long barrows. This might show that a number of long dolmens actually had an initial stage as earthen long barrows. At about the same time as the excavations above were conducted, a couple of excavations due to development showed similar features. In recent years a number of other earthen long barrows have been identified. In addition to the well-known long barrows a number of excavations have shown that facades seem to be common, with a very low barrow or in most cases no barrow at all. These different aspects will be discussed.
Architecture for the Dead – Mound Construction and Use in the 4th millennium BC May- kop culture (North Caucasus, Russia)

Sabine Reinhold (Eurasia-Department, German Archaeological Institute)
Co-author: Alexey Kalmykov

Burial mounds are the most emblematic monuments of Eurasian steppe landscapes. Mounds are ubiquitous and have transferred most parts of Eurasia into a unique ancestral landscape. Starting from first small earthen construction in the late 5th millennium, which were first used as memorial in an area between the Lower Danube, the Volga and the Caucasus, burial mounds in the North Caucasus were transformed during the early 4th millennium into a high skilled architecture of dead. Mounds of gigantic size were constructed on-top of lavishly equipped burials of important individuals, such as the eponymous grave of Maykop-Ozhad. Maykop communities operated at monumental scales, employed complex building structures and an artificially transformed the former pristine landscapes. Mounds of the Maykop phenomenon range among the earliest constructions of this type. The combination of a mound for a single individual and burial gifts that reflect on his/her social personae, is a novum but outline the prototype of a monumental memorial later used by most Bronze Age societies all over Eurasia. In this presentation we will discuss results of the 2018 excavation in a Maykop mound from a site near the town Essentuky in the North Caucasus. Modern excavation techniques and an excellent documentation offer the chance to dissect building stages in details, follow the sequences of building, the alterations in the shape and size of the mound, and the components of construction. They have confirmed earlier ideas of Maykop mounds as a specialized form of complex ritual architecture, not just the heaping up of earth for a memorial. Even not being one of the mega-mounds, the Essentukskiy mound reveal similar construction principles as the huge buildings which characterise the early Maykop epoch. From this latest observation we can reconstruct the châine opératoire of such structures from the burial to the finished monument and follow the complex rituals associated with burial and mound construction. This new insights in the details of mound construction in its earliest stages will offer the basis to discuss mound building in other parts of Eurasia as results of diffusion or independent developments.

Mound building – constructions of community and identity

Anne Birgitte Gebauer (guest researcher, The National Museum of Denmark)

One of the defining features of Neolithic societies is the remodeling of the landscape by extensive mound-building. The question is why such a massive expenditure of time, labor and resources was necessary and what was the role in society of the amplifications of symbolic and ritual activities? Changing subsistence strategies, increasing population density and size of co-resident groups may have produced different perceptions of time and space as well as individual and collective identity. Mound building could be part of the cultural adaption to these changes. By using different examples from the Danish Funnel Beaker culture various aspects of the significance of mound building will be discussed. Several kinds of ritual activities were performed in the Funnel beaker culture, some sites ap-pear to be related to topographically distinctive location such as water (bog sacrifices) or promontories and hilltops (enclosures), but neither type of site was memorialized in the land- scape by durable structures. Mound construction was restricted to funerary sites, however only some burials were covered with an earthen barrow. Some wooden structures surrounded by a palisade were left uncovered while others were embedded in long barrows. Some mega- lithic tombs were covered by an earthen mound, but not all tombs were covered right away after construction, and some were apparently left free standing without a mound. A few sim-ple inhumation graves without mound-cover have achieved a degree of monumentality by being located in the immediate vicinity of a mound covered monument. Also, more impressive degrees of monumentality might evolve by repetitive use and additions to older monuments. In addition, mounds may play a different role as constructions sites and as final monuments. Finally, monuments may serve as arenas for ritual activities after they were finished. By ana-lyzing the different contexts of mound building, the paper will discuss the social, cultural and ideological role of these earthen structures within the Funnel beaker culture.
## From Tells to settlement systems: Landscape and networks along the Danube and the Tisza from the Neolithic to the Bronze Age

**Thursday March 14th and Friday March 15th, Room 208**

*Session organizers: M. Savu, R. Staniuk, R. Hofmann, J. Müller*

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### WED 15:30: POSTER SESSION

**People, landscape and diachronic choices.**

Tent Cătălin Lazăr (ArchaeoScience/RO, Research Institute of the University of Bucharest (ICUB), University of Bucharest, Romania)

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### 15:40: POSTER SESSION

**Fishing on the Lower Danube during the 5th millennium BC. Was it specific only to the settlement mounds?**

Mihaela Savu (Graduate School Human Development in Landscapes)

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### THU 08:30: Against the state: Prehistoric landscape histories in the Lower Danube Basin

*Keynote speaker: Dušan Borić (Columbia University)*

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### 09:00: For Comparative, Long-Term, Collaborative, Regional Research in European Prehistory

*Keynote speaker: William Parkinson (Field Museum of Natural History and University of Illinois at Chicago)*

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### 09:30: Neolithic tells as spaces of memory. Place-making and ‘efficacious ancestors’

Alexandra Ion (Institute of Anthropology ‘Francisc Rainer’ & McDonald Institute for Archaeological Research)

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### 09:50: Discussion

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### 10:30: The lithic procurement and production in the Late Neolithic period in southwestern part of Hungary. A case study from Alsónyék-Bátaszék.

Kata Szilágyi (Mára Ferenc Museum, University of Szeged)

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### 10:50: On the Northern ‘Periphery’ of Tells – New perspectives in Neolithic Settlement Network Analysis in North-East Hungary

András Füzesi (Eötvös Loránd University)

### 11:10: Aspects of Tisza cultural processes as reflected in ceramic assemblages at Ócsöd-Kováshalom (Hungary)

Pál Raczky (Eötvös Loránd University)

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### 11:30: Death on the tell. Human remains from Neolithic settlement mounds on the Great Hungarian Plain

Alexandra Anders (Institute of Archaeological Sciences, Eötvös Loránd University)

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### 11:50: Discussion

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### 13:30: Origins of households at Neolithic and Bronze Age tell settlement complexes on the Great Hungarian Plain

Paul R. Duffy (The Archaeology Centre, University of Toronto)

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### 13:50: Early neolithic settlement systems along the lower Mureș/Maros river valley

Lennart Brandstätter (University Tübingen)

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### 14:10: Environmental setting, settlement dynamics and land use in the Boroš micro-region in the Serbian Vojvodina from the Neolithic to the Bronze Age

Robert Hofmann (Kiel University, Institut for Prehistoric and Protohistoric Archaeology)

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### 14:30: Feathergrass in the vase and Sanduri wheat in the field – Environment and land use in the Bordos microregion after the botanical record

Aleksandar Medović (Museum of Vojvodina, Novi Sad, Serbia)

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### 14:50: Discussion

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### 15:30: Bronze Age Settlement and Society along the Danube in Central Hungary

Gabriella Kulcsár (Institute of Archaeology RCH HAS)
ABSTRACTS

From Tells to settlement systems: Landscape and networks along the Danube and the Tisza from the Neolithic to the Bronze Age

Keynote speakers: W. Parkinson (Field Museum of Natural History and University of Illinois at Chicago), D. Borić (Columbia University, New York City)

Session organizers: M. Savu*, R. Staniuk, R. Hofmann, J. Müller

*corresponding chair, msavu[at]gshdl.uni-kiel.de

Prehistoric societies along the Danube and Tisza are consistently divided based on conventional periodization systems, which limits the possibilities of investigating long-term trajectories of human development in specific environmental transects. We refer here to aspects such as the re-occurrence of settlement mounds between the Neolithic and the Bronze Age, the identification of the complex mechanisms leading to their formation, as well as the degree of their intentional. The prevalence of period-based research methodologies and interpretative framework also affects the comparative investigation of settlement systems and of their socio-economic setting.

We believe that in order to achieve a deeper understanding of long-term historical processes, it is important to address problems in a comparative and diachronic manner, and shift the discussion towards households, population processes, economic strategies, power structures, and networks.

We would like to ask questions such as:
- How did the previous generations set the trajectory of the subsequent ones?
- To what extent are the economic structures dependent on the landscape potential?
- How are population processes related to the formation of human societies?
- How can we address the emergence of power structures and can we really connect them with certain settlement types?

We especially encourage papers focusing on aspects such as those mentioned above and involving research which applies multi-proxy methodologies.

Against the state: Prehistoric landscape histories in the Lower Danube Basin

Keynote lecture: Dušan Borić (Columbia University)

This paper takes a long-term perspective in understanding the patterning of continuities and discontinuities in regional settlement histories along the Lower Danube Basin. This evidence is then examined in relation to landscape affordances, population
demography, and elements of both continuities and changes in documented cultural traditions. Mesolithic, Neolithic and Copper Age settlement histories are covered. The paper examines to what extent the establishment of autonomous enclosed villages as the characteristic of the Late Neolithic and later periods in this and adjacent regions follows an assumed cross-cultural generalization based on the postulates of the Agricultural Demographic Transition model. Like in many other parts of the world, in the Lower Danube Basin, there are important differences in the archaeological visibility of settlement and burial evidence throughout the periods being considered. Several theoretical models have been suggested to account for these variations and the fluctuations in periods of aggregation and disaggregation linked to emphasis on social “complexity” and “simplicity”, or demographic “booms” and “busts.” A suggestion will be advanced that one of the reasons for the lack of evidence for the emergence of institutionally stratified societies or the formation of early states in this region could be sought in the existence of centrifugal social forces, linked to a possible role of institutionalized inter- and intra-group/settlement violence that might have served as a mechanism for maintaining a desired social equilibrium. Such a perspective aims to destabilize the stadial social evolutionary view that still dominates our grand narratives.

Agricultural Demographic Transition model. Like in many other parts of the world, there are important differences in the archaeological visibility of settlement and burial evidence throughout the periods being considered. Several theoretical models have been suggested to account for these variations and the fluctuations in periods of aggregation and disaggregation linked to emphasis on social “complexity” and “simplicity”, or demographic “booms” and “busts.” A suggestion will be advanced that one of the reasons for the lack of evidence for the emergence of institutionally stratified societies or the formation of early states in this region could be sought in the existence of centrifugal social forces, linked to a possible role of institutionalized inter- and intra-group/settlement violence that might have served as a mechanism for maintaining a desired social equilibrium. Such a perspective aims to destabilize the stadial social evolutionary view that still dominates our grand narratives.

For Comparative, Long-Term, Collaborative, Regional Research in European Prehistory

Keynote lecture: William Parkinson (Field Museum of Natural History and University of Illinois at Chicago)

Since its inception, scholars of European prehistory have taken up the difficult task of writing comprehensive, continental-scale, syntheses that describe and explain the rich, deep, ar- chaeological record of the European continent. More than any other place in the world, as a result of the long history of systematic research, Europe has been the focus of synthetic monographs that either focused on specific temporal periods or on the long-term, diachronic, evolution of cultures on the continent. Most of these synthetic works, however, were based on the sequences from a few specific sites, creating a dialectical tension between, on the one hand, a desire to create broad, comprehensive syntheses and, on the other hand, a need for detailed, systematic research grounded in site-based sequences. This historically schizophrenic tendency in European prehistoric studies (Parkinson 2018) has been offset by the regional-scale datasets that have been created by some national programs (e.g., the Archaeological Topography of Hungary) and by numerous regional research projects in the last fifty years. The development of these systematically collected, regional-scale, datasets is beginning to create an analytical framework that permits the comparative study of cultural trajectories at the regional scale. But the comparison of regional trajectories is hindered by several factors. The diversity of geographic environments, research foci, and research techniques employed throughout Europe make the comparison of datasets collected by different projects difficult, if not impossible. And some, for whom the primary goal of archaeology is solely to document and preserve national or ethnic cultural heritage, simply do not see the theoretical value in regional comparisons. One productive way to build upon the successful development of individual regional datasets is to encourage the establishment of long-term, collaborative, regional research projects that employ similar methodologies, permitting the comparison of long-term cultural trajectories within and between different regions. There are real challenges to carrying out such ambitious, long-term, collaborative projects, especially with regards to fun- ding, but the various benefits to the field make the development of such projects worth the effort. Recent research into the organization of tell-based Neolithic sites in the Carpathian Basin demonstrates the impact long-term, collabora- tive, projects can have on our understanding of prehistory.

Neolithic tells as spaces of memory. Place-making and 'efficacious ancestors'

Alexandra Ion (Institute of Anthropology ‘Francisc Raineri’ & McDonald Institute for Archaeo- logical Research)

Drawing from the results of the DivMeanBody project, my talk aims to engage with two inter- related key questions raised by the organisers of this session: what is the degree of the tells formation intentionality, and what is the nature of the link between generations? To explore these, I will look at evidence presented by human remains discovered in Neolithic tells in the Balkan area, with a focus on those from SE Romania. These settlements have yielded collections of disarticulated/fragmentary/scattered human remains. Given its broad time span, ap- parent uniformity on a large geographical area and across multiple prehistoric cultures (from Southern Romania to northern Greece), studying this depositional practice is key to understanding the context which shaped the beginnings of settlements, agriculture and the Neolithic way of life in Europe. The most common interpretation in the case of the fragmentary dead is to see them as ‘secondary depositions’, or even as discarded body parts (tertiary de- posits), the implicit narrative being that they are a form of deviant, non-burial type of dis- coveries. Instead I would argue, the opposite is happening here – keeping these body parts is the important part of the funerary process. Furthermore, their presence among the living points to the intentionality of tells formation, part of a strategy of place-making of these past communities, both in a physical, and ‘sacred’ sense. At the same time, by looking at what happens with these human remains, an argument can
be made that temporal distances on tells gain a different value through the present materiality of the dead from the past, and the associated archaeological materials; their manipulation becomes a means through which the past can be referenced, thus creating an inter-generational dialogue. Therefore, my claim will be that in order to understand better the formation of tells, and also the treatment of their dead, we need to rethink the depositional context themselves — what tells are-, and instead of assuming that these are settlements which happen to contain bodies (and body parts), a different situation is more probable. As I will show through revisiting osteological and taphonomic data, as well as the associated archaeological materials and contexts, we can safely argue that at least some tells are a special kind of Neolithic feature, collapsing the distinction between the archaeology of settlements and funerary archaeology, between the sacred and domestic. Thus, in order to grasp their complexity we need to adapt our previous models which have been informed by modernist dichotomies, towards finding new questions to engage with multi-disciplinary data.

The lithic procurement and production activity in the Late Neolithic period in the south part of Transdanubia
Katalin Szilágyi (Móra Ferenc Museum, University of Szeged)

Starting from an analysis of the 6200 chipped stone tools of the Late Neolithic Alsónyék–Bátaszék site, questions related to main raw material used: the Mecsek radiolarite: 1. What were the criteria of selection and strategies of procurement of the knappable lithic raw materials? 2. What production methods can be identified in connection with the use of the local raw material at Alsónyék and in the Southeastern group of the Lengyel culture? 3. Which were the Late Neolithic sites in the Great Hungarian Plan where the Mecsek radiolarite appears? 4. What was the value of this radiolarite type in Transdanubia and Great Hungarian Plan? 5. What kind of exchange network was connected to the Mecsek radiolarite? 6. Can we reconstruct the distribution routes of this radiolarite?

Beside the presence of trans-regional flints, the greatest quantity of the lithic raw material in Late Neolithic in Transdanubia and the Great Hungarian Plain is radiolarite from the East-Mecsek Mountains. This is a raw material of good quality and available in sufficient quantities to cater the raw material demand of the region. The geological sources of this radiolarite were located very close to Alsónyék. The patterns of raw material distribution, indicate very strong local networks around the Alsónyék site. This tendency is very similar the contemporaneous Lengyel settlement like Zengővárkony, Pécsvárad–Aranyhegy, Lengyel–Sánc, Villánykövesd and Mórágy–Tűzkődomb also.

Investigating the nature and significance of the use of local raw materials, this contribution will discuss the results of an ongoing geoarchaeological research project in the eastern part of the East-Mecsek Mountains focused on locating and documenting the exact geological sources of local radiolarite in order to reconstruct the procurement strategies. These findings will be put into a larger perspective of Late Neolithic southern Transdanubian interaction networks.

On the Northern ‘Periphery’ of Tells – New perspectives in Neolithic Settlement Network Analysis in North-East Hungary
András Füzesi (Eötvös Loránd University)

The Upper Tisza region is well known to international Neolithic research since the 1990s. The region’s first investigated archaeological site was Polgár-Csőszhalom, which has retained its prominent role to this very day. The settlement is not only the northernmost tell in South-East Europe, but is a most unusual site with its special enclosure system, its tell and the associated 61 hectares large single-layer settlement. Its archaeological material, whose assessment was begun in 2012 by the Neolithic research team of the Eötvös Loránd University, provided evidence for the northern (Samborzec) and western (Lengyel) connections of the local community. The importance of this region was recognised by John Chapman, who with his colleagues analysed the settlement history of north-eastern Hungary. The Upper Tisza Project (UTP) incorporated several micro-regions, including Polgár Island, the broader catchment area of the Polgár-Csőszhalom site. In his report of the project’s initial results, Chapman emphasised the social power reflected in settlement concentration and the importance of local conditions in the emergence of tells. Our researchers team undertook systematic field surveys in 2007 and for several seasons since 2012. These surveys covered not only Polgár Island, but also the micro-regions to its south (Tiszacsege Island) and north (Tiszadob Upland). Thus, we have data on the Neolithic settlement network of a 36 km long territory along the Tisza River. These investigations enable us to draw a new picture, not only because of a wider spatial perspective, but also owing to the changes in research methods and the findings of other projects on the Great Hungarian Plain. My presentation demonstrates the new results of studies on the Middle and Late Neolithic settlement network in the Upper Tisza region. The transformation of local Neolithic communities could be studied in a much more complex way by using the data from the excavations too. The geographical conditions determining human settlement have a mosaic patterning in the study area. The former meanders of the Tisza rivers and fragmented loess surfaces rising above the floodplain form the natural basis of the micro-regional units. The geographical units (Polgár Island, Tiszacsege Island, Tiszadob Upland) are loosely related to each other and provide the
Aspects of Tisza cultural processes as reflected in ceramic assemblages at Öcsöd-Kovásha- lom (Hungary)

Pál Raczky (Eötvös Loránd University)
Co-author: András Füzesi (Eötvös Loránd University, fuzesia@gmail.com)

In our presentation, we discuss the different general cultural processes of the Tisza culture as reflected in the ceramic material. Our springboard was the Late Neolithic tell-like settlement of Öcsöd-Kováshalom: the cited examples come from the ceramic assemblages excavated at this site and from the associated intrasite and regional phenomena. Over 80,000 ceramic sherds were recovered from two consecutive occupation levels. The ceramic material included 268 intact or refittable vessels. The assemblage consisted of diverse, but nevertheless well-definable form types, whose profile and proportion as well as their sizes represent a specific range. The ornamentation and the diachronic changes in decorative motifs and designs reflect the process of how the Late Neolithic Tisza style emerged in the context of a tell-like settle-ment complex. Questions of local ceramic production and pottery use are discussed only in brief. The technological analysis of the ceramic material based on thin sections is still in pro-gress. Artefacts are directly associated with the environment through their material. Our tech-nological and functional analysis principally focused on the role of ceramics in social practices. Reflecting on the triple functional categories of storage, processing and consumption, we exa-mined the spatial patterns of different vessel types (storage jars, jugs and bowls). Face pots, representing a special storage jar type, embody the entanglement of community usage and community symbolism. Finally, we present a few examples of how social relations are possibly reflected in ceramic decorative styles. Different elements of style (motifs, patterns, decoration structures and decorative techniques) are suitable for mediating social relationships within and between groups. Representations of different levels of individuals, households and com-munities appeared on the surface of decorated vessels, which were ancient message boards inscribed by the creators of the physical and mental landscapes around the Late Neolithic tell-like settlement of Öcsöd-Kováshalom.

Death on the tell. Human remains from Neolithic settlement mounds on the Great Hunga- rian Plain

Alexandra Anders (Institute of Archaeological Sciences, Eötvös Loránd University)

The settlement network of the Hungarian Plain during the Late Neolithic (5100/5000–4600/4500 BC) was made up of settlements occupied for various lengths of time that were located along the winding rivers and streams, the Tisza, the three Körös and Berettyő rivers and their tributaries. The settlements include tells, tell-like settlements and single-layer sett-lemens, some of which emerged in association with tells, some independently of them. Tells are regarded as special locations in the life of prehistoric communities, the setting of major community actions such as the construction and deliberate burning of houses and communal feasting. These ritual activities served to glue the community as well as to maintain and ensure the continuity of social remem-brance. At the same time, tells were also the settings of mortu-ary rites: even though several burials and disarticulated human remains have been brought to light on tells, these were accorded little attention in archaeological scholarship. Discussed here are 300 burials from 13 sites, alongside a more detailed overview of the new findings of biosocial archaeological and spatial analyses covering the sites of Öcsöd-Kováshalom, Be-rettyóújfalu-Herpály, Hódmezővásárhely-Gorzsza, Polgár-Csőshalom and Polgár-Bosnyák-domb. How do the dead appear in the context of tells? How did burials structure space? Were the burials furnished or not? Who were buried on tells, when were they interred and where? Who were buried on the tell and who on the single-layer settlement? What were the main considerations when making these choices: age, sex/gender, wealth or some other factor? Whom or what did they represent? How were burials linked to the world of the living? Are there any similarities and/or differ-ences in how bodies were treated in different locations and sites? The project is funded by a grant from the National Research, Development and Innova-tion Office (Grant no. K124326).

Origins of households at Neolithic and Bronze Age tell settlement complexes on the Great Hungarian Plain

Paul R. Duffy (The Archaeology Centre, University of Toronto)

Co-authors: William A. Parkinson, Attila Gyucha and Richard W. Yerkes

Tell settlement complexes emerged, and then collapsed, in both the Neolithic (5000-4500 BC) and Bronze Age (2000-1500 BC) on the Great Hungarian Plain. Remote sensing and surface collection over the past twenty years accompanies the study of many of these sites, and the spatial scale of tell settlement complexes in both periods is remarkable. Though the duration of these settlements is sometimes short, population overall framework of the analysis. Based on the available data, I strove to construct a model of settlement history, in which the long-term interactions between, and transforma-tions of, the landscape and the human communities were interpreted in the context of the diversity of local variants.
estimates suggest in some cases popula- tions over a thousand. While the timing and extent of these tells is increasingly under scrutiny, two dimensions of these social trajectories are commonly left out. First, the source of the incoming populations to tell settlement complexes for either period has not been adequately scrutinized, and we often do not have a sense of whether population growth is most plausibly attributable to in situ demographic growth, localized aggregation from people in the micro- region, or incoming populations from the wider area. Second, the catalysts and benefits of population aggregation at the household level have been widely overlooked. The costs and the benefits—or the ‘pulls’ and the ‘pushes’—of settlement aggregation on the Great Hunga- rian Plain are surely varied, but case studies of settlement aggregation from outside of the Carpathian Basin can be useful models for thinking about why the process of aggregation oc- curs, and why it eventually ends. In this paper we look at two cases of settlement aggregation from the Körös region of eastern Hungary—one from the Neolithic (Szeghalom-Kovácsalom) and one from the Bronze Age (Békes- Várdomb)—to explore the extent to which tell settle- ment complexes may have drawn populations from their immediate micro-regions. Second, we visit several case studies to explore the reasons why households of more egalitarian socie- ties seem to accept unprecedented village densities, at least in the short term.

Environmental setting, settlement dynamics and land use in the Bordőš micro-region in the Serbian Vojvodina from the Neolithic to the Bronze Age

Robert Hofmann (Kiel University, Institut for Prehistoric and Protohistoric Archaeology)
Co-authors: Fynn Wilkes, Stefan Dreibrodt, Aleksandar Medović, Tijana-Stanković-Pešterac, Ildiko Me- dović, Sarah Martini, Martin Furholt

Since 2014 in a Serbian-German cooperation comprehensive field work has been carried out at the spatial scale of a micro-region (20 km² in size) near the town Novi Bečej on the downstream section of the Tisza River in the Serbian Vojvodina. In the focus of the research are the complex settlement hotspot Bordőš and the socio-environ- mental dynamic of Neolithic settlement systems. However, surveys and archive studies provided also data for other peri- ods. Our field activities included archaeo-magnetic and geolectric surveys, core drillings, surface collections and targeted excavations. In our paper the first attempt of a synthesis re- garding environmental setting, settlement history and land use is made in a long-term per- spective.

Feathergrass in the vase and Sanduri wheat in the field — Environment and land use in the Bordos microregion after the botanical record

Aleksandar Medović (Museum of Vojvodina, Novi Sad, Serbia)
Co-authors: Robert Hofmann, Fynn Wilkes, Stefan Dreibrodt, Tijana-Stanković-Pešterac, Ildiko Medo- vic, Sarah Martini, Martin Furholt

There is a big difference in scope/diversity-index between macrobotanical assem- blages from Neolithic and Bronze Age sites in the south-eastern part of the Pannonian plain. The species- rich and abundant Bronze Age collections are opposed by low-pool samples for the Neolithic period. Scarce archaeobotanical records from Eneolithic period makes the possibility of inves- tigating long-term trajectories of crop husbandry development in this area even more difficult. Nevertheless, new archaeo- botanical research at late Neolithic sites from Serbia, Hungary and Romania (Bordos site-complex, Hódmezővásárhely-Gorza and Uivar) has brought some new insights into the composition of main crops (e.g. cf. Triticum timopheevii and T. spelta), har- vesting activities (e.g. Scleranthus annuus) and growing and gathering activities (e.g. Abutlon theophrasti and Chenopodium polyaspernum). Latest research at Bordos and its neighboring sites suggests that the prevailing vegetation of on black earth-covered loess plains of the Tisza during late Neolithic was steppe (e.g. Stipa) while the forest was growing in the floodplain of the Tisza.
Bronze Age Settlement and Society along the Danube in Central Hungary

Gabriella Kulcsár (Institute of Archaeology RCH HAS)

The presence of fortified multi-layer/tell/tell-like settlements is an important characteristic of the late Early Bronze Age and Middle Bronze Age (according to Hungarian terminology, ca. 2300/2200-1500/1450 BC) of the Carpathian Basin. The aim of this paper is to review the available evidence on these settlements in central Hungary, and to describe and give a pre-iminary analysis of Middle Bronze Age settlements and settlement patterns along the Danube and in the Danube-Tisza interfluve, especially in three smaller areas on the right and left bank of the Danube. We discuss previous views on the significance of Middle Bronze Age fortifica-tions, attempt to deconstruct the preconceptions they had been built upon and put forward a few preliminary observations upon which further research can be based. The study of Early and Middle Bronze Age tells and fortified settlements can provide invaluable information on social, economic and political developments in the period. Nevertheless, we have to empha-size that due to this focus on larger centres, research has become biased. Such settlement studies can be fruitful only if smaller, outlying villages, hamlets, farms and off-site locations with cultural remains are also investigated. The picture that emerges from this review is that of great variability in terms of settlement forms, locations and relationship between settle-ments. We have to differentiate between various types of sites in terms of fortification, posi-tion within local and regional settlement hierarchies, etc. Issues such as the differences between the thickness of the sequence of layers of the sites that had been occupied for the same time-span must also be taken into consideration, since they indicate different modes of habitation, house destruction and abandonment, and the accumulation of settlement debris. We think that the study of Bronze Age settlement and society in Hungary has reached a point where it needs to open a new chapter in research. A more mature theoretical background and the launching of a series of carefully planned, systematic microregional projects will hopefully provide a host of new information and exciting interpretations that will shed new light on a crucial period and area in European prehistory. In this presentation, we review the latest re-sults of the past 10 years in Central Hungary.

Material culture patterns and settlement systems at the end of the Early Bronze Age in central Hungary. Some preliminary observations.

Csaba Bodnár (Eötvös Loránd University, Budapest; Museum of Fine Arts, Budapest)

Archaeological data from the central part of the Carpathian Basin, in particular from Hungary suggests that some significant changes had begun in this area around 2300/2200 BC. Communities living in this region at the end of the Early Bronze Age (according to Hungarian termino-logy) had undergone some important transforma-tions in terms of their internal social organi-zation and the scope of their communication networks. An important feature of this period is the emergence of regionally distinct pottery styles which can be seen as the result of more actively communicated group identities, as well as of more restricted social bonds among members of communities living in different spatial areas. Another salient change in this period is the (re)appearance of tell settlements in larger parts of the Carpathian Basin, mainly along the Danube and Tisza rivers and their tributaries. These multi-layer sites had become im-portant parts of the settlement systems, their importance, however, varied regionally. The current state of research on settlement patterns in Early Bronze Age Hungary suggests regio-nally different settlement networks with sites of various forms, size, and functions. In this pa- per, I would like to integrate archaeological data on material culture patterns and settlement systems from the distribution area of the Nagyrév-style ceramic assemblages (central Hungary). Two smaller (micro)regions have been selected where the available archaeological evidence on the composition and context of Nagyrév-assemblages will be compared. One of the microregions is located around the tell site of Tőszeg-Laposhalom, close to the bank of the Tisza river, the other is situated around Szekszárd, west to the Danube (including the sites of Sióagrád-Gencs and Gerjen-Várpadpuszta). At the end of the Early Bronze Age period both areas were characterized by communities producing and using Nagyrév-style pottery, the spa-tial organization of their settlements, however, showed slightly different structure. Focusing on these two areas, the basic question of my analysis is whether some remarkable differences can be observed in the ways and strategies of artifact production and consumption between the several, formally and functionally different structural elements (e.g. single-, multi-layer sites, fortified sites, cemeteries) of the reconstructed human landscapes. With the help of network analysis, some preliminary obser-vations will be presented.

“Kakucs-Turján – a Bronze Age multi-layered site or a multi-layered settlement system?”

Mateusz Jaeger (Adam Mickiewicz University in Poznań; Institute of European Culture)
Co-authors: Robert Staniuk, Gabriella Kulcsár, Sofia Filatova, Jakub Niebieszczański, Nicole Taylor

The Hungarian Bronze Age (ca. 2700-1600 BC) is characterized by diversified settlement sys-tems unified by the presence of multi-layered sites, the largest of which are classified as tells. Regardless of the variety of environmentally distinct areas, such settlements remain a constant feature of the landscape. While the numbers of and location of sites vary from period to period, with the largest number of sites associated
The organisation of life on an European Bronze Age tell: reflections from Szazhalombatta-Foldvar

Marie Louise Stig Sørensen (University of Cambridge)
Co-authors: Magdolna Vicze, Joanna Sofaer

Our ideas about the organisation of Bronze Age tells in Europe - 'the tell-way of living' - is largely based on inferences rather than factual evidence. This is partly because the material correlates of 'social organisation' are difficult to identify and agree to and partly it is due to the character of many earlier excavations which paid limited attention to the evidence of life suspended between horizons of floors. Instead, our ideas of life on tells were informed by evidence from tells in the Near East, well preserved and extensively excavated Neolithic tells in Europe, and also sharpened around mega narratives about the European Bronze Age. With several ongoing projects investigating Bronze Age tells through advanced methodologies we can now begin to reassess how well our existing ideas match the evidence in the ground. In this paper we ask whether we can get closer to an understanding of how these settlements 'functioned' - what kind of social organisations and mechanisms were in place to make this form of settled life possible. Based on evidence from the excavation of Szazhalombatta-Foldvar we shall consider this question from a number of angles, including evidence of relations external to the site, attitudes to space and dirt, and some of the characteristics of pottery production and use that ground this material in the local...
The eastern alternative to tells: Tripolye mega-sites in the Southern Bug-Dnieper interfluve in light of recent radiocarbon dates


This paper aims to analyze the Tripolye giant-settlements (also known as Tripolye mega-sites) and their settlement systems in the Southern Bug-Dnieper interfluve in reference to the most recently obtained radiocarbon data. By discussing the agglomeration and dispersal of the Wes-tern Tripolye and Eastern Tripolye populations in space and time, as well as their patterns of mobility and subsistence, we hope to provide a wide comparative framework for the different trajectories of spatio-demographic development in prehistoric Europe observed during the interval of 4300 – 3000/2950 BC. Our paper addresses several specific issues. What was the duration of the Tripolye giant-settlements? Were there any differences between the forma-tion and development of the Western Tripolye and Eastern Tripolye mega-sites? How did the interactions between populations of those units influence the related material culture assemblages? Finally, what were the mechanics of the eastern waves of advance that produced these settlements, and how are they manifested in the material record from 4300 until 3000/2950 BC?

Answering archaeological questions with (quantitative) geoarchaeo-logical methods – exa mplies from a transect of tell sites, Anatolia to central Europe

Sarah Martini (Institute of Pre- and Protohistoric Archaeology, CAU-Kiel) Co-author: Stefan Dreibrodt, Knut Rassmann

Tells and multi-layered settlements form important nodes in the cultural landscapes of a large part of the Eurasian continent from the Neolithic period onwards. As mounds formed by the accumulation of architecture and debris resulting from continuous habitation of the same area, the layers of sediment making up a tell are invaluable records of the interaction between cultural and natural processes for geoarchae-ologists. As these sites are often occupied for an extended period of time, they also provide the opportunity to examine these processes from a diachronic perspective. Furthermore, given their wide spread across Eurasia, they offer a chance to compare and contrast the behaviors that eventually led to the formation of this type of “similar” sites. In this paper, we compare the results of qualitative and quantitative geoarchae-o logical analyses of eight tell or tell-like settlements that were occupied for varying intervals from the Neolithic through the Roman Iron Age and that make up a transect from Anatolia to Central Germany. Questions addressed include: What similarities and differences are visible in the geochemical and geoarchaeological signatures in these sites and how might they be connected to human behaviors? Are these similarities smaller or larger than would be expected given the vast differences in environmental setting along this transect? And, how might the analysis of sediments be used to expand archaeological knowledge and help un-tangle the complex knot of cultural and natural processes that lead to the formation of a tell? In answering these questions, the possibilities and weaknesses of the application of a novel quantitative approach is also discussed.

POSTER SESSION: People, landscape and diachronic choices. New insights regarding Gumeñlita tell settle- ment (Romania)

Cătălin Lazăr1 Co-authors: Adrian Balasescu2, Valentin Radu1, Mihaela Golea1, Mihaela Danu1, Cristina Covaturu1, Adrian Serbanescu1, Alfred Vespermeanu-Stroe1

1 ArchaeoScience#RO, Research Institute of the University of Bucharest (ICUB), University of Bucharest, Romania; catalin. lazar@icub.unibuc.ro
2 Institute of Archaeology “Vasile Pârvan”, The Romanian Academy, Bucharest, Romania
3 National History Museum of Romania, Bucharest, Romania
4 "A. I. Cuza" University of Iaşi, Iaşi, Romania

The tell settlement from Gumeñlita (or “Măgura Gumeñlita”) is the eponymous site of the Eneolithic civilisation with the same name. It is probably the biggest tell settlement North of the Danube, and it belonged to the Ködjardermen - Gumeñlita - Karanovo VI civilisation that occupied in the Balkan area in the second half of 5th millennium BC. The current paper will investigate the complex interface between the human community that lived at Gumeñlita, and their socio-economic setting in correlation with the landscape, Danube River, available raw materials and the environment, but also its position in the regional net- works. In order to identify the particular history of those past people, our analysis will include a focus on the integration of the archae-ological, gearchaeological, zooarchaeological, and archaeobotanical data, and their correlation with topographical, GIS, remote sensing infor-mation, and chronological data. In this manner, we will be able to set the diachronic choices of these populations
correlated with different general or particular constraints. Furthermore, this approach will allow us to explore the development degree of local communities from Gumelnita along the 500 years in terms of multiple land-use (e.g. for habitation, burying the dead, other economic activities), exploitation of the environment (natural resources) and human impact, but also their integration in the existing exchange networks from the Balkans. This work was supported by two grants of the Romanian Ministry of Research and Innovation, CCCDI – UEFISCDI, projects number PN-III-P1-1.2-PCDI-2017-0686 and PN-III-P4-ID-PCE-2016-0676, within PNCDI III.

POSTER SESSION: Fishing on the Lower Danube during the 5th millennium BC. Was it specific only to the sett-lement mounds?
Mihaela Savu (Graduate School Human Development in Landscapes)
Settlement mounds, also known under the term tells, have been more than a century in the focus of researchers studying various aspects, from social stratification to different innovati-ons. For the Lower Danube, the 5th millennium BC is often seen as a time of change, when copper metallurgy emerges, alongside the Tells, and furthermore, certain cultural and econo-mic shifts. In the said region, besides the domesticated plants and animals in the preceding Neolithic, during Copper Age, many sites show a renewed importance awarded to wild re-sources, aquatic fauna included, with a special stress laid upon large taxa in fish (e.g. catfish with an average of 1m in length). This has been interpreted as a necessity in order to increase food supplies, due to a growing population, especially in the tell settlements. But was this indeed a uniform trend and chiefly occurring in tells or did it suffer particularities? The explo-ration of water faunal resources implies at least a minimal knowledge of faunal behaviour and an understanding of the environment. This would determine the employment of certain kinds of tools and techniques, more or less specialized. The lots of faunal material retrieved from the archaeological sites are partly indicating which techniques are suitable in capturing different species. Along with the zooarchaeological material, various implements made on different supports (wood, fibres, osseus material, copper, stone, ceramic), indirectly confirm the practice of fishing. The occurrence of this kind of artefacts tends to be more intense for the Copper Age period in the Lower Danube region. Based on this information, the aim of the study is to acknowledge the contribution of fishing to the economy of the Neolithic and Copper Age sites, as well as the potential effort involved in the whole process, from producing the necessary instruments to bringing back the pray. My main interest is the comparison of aspects from settlement mounds to those in contemporaneous flat settlements. Although my focus will be on the Lower Danube region, I am aiming at a parallel with the area along the Tisza valley, where analogous objects, linked to the practice of fishing have been discovered, and to explore the context under which they occur.

Complexity in archaeology – Diachronic transformations of complex networks and theoretical aspects of complex systems

Tuesday March 12th, Room 209
Session organizers: Oliver Nakoinz, Jan Eric Schlicht, Martin Hinz, Daniel Knitter, Liang Yang, Timothy Kohler

TUE
08:30 Applying Complex Adaptive Systems Approaches to the Global Archaeological Record
Keynote lecture: Stefani Crabtree (The Pennsylvania State University and the Center for Research and Interdisciplinarity)
09:00 Complexity models in archaeology: the shadow of determinism
Artur Ribeiro (Kiel University)
09:20 Complexity-tinted Glasses: Some Ideas for a different Perspective on theoretical Discourse in Archaeology
Jan-Eric Schlicht (Institute of Pre- and Protohistoric Archaeology, Kiel University)
09:40 Discussion

10:30 A multidisciplinary and multiscale approach to study the network of a capital and its hinterland: Ravenna in the last two millennia
Federico Zoni (University of Bologna)
10:50 Representing complexity, communicating relations. Network analyses of ornamentation on twenty pottery vessels from the Sarup causewayed enclosure on Funen, Denmark
Rie Bloch (Aarhus University)
11:10 Flint artefacts as a social media in Neo-Eneolithic societies of North Pontic region during VI-V mill. BC
Dmytro Kiosak (Odessa I.I. Mechnikov National University)
SESSION 6

11:30 Transformations in settlement structures and distribution systems in the Neolithic Moravia
Petr Pajdla (Department of Archaeology and Museology, Masaryk University, Brno)
11:50 Discussion

13:30 Trade has social impact! Why we need to rethink „distribution“ in the Bronze Age
Lennart Linde (Goethe Universität Frankfurt)
13:50 Settlement scaling theory and the Roman Empire
John Hanson (University of Reading)
14:10 Social complexity and complex societies in Iron Age
Oliver Nakoinz (Institute of Pre- and Protohistoric Archaeology, Kiel University)
14:30 Discussion

15:30 Styles, Pottery and Complexity at the Swiss Plateau. Neolithic ceramic production and consumption 3900-3500 BCE
Martin Hinz (Institut für Archäologische Wissenschaften, Universität Bern)
15:50 Where innovations come from?
Aleksandr Diachenko (National Academy of Sciences of Ukraine, Institute of Archaeology)
16:10 Discussion (including Summary by the Organizers)

6 ABSTRACTS

Complexity in archaeology – Diachronic transformations of complex networks and theoretical aspects of complex systems

Keynote speaker: S. Crabtree (Pennsylvania State University)
Session organizers: O. Nakoinz, J. Schlicht*, M. Hinz, D. Knitter, L. Yang, T. Kohler
*corresponding chair, oliver.nakoinz[at]ufg.uni-kiel.de

Studies of complex systems and their inherent specific characteristics are rapidly developing in archaeology. Of particular interest are (a) the rules governing the development of such systems over long periods; (b) how archaeology's heterogeneous and sparse data can be integrated into complex system modelling; (c) how this epistemological approach can be included in the canon of theoretical approaches currently being pursued in the discipline (e.g. agency, materialism, speculative realism) and in the increasing sovereignty of scientific disciplines to explain (pre)history; (d) whether the discipline benefits from dealing with complex systems at all, or whether it is just short-term hype and a new buzzword. This session focuses on complex networks – which are a type of reduced model of complex systems, and hence seem to be easier to apply in archaeology and anthropology – as well as on the theoretical background of complex systems, which could be enriched by different flavours of network theories. The integration of complex systems and network theories should encourage exploration of the implications, perspectives, and limitations of complex networks in the overlapping fields of ethnography and archaeology.

With this session we aim to provide an overview of the state of the art, new developments, and thoughts stemming from reflection on and application of complex systems theory in archaeology. We invite contributions from all archaeological and anthropological disciplines dealing with questions like:
• What can simulations of emergent phenomena of long-term processes in landscape archaeology and social archaeology contribute to understanding transformations?
• Are complex networks adequate models of complex systems?
• How can qualitative definitions of emergence complement each other?
• Are ethnoarchaeological analogies possible under complexity assumptions?
• Can prehistory benefit from ethnological case studies of complexity?
• What does agency (Latour etc.) mean in the light of complexity?

We hope for contributions from computational archaeology, papers that revolve around questions of theory, case studies, and papers developing methods. The topic of this session might also link to the sessions on maritime networks (Rutter et al.) as well as social resilience (Yang et al.).
Applying Complex Adaptive Systems Approaches to the Global Archaeological Record

**Keynote lecture: Stefani Crabtree (The Pennsylvania State University and the Center for Research and Interdisciplinarity)**

Archaeology is not just the study of a past that has been discarded and abandoned, it is the study of how the trajectory of humanity has led to where we are today. Modern methods can harness the explanatory power of the past to calibrate our understanding of the present and predict how we will face challenges in the future. In this vein approaches from complex adaptive systems science including agent-based modeling and network science prove particularly promising. By simulating societies in silico agent-based models and networks have enabled researchers to not only understand previously intractable aspects of the past, but also to use these simulations to predict what can make resilient societies and what lead them toward vulnerabilities to external perturbations. My work has used agent-based modeling, social network analysis, and trophic network analysis (or food web modeling) to examine robustness and vulnerabilities of societies from the American Southwest, to northern Mongolia, to Aboriginal Australians. In this talk I explore the unique ways that complex adaptive systems approaches can help us understand the lifeways of societies worldwide, and also suggest that understanding how people interacted in their uniquely challenging environments can provide parallels to understanding humanity's position in ecosystems today. Only through applying a complexity lens can we truly understand how the actions and interactions of people led to the large overarching structures we see today.

Complexity models in archaeology: the shadow of determinism

**Artur Ribeiro (Kiel University)**

In a paper from 2004, Travis Stanton argued that there is little to no determinism in archaeology, except in Complexity Theory research, namely that developed at the Santa Fe Institute by Timothy Koehler (1993, 2000). Stanton claims: “The idea that a researcher can hold the majority of programmed behaviors of simulated social agents constant while ‘tuning’ one behavior to assess its role in the decision-making process [...] unequivocally demonstrates a deterministic world-view” (Stanton 2004: 40). The issue surrounding determinism in Complexity Theory is not that straightforward and requires some elucidation. The central problem surrounding determinism in archaeology is the lack of clarity when it comes to understanding what it actually is. In the archaeological literature it is not uncommon to see the concept of determinism being confused with fatalism, or necessity. An additional problem is that of assuming actors need to denote real agency to counter determinism. This is not necessarily true: agency can exist in a deterministic universe. Similarly, describing actors without agency does not necessarily entail determinism – it is possible to describe agents in mechanistic fashion while accepting that they retain free-will. With these ideas mind, the aim of this paper is to elucidate these concepts, and discuss whether complexity models need to denote agency, or if it is better to ignore agency altogether.

Literature


Complexity-tinted Glasses: Some Ideas for a different Perspective on theoretical Discourse in Archaeology

**Jan-Eric Schlicht (Institute of Pre- and Protohistoric Archaeology, Kiel University)**

Human interaction be it with other humans, animals or their material environment represents a broad topic which can and has been analyzed with a plethora of different tools, methods and theories addressing a multitude of aspects. Since the inception of the subjects one could subsume under the umbrella of anthropology in its broadest (modern) meaning – the study of humans – including archaeology as a means to study humans through material remains, provably countless endeavors seeking to explain this subject have been undertaken. Over the last decades there have been multiple paradigms in archaeological theory, each being, broadly spoken, toppled over by a new generation of researchers on the quest to gain a “better” understanding of the subject, while discarding the old ways of thinking seemed like more or less the norm. The urge to “renew” theoretical discourse by getting rid of the old is thereby still visible, as for example with New Materialism, Post-Humanism, the Practical Turn, Spatial Turn and others. Aside the fact, that these discourses could indeed contribute new and/or valuable ideas, or even a heightened political awareness in the present age, the tendency for “revolution” might not be the ideal modus operandi to improve theoretical discourse in archaeology today. In recognizing complexity and realizing, that societies, collectives and humans in general represent complex systems with multiple layers of interaction, archaeology not only gains new fields of discourse for modeling and simulation, but also possibilities for approaching theory from another perspective. With complexity in mind, many approaches to explain the mechanics of human lifeways, materiality, behavior or large scale historicity could be integrated and possibly elevated in terms of their epistemological value. Not only that, but the subject itself might be given the chance to actually strengthen the link between natural
A multidisciplinary and multiscale approach to study the network of a capital and its hinterland: Ravenna in the last two millennia

Federico Zoni (University of Bologna)
Co-authors: Marco Cavalazzi (University of Bologna), Mila Bondi (University of Bologna), Michele Abballe (Universiteit Gent), Celeste Fiorotto (University of Verona))

In this paper we aim to present different data collected since 2002 during several research projects carried out by the Bologna University and focused on the rural and urban landscapes of the city of Ravenna (Northern Italy), the capital of the Western Roman Empire since A.D. 402. The main purpose is to analyze the transformations of an urban/rural complex network through different kinds of data and methods. The areas investigated are the lowlands of Ravenna, in the southeastern part of the Po Valley, between the Apennine Mountains and the Adriatic coast; this part of the Italian Peninsula has been characterized by intense geomorphological transformations in the past. The chronological range taken into consideration is short but significant: from the Roman period to the modern era. There are four main topics selected, analyzed with different types of sources: land use and land cover, evolution of rural settlement patterns, urban identity and its significance through history and palaeoenvironmental transformations. One of the aims of the project will be to enlighten limits and potentials of using different kind of sources in the areas of interest: - Land use and land cover from XVI to XXI centuries will be investigated using historical cartography (e.g. using Pontificale Cadaster); - The evolution of the rural settlement patterns will be discussed looking at the data collected by two landscape archaeological projects, the “Decimano project” (2002-2006) and the “Bassa Romandiola project” (2009-2018); - Urban identity is well known in historical studies based on the written sources, but a different interpretation could be reached just analyzing historical evidence in relation to a wider network, including rural landscapes, geographic context and natural environment; - The palaeoenvironmental transformations will be studied through geoarchaeological and palaeobotanical approaches (e.g. coring and macro- and microplant remains analysis). The final aim of this project is to define a comprehensive management and interpretation method for different kinds of raw data. A multiscale approach will allow the use of those information to achieve a single framework for the evolution of a complex network, namely a capital city and its hinterland during the last two millennia.

Representing complexity, communicating relations. Network analyses of ornamentation on twenty pottery vessels from the Sarup causewayed enclosure on Funen, Denmark

Rie Bloch (Aarhus University)

The comprehensive and complex ornamentation on the Funnel Beaker Vessels are products of human choice and technology, and are in no way coincidental. But how about the composition of these ornaments – does it display a specific structure, or syntax? Are there any types of geometrical decorations that are more central than others, or do they all appear to be positioned coincidentally? The foundation of this research is a general enquiry into what happens during the middle Funnel Beaker period (in Denmark, around 3300-3100 BCE) with the expansion of both ornamented pottery vessels, megaliths, causewayed enclosures and ritual acts, and how this is reflected in the pottery ornamentation. With all this evidence on structure, consciousness and not at least the ritual practices within which pottery vessels are of key importance, it seems plausible that these aspects of the TRB society are re-occurring in the arrangement of the pottery ornamentation as well. Network analyses are applied to decode the syntax of Funnel Beaker ornamentation, as this multivariable statistical tool can decode the relations between ornamentation whereas the CA analysis for instance rather decode the combinations of ornaments, shape etc. Furthermore, the network analysis will disclose information on different degrees of centrality of the specific ornaments involved and hence which ornaments attain the most relations to others. Traditionally, network analysis has been used in archaeology to decode e.g. routes of trade, migration, communication and exchange of ideas (see e.g. Knappett 2013). By applying the network analysis on artefacts and hence “dead objects”, a new methodology is developed. Archaeologists are hence offered new insights to a classical, thoroughly analysed material, which eventually might lead to questions about existing typologies (and chronologies) in Neolithic archaeology. With a theoretical basis in semiotic discussions of material culture, communication and agency, it will be discussed if the syntax of ornamentation is communicating a message...
and hence potentially can be equated with a symbolic language within and between different Funnel Beaker communities.


Flint artefacts as a social media in Neo-Eneolithic societies of North Pontic region during VI-V mill. BC

Dmytro Kiosak (Odessa I.I. Mechnikov National University)
Co-authors: Jehanne Affolter (Bern), Nadiia Kotova (Kyiv), Willy Tinner (Bern), Ebbe Nielsen, Helena Wehren (Bern)

Lithic collections from the region of interest were subjected to a raw material provenance study combined with the reconstruction of prehistoric technology. In developed Eneolithic (Trypillia B2-C1) some varieties of flint were moved over distances of hundreds of kilometres to reach consumption sites. The transport required some sort of social institution – logistic network in order to establish and keep the supplies going. Some Eneolithic flint-knappers were involved in a logistic network, and developed some professional skills and abilities as evidenced by technological complexity of their products. The development of this system is an open research problem. The stratified site of Melnychna Krucha provided us with a long record of flint acquisition strategies. The “Mesolithic” model is defined by limited amount of exotic raw material. Linear Pottery culture sites (namely Kamyane-Zavallia group) mostly depended on the long-distance export of excellent quality flint from west and north-west, while Early Trypillian expansion in the first half of Vth mill. BC saw the revival of “Mesolithic” flint supply strategies. The developed network of logistical support of flint tools production had arisen in Trypillia B1 basing on the Dniester river valley outcrops.

Transformations in settlement structures and distribution systems in the Neolithic Moravia

Petr Pajdla (Department of Archaeology and Museology, Masaryk University, Brno)
Co-author: František Trampota, Department of Archaeology and Museology, Masaryk University, Brno

The aim of this paper is to investigate spatial organization of Neolithic groups in Moravia (Czech Republic) based on distribution networks of raw materials for chipped stone tools. Within the region, the Neolithic period (ca. 5500 BCE to 4000 BCE) is represented by a sequence of pottery traditions (cultures), the so-called “Linearbandkeramik” (LBK), “Stichbandkeramik” (STK) and “Lengyel culture” (LGK). Individual settlements in each of the subsequent chronological horizons form nodes of larger supra-regional interaction networks facilitating the flow of material goods as well as information. Changing over time, these interaction networks are not stable phenomena; some collapse with the end of the LBK pan-European cultural continuum, whereas some new, different networks emerge. Network analysis and geographic information systems approaches are employed to correlate developments of interaction networks with changes in settlement structure. The paper focuses on modelling exchange networks of raw materials for chipped stone tools that are easily transportable and thus represent good proxies by whose study the networks may be reconstructed. Several theoretical models of diffusion patterns for raw materials are considered. A down-the-line distribution pattern implies exponential decay in the volume of the exchanged commodity with distance. Such a situation would suggest a non-hierarchical settlement structure. On the other hand, hierarchical modes of distribution where some settlements differ significantly in terms of volumes of raw materials present imply a hierarchy in settlement patterns. A comparison of the networks modelled on the basis of extant data with these theoretical models allows for the assessment of discrepancies between social and spatial distances in settlement network and indicate the nature of social organization. This approach enables us to study network topologies in discrete time horizons of the Neolithic period and link the dynamics in interaction networks with transformations of settlement patterns.

Trade has social impact! Why we need to rethink „distribution” in the Bronze Age

Lennart Linde (Goethe Universität Frankfurt)

The study of material fallout over space and time is a key technique in archaeological research. Especially within the field of Bronze Age studies it quickly became evident that the patterns observed can be interpreted as the „footprint” of former distribution networks. Today one of the main applications of social network theory in archaeology is the reconstruction of such distribution networks. In sharp contrast to the high significance we attribute to this networks themselves our frameworks to explain and interpret the modes of distribution driving them appear perilously one dimensional. With some scholars even argue they are thoroughly reciprocal. This thinking needs to be challenged by incorporating „trade” into a complex system that pays attention to the fact that exchange of goods has agency lead to an emergence of interlocked social phenomena. As flows of goods traverse to space they have an impact on the social landscape that forms the substrate that fuels them. So does the diversification of labor, the raising complexity of production cycles and the ever growing entanglements and dependencies that come with them. This leads to a political dimension of economy that will spawn alliances and conflict between territorial units but also within a society on a micro scale. Conflicts and tensions on various scales
inevitably bear institutions that aim to balance them and therefore stabilize society. The presentation outlines a rough draft of a framework that incorporates ideas from socio geography, economical theory and conceptions of conflict in prehistory with the aim to broaden (and challenge) our understanding on the social impact on distribution systems.

**Settlement scaling theory and the Roman Empire**

*John Hanson (University of Reading)*

Settlement scaling theory and the Roman Empire In the last few years, there have been two developments that have led to a radical transformation of our view of ancient urbanism. There is now an emerging collection of theories, known as settlement scaling theory, which has devised a unified set of models of how settlements function across space and time, drawing on recent thought on complex systems. At the same time, there has been increasing interest in quantifying various aspects of the urbanism of the Greek and Roman world, including the sizes of the inhabited areas of settlements, allowing us to estimate the numbers of inhabitants in sites. In this talk, I will begin by offering a brief review of recent work, which has attempted to extend settlement scaling theory to the Roman world in the Imperial period, concentrating on various forms of infrastructure, such as the numbers of houses, sizes of public spaces such as fora and agora, dimensions of street networks, capacities of theatres and amphitheatres, etc. I will then discuss one of the most important outstanding issues in current work, which is our inability, as yet, to find meaningful proxies for material outputs, before sketching some avenues for future research.

**Social complexity and complex societies in Iron Age**

*Oliver Nakoinz (Institute of Pre- and Protohistoric Archaeology, Kiel University)*

Complex societies are a frequently discussed topic in Iron Age research. Complex societies are societies with a hierarchical structure indicated by different quality levels of grave goods. This paper discusses the relationship of social complexity and complex societies in Iron Age starting with the “hierarchy pitfall” which is a common logical error in archaeological hierarchy reconstructions and continuing with identifying the need of complex societies with complexity reduction. This shows that social complexity and complex societies are inverse. In a case study social instability and population thresholds are addressed. In this context the use of simulations is explained and finally, the question of social complexity in networks is addressed.

**Styles, Pottery and Complexity at the Swiss Plateau. Neolithic ceramic production and consumption 3900-3500 BCE**

*Martin Hinz (Institut für Archäologische Wissenschaften, Universität Bern)*

**Co-Author: Caroline Heitz (Institut für Archäologische Wissenschaften, Universität Bern)**

The study of pottery and their distribution patterns constitutes one of the basic archaeological tasks since the establishment of the discipline. But what seems so simple and time-tested is in reality a complex process for several reasons: Firstly, different scales, conditions of preservation and states of research overlap in the spatial and temporal distribution patterns of ceramic artifacts. In terms of research technology, this leads to complexity because we always have only selective evidence from originally spatially much more widespread practices of pottery production and consumption, which itself represents only a small part of the underlying ideational space of possible ceramic forms and uses. Thus, secondly, also the past – the realworld process itself – is complex: Distribution takes place in the material space, which is spanned by distances, but also by transport costs. Another important aspect is social space, which is certainly dependent on material space, but distorts it through its specific configurations. The spread of pots and stylistic features is determined by the sometimes interrelated practices of producers and consumers, some of whom may be identical social groups, some not. Pottery makers and users are related to each other through their actions in complex entanglements, which are supported by spatial mobility of humans and things. Thereby, already locally existing styles affect the appropriation and transformation of innovations, which is co-determined by their positions in relation to each other in a stylistic similarity space. All these interactions within and between the spaces leads to emergent phenomena in terms of style transformation in a diachronic and spatial perspective, which in the end is simply bundled in an archaeologically evaluated ceramic vessel. How do we define local and non-local ceramic forms and stylistics features under these conditions? In order to investigate such complex entanglements and their mutual influences, it makes sense to define a spatially and temporally limited domain without isolating it. At the same time, it is extremely helpful to have good control over the dating and homogeneity of the data. The cirumalpine lake shore settlements are an outstanding example of this, where dendrochronology can be used to track changes on a potentially year-specific level, where the specific preservation conditions provide an extremely rich collection of even completely preserved vessels, and where long-standing experience and research practices have established standards for data reporting. In this presentation we want to give an insight into the already achieved results of the SNFS-project ‘Mobilities, Entanglements and Transformations of Neolithic societies on the Swiss Plateau (3900-3500 BCE)’ regarding the complexity of mutual stylistic influences. On the other hand, we want to discuss our ideas for a simulation based on these results. With the help of an abstract agent-based
Where innovations come from?
Aleksandr Diachenko (National Academy of Sciences of Ukraine, Institute of Archaeology)
Co-authors: A. Diachenko, I. Sobkowiak-Tabaka

Spread of innovations recently became a topic of growing interest in archaeology and anthropology. The related studies question the mechanics of innovations flow through the complex networks mostly examining their basic statistical properties. Our paper contributes to the development of this topic with the analysis of culture as information system. First, we will briefly present the theoretical background providing simulations with the proper categorical language and main parameters, which can be quantified. More specifically, the following categories will be concerned: ‘unification’ and ‘diversity’; ‘invention’, ‘innovation’, ‘imitation’ and ‘diffusion’; ‘reduction’, ‘informational capacity’ and ‘system memory’. Second, we will question the explanatory capacity of network analysis for simulating the origin of inventions, innovations and imitations. The utility of several well-known approaches, such as Erdős-Rényi model, to simulate and analyze the cultural complexity will be tested. Third, the obtained results, which specify the interrelations between the origin and spread of innovations and cultural transformation, will be discussed within a wider framework of the complexity theory and complex networks in archaeology.
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| 09:00 | A sea of wine and honey. Immaterial connections and networks of narratives in the Hellenistic Western Mediterranean  
Rafaela Da Vela (Gastwissenschaftlerin Historisches Seminar Universität Leipzig, Lehrstuhl für Klassische Archäologie) |
| 09:20 | By Sea and by Land: some observation on Pre-Roman and Roman terrestrial transportation system in Latium and Etruria between the Mediterranean and Europe  
Francesca Fulminante (Bristol University) |
| 09:40 | Maritime Cultural Landscapes of Fishing Communities in Roman Cyprus  
Maria Michael (University of Southampton, Southampton, UK) |
| 10:30 | Glocalising identities within the Mediterranean: the case of Fregellae  
Luca Ricci (Utrecht University) |
| 10:50 | People, Ideas, and Things: A Theoretical Analysis of Koan Mycenaean Identity During the Late Bronze Age  
Katarzyna Dudlik (Adam Mickiewicz University in Poznan) |
| 11:10 | Cyprus’ link to the Levant: The ancient city of Sidon and its relation to the island’s Early Iron Age pottery  
Kevin Spathmann (Ruhr-Universität Bochum) |
| 11:30 | Uncovering networks through the study of Nuragic sanctuaries  
Valentina Matta (Aarhus University) |
| 13:30 | The Iron Age Adriatic World: Identity and Connectivity Beyond Borders  
Leah Bernardo-Ciddio (University of Michigan) |
| 14:10 | Sea-Storms and Aristocratic Identity in Alcaeus  
Ippokratis Kantzios (University of South Florida, USA) |
| 14:30 | Becoming a Man Ashore - the Role of the Sea in Sappho’s Brothers Song  
Laura Schmidt (Institute of Classics/GSHDL, Kiel University) |
| 14:50 | Discussion |
| 15:30 | POSTER SESSION Roman amphorae network analysis  
Barbora Ruffini (Masaryk University, Faculty of Arts, Department of Archaeology and Museology) |
| 08:30 | Recalibrating the Digital Humanities for Archaeology: The Mycenaean Aegean  
Henry Price, Ray Rivers (Imperial College London) |
| 08:50 | Aegean connections in context: appropriation of urban culture in the Mycenaean Greece  
Piotr Zeman (Adam Mickiewicz University in Poznan) |
| 09:10 | Seafaring Poems in Pindar’s Epinicia and Encomia  
Thomas Kuhn-Treichel (Universität Heidelberg) |
| 09:30 | Maltese connections: remarks on cultural identity starting from the architectural language between the 4th and the 3rd century BC.  
Francesca Bonzano (Catholic University of the Sacred Heart, Milan) |
| 09:50 | Discussion |
| 10:30 | Chalcidic connectivity between Sithonia and Pallene: transmutations of epichoric 10.30 identity and resilience through environmental sustainability in the long 5th and 4th  
Maria Xanthou (Harvard Center for Hellenic Studies) |
| 10:50 | Ovid’s Identity as Exiled Poet  
Stefan Feddern (Assistant in Classics (Latin Philology), Kiel University) |
11:10 To be Greek or not to be: about the “Greekness” of Epirus and Southern Illyria. An overview through urbanism and theatrical architecture in a Mediterranean perspective. 
Ludovica Xavier de Silva (“Sapienza” University of Rome – Department of Classics)

11:30 Black Sea networks, monumental burial traditions and elite display in the late Classical and early Hellenistic period
Jane Rempel (University of Sheffield)

11:50 Discussion

13:30 Sea routes of amber around Europe. The dynamics of Baltic amber distribution during the IInd millennium BC
Janusz Czebreszuk (Institute of Archaeology, Adam Mickiewicz University in Poznań, Poland)

13:50 From sea to desert The Mediterranean influences on the inland Hurrian culture and vice versa
Yasmine Mahmoud (Università degli studi di Pavia)

14:10 Archaeology and Syrian Identity: ‘Urkesh Gate’ a good Tale from Syria
Keynote lecture: Hiba Qassar (PhD in museum studies, AVASA)

14:40 Discussion

7 ABSTRACTS
Mediterranean Connections – how the Sea links people and transforms identities

Keynote speakers: Carl Knappett (University of Toronto), Hiba Qassar (PhD in museum studies, AVASA)

Session Organizers: A. Rutter, E. Loitzou, O. Nakoinz, F. Fulminante, L. Schmidt, D. Möhlmann, L. Käppel, H. Klinkott

Long-term research interest in the Mediterranean has produced a substantial body of data and concepts that make it a fascinating testing ground for new approaches on identity, alterity, and connectivity. For the inhabitants of the Mediterranean, the sea evidently influenced their lives and their thinking in a significant way. (Pre-)history, philology, and archaeology alike can trace the emergence of ancient perceptions of distance and connections as well as the movement of material, people, and ideas. Researchers of these professions have long been irritated by a tendency to define political or cultural entities spatially. The identification of collective identities as networked spheres of interest, however, allows us to progress towards an understanding of processes within the Mediterranean as a dynamic area of common cultures and conflicts. Shared mental maps and networks thus help to understand the collapse of powers, systems, and identities, the emergence of new ones, and the role of possibly persisting parts of a network in such processes. With contributors from all disciplines dealing with connections, networks, and mental maps, whether they be archaeology, (pre-)history, philology, geography, and sociology, and also the natural sciences, we would like to discuss the following:

• how the contact area of the Mediterranean influences the (self-)representation of peoples and individuals as well as the formation of identity and alterity
• what role Mediterranean connections play in cultural, political, and ideological developments
• how ancient writers and artists form and use Mediterranean connections
• analyses of the emergence and transformations of connections within the Ancient Mediterranean
• the conditions under which the physical environment determines the presence or absence of connections
• how the concept of network layers contributes to an understanding of past events around the Mediterranean seascape
• new theories and interpretations concerning the role of power, conflicts, and different communities that can be connected to the network approach
• network modelling between simulations and empirical observations
We particularly invite contributions from a wide range of regions to include as many perspectives as possible from around the Mediterranean World. The network aspects of this session links with the theoretical approaches of Complexity (Schlicht et al., Session 6), while connectivity and emergence of identity relate to Social Space (Grimm et al., Session 1) and Social Resilience (Yang et al., Session 11). They also form a backdrop to considerations of Territoriality (Schaefer-Di Maida et al., Session 8). The concept of mental maps is also reflected in Urban Knowledge (Chiarenza et al., Session 9).

**Deep histories of Mediterranean mobility and the role of network models**

*Keynote lecture: Carl Knappett (University of Toronto)*

Network analysis has seen conspicuous growth across archaeology, no more so than in studies of ancient Mediterranean mobility. The application of similar sets of methods can give the impression that we might soon be able to compare patterns of mobility diachronically, thereby providing long-term narratives that cut across not only millennia but also the disciplinary divides of prehistory and ancient history. While this is an exciting prospect, a little caution is required. Any network analysis rests on an underlying model or theory, implicit or explicit, concerning the characteristics of connectivity and the motivations for mobility. Are these the same in scholarship on the Neolithic, the Bronze Age, the Archaic, and the Roman periods, for example? For later periods there can be a considerable emphasis on understanding mobility and interaction within the framework of economic history, an emphasis that is not necessarily shared in prehistoric archaeology. If economic history is not providing the models and theories, then what? Has Bronze Age mobility, for example, typically been understood in more social or political terms? I will stress the need for a clear-sighted and explicit awareness of our sources of analogy and models prior to the application of any particular network methods, the selection of which should then of course be made within this wider framework. If an effective deep history of Mediterranean mobility is to materialise, then it will require the different models for interaction that might emerge out of distinct scholarly traditions to be ‘tuned’ or brought into some degree of alignment.

The most representative Late Bronze Age-Early Iron Age Mediterranean burial assemblages preserving weaponry have passed down data sets that are very useful for investigating identity, alterity, and connectivity throughout the Mediterranean scape. In fact, these funerary contexts, often reductively described as pertaining to ‘warriors’, yielded indeed cultural diacritics hinting at kaleidoscopic identities mirroring various social roles, likely fostered by a plethora of life experiences. In particular, the occurrence among some of these burials of refined weighing tools as well as of concurrent hoards of hack-metal in the neighbouring regions but originating from outcrops located far away, let one hypothesize their involvement in the ebullient exchange networks spreading across the Mediterranean Sea. By sailing the ‘black sea’ and playing a role in a physical and mental frontier milieu, multifaceted and permeable by nature and where newcomers-natives’ interactions had capital significance, these individuals likely developed a rather acute hodological perception of space. Such perception thrived in mental maps made up by threads connecting individuals acting as human nodes of webs of significance spreading across space and time. By dealing with a plethora of externalities these prominent individuals developed a transcultural attitude that allowed them to face alterities not only by displaying power and embarking in cultural and physical conflicts, but also by taking part in and setting up new cross-cutting ‘groups of solidarity’ reflecting the ebullient factional competitions shaking all the groups involved. Such experiences made it possible for these people to internalize new sets of practice and significance so deeply that some of them could not help but introduce their seriously altered badges of identification to their community of origin when returning home.

**The Ideology of Seafaring in the Odyssey**

*Hauke Schneider (Institute of Classics/GSHDL, Kiel University)*

Hardly any other literary work of ancient Greek or Latin literature is as much interwoven with the Mediterranean as the Odyssey. Perpetual references throughout the epic make it possible to show how highly ambivalent the sea was perceived by the Homeric society: Unbreachable and separating except for a seafaring man. But even for them the sea was extremely dangerous. Yet the one who crosses the sea successfully has the chance to expand his knowledge and achieve wealth and fame, an essentially task for members of the Homeric aristocratic courtly society (Dodds’ shame culture is the central term here). My aim in this paper is to show how these negative and positive aspects of Mediterranean seafaring were rated so high that seafaring itself became an important criterion to judge people’s culture and power. How fundamentally successful seafaring as a sign of a highly developed culture and general superiority underlie the protagonists’ thoughts and deeds shall be demonstrated by the analysis of
Evagoras of Salamis – the link between Athens and Susa?

Dennis Möhlmann (Institute of Classics, Department of Ancient History, Kiel University)

The relationships between the Achaemenid Persia and Hellas were ambiguous. At the end of the Peloponnesian War the Athenian admiral Conon fled from the battlefield at Aegospotamoi to Cyprus. There, he hoped to get asylum at the court of Evagoras, King of Salamis and also vassal of the Great King Artaxerxes II. After the surrender of Athens, the Lacedaemonians waged war against Persia and send troops to Asia Minor. Due to the broken thalassocracy of the Athenian Sea Empire the Achaemenid King now seized the opportunity to create a new Mediterranean fleet - to win the war on the open seas. Furthermore, in order to avoid a potential threat from the “Greek world” the Persians followed an established strategy by stirring up the internal conflict in Hellas (Thucydides). For this purpose, Subsidia were sent to Athens and their former Admiral Conon should be appointed to a Nauarchos for the newly created fleet of the Great King, besides the Persian satrap Pharnebasoz. Concerning Conon’s transition into the service of the Great King many questions remain unanswered. The aim of this paper is therefore, to clarify the role of Evagoras of Salamis as a possible mediator in this process - especially, as Conon sought refuge directly at his court, instead of trying to get help by a Persian satrap in Asia Minor like other Greeks before him (i.e. Alcibiades). Evagoras probably was known as a friend of the Greeks and especially of the Athenians (Isocrates). But has he built a network, and hereby created a link between Athens and Susa, which became crucial to get a connection to the Achaemenid Empire? Such being the case, which benefits perceived Evagoras by this intermediation? On these issues, the paper is divided into two parts: The first is meant to point out the initiating person of the mediation – particularly in view of the fact, that the ancient literary testimonies give us inconsistent reports, whether it was the expatriate Conon, the Persian satrap Pharnebasoz, Evagoras, the author Ktesias or even the Great King himself. The second part of this contribution will examine the potential intentions of Evagoras, if he was the mediator among Hellas and Persia. In consequence it must be also elaborated if he accomplished his possible motives.

Regional religious connectivity in the Hauran

Francesca Mazzilli (Cambridge Archaeological Unit, University of Cambridge)

The paper aims to re-evaluate cult sites as the product of movements of people and ideas by undertaking an increasingly popular computer-based methodology: network analysis. It considers 29 attributes gained from multiple aspects of 60 cult sites in the Hauran (in southern Syria). These attributes are organised into the following categories: the script of inscriptions (e.g. Greek, Aramaic), major deities based on inscriptions and statues (e.g. Zeus, Tyche), dedicators (e.g. Roman soldiers), main temples’ plans (e.g. Graeco-Roman cela) and decorations (e.g. Corinthian capitals). The use of this comprehensive dataset is essential to counterbalance the fragmentary nature of the data and to have a more complete picture of cult sites. I show an application of bimodal network analysis successfully used by Raffaela da Vela's work in northern Etruria. My study is based on the relational link between the group of cult sites and the different elements of each category mentioned above. It will enable us
to evaluate, for the first time, regional connectivity in the religious landscape of the Hauran by visualising the evolution of cultural religious transmissions and movements of dedicators, and the relations between the two.

Redefining the role of insular and marginal spaces in Mediterranean interaction networks from the Neolithic onwards
Helen Dawson (FU Berlin)

In the present day, the islands of the Mediterranean are generally categorised as marginal spaces, lying on the edge of mainstream political and economic processes. Small islands in particular have finite resources, often specialising in certain products, and historically they have suffered from their limitations. Their present condition may account for the tendency to project marginality on islands also in the past, as if marginality was an unavoidable consequence of insularity. Contrary to this imposed view, a diachronic perspective reveals how islanders experienced both phases of centrality and marginality over the Mediterranean Longue Durée.

The small islands off the coast of Sicily provide us with ideal case studies to explore these ideas further. Their development - starting from their earliest colonisation in the Neolithic (6th millennium BC) - is almost a cyclical repeat of a centrality/marginality pattern: while at times the islands fulfil the criteria of marginal spaces, at others they can also lie at the centre of interaction. The latter is particularly evident during the Middle to Late Bronze Age (ca. 1700-1200 BC), which saw the establishment of long-distance contacts between the Aegean and the central Mediterranean. This alternating pattern prompts a reflection on the meaning of the concepts of insularity and marginality in this context has connotations of being “on the edge” rather than being geographically isolated - facilitating interaction given the right historical conditions. The key element is an island's lying between different worlds rather than its distance in absolute terms to a centre. A network perspective can thus redress the role of small islands in prehistory, which have been marginalised by the prevailing core-periphery model. Moreover, as in-between spaces, islands fostered new forms of cultural identity through local syncretism, thus playing a vital role in the process of “Mediterraneanisation”.

The Sea as a Comic Landscape: Ps.-Scymnos and the literary appropriation of the Mediterranean Sea in Hellenistic Times
Lutz Köppel (Kiel University)

The work on a 'Periodos of the World', written by an anonymous author (the so-called Ps.-Scymnos) in ‘comic verse’, i.e. iambic trimeters, which are characteristic of ancient comedy, is one the most charming pieces of writing of hellenic times. As a didactic poem it gives a lot of geographical and cultural information. The paper, however, will investigate the role, which the sea plays as a connecting factor between the different places on the shores of the Mediterranean sea, and will thus try to characterize the ‘hellenistic’ view on seafaring in the media of a highly artificial form of writing. A key to the proper understanding of the poem seems to be its form as a comedy: The ‘fun’ of cruising the Mediterranean shall be shared by the readers.

Seafaring and the Reception of (some) Archaic Greek Lyric Poetry
Keynote lecture: Maria Noussia-Fantuzzi (Aristotle University of Thessaloniki)

This paper discusses the relationship between seafaring and the Hellenistic reception of some archaic Greek Lyric Poetry. Although most of the texts in question have been discussed recently, the role of the sea has been underplayed or overlooked. Seafaring across the Mediterranean Sea between Egypt and the rest of the world or specifically with continental Greece or the Minor Asia Greek cities can be argued to have a natural role in the chronotopic definition of Hellenized Egypt. Indeed, the idea of seafaring is an aspect of the poems on the Hellenistic Reception of Archaic Lyric Poetry that deserves more attention as it seems to often support/help the continuity between archaic and classical Greece and thriving Egyptian literature and scholarship. The sea unites more than it divides, and seems to ensure the contact at the end of the journey, instead of emphasizing its risks.

In Phanocles fr. 1 Powell the most widespread motif of the sea as the ideal place for persons and things to be disposed off irretrievably is overturned as the head and the lyre of Orpheus are driven by the sea into which they are thrown to Lemnos. The sea as a dangerous place with its potential of bringing death, or of taking things away and making them disappear, is overturned again in Posidippus’ epigram 37 AB, which contains the description of how the lyre of another great figure of archaic poetry, Arion, came to Egypt brought by a sea dolphin. In both cases the sea and its creatures make possible the preservation and transmission of the lyres. In other words, the sea is transformed into an agent of transmission of the lyric past to the lyric present – a guarantee of identity.

In another epigram by Posidippus, 122 AB, for Doricha, a hetaera of Naucratis in Egypt, famous as the mistress of Sappho’s brother, the poet comments at line 8 that [Naucratis will preserve the name of Doricha] ‘as long as a ship sails out from the Nile across the salt sea’. It will be argued that it is better to understand the Naucratite ship as conveying Posidippus’ own poetry and not merely that it is probably laden with poetic scrolls (Rossmeyer 1997, 132; Bing 2005, 132). In any case, either Posidippus...
seems to feel assured that his work will come to be preserved for posterity (like Sappho’s) through the well-developed book trade, or this preservation is ensured more in generally by the literary heritage of Greek poetry. If, however, Posidippus is thinking of his own poems his statement would update Pindar’s self-confident proclamation in Nem. 5.2.3 ‘on every merchant ship, on every boat, sweet song, go forth from Aegina proclaiming the news’. He does not say (like Pindar in Ol. 9.21-27) that he will ‘spread Doricha’s fame ‘faster than any ship or horse can travel’ but in realistically connecting dissemination with the papyrus trade from Naucratis, “the city whose power is in ships”, he shows awareness about seafaring as a mechanism of safe preservation and circulation. It will be precisely by transporting the poem of Posidippus to faraway places that the name of Doricha will be preserved.

A sea of wine and honey. Immaterial connections and networks of narratives in the Hellenistic Western Mediterranean

Rafaella Da Vela (Gastwissenschaftlerin Historisches Seminar Universität Leipzig, Lehrstuhl für Klassische Archäologie)

The political, economic and structural turmoil of the Western Mediterranean between the 4th and 2nd century BCE is reflected in the narratives of many literary sources, labelling events as Punic Wars or Celtic invasions. An archaeological approach to the materiality of this area, in particular to the archaeological record of the coastal centers, shows articulated patterns of interaction. The widespread of some ceramic forms and the recurrences of patterns in funerary assemblages cannot be easily labelled under terms such as koiné or ‘romanization’. Global factors and local peculiarities are strongly entangled, as the multivariate analysis of grave contexts of emerging elites from coastal and subcoastal centers illustrates. The focus of this paper is the emergence of a shared international narrative or symbology of social identities in the coastal centers of the Western Mediterranean based on reflected or constructed consumption of luxury goods, such as wine or honey in grave contexts. Iberian kalathoi in many coastal contexts of Liguria, Etruria, Corsica and Sicily, the huge Campanian kraters at Cartagena (Spain) and the amphorae used as case for cinerary urns in the Ligurian necropoleis are just some of the characteristic markers of a wider immaterial system of communication of social identities. To allow a comprehensive analysis, the archaeological records of the coastal and subcoastal necropoleis of Tarquinia, Orbetello, Populonia, Castiglioncello, Ameglia, Aleria, Genua, Ensérune, Ampurias, Cerro del Santuario (Cartagena), Lilibeo, Taormina, Neapolis and Taranto are examined quantitatively and qualitatively with the Social Network Analysis (SNA). The relational approach of the Social Network Analysis is not linking together places on the base of pottery records, but is directed to detect common patterns of Western Mediterranean Elites in terms of narrative of power and social identities. A two-mode network of the grave goods, in which each center gets related to the use of specialized pottery forms, allows the analysis of immaterial connections of the international communication code of local emerging elites. In particular, the semantic interlocked network of pottery attesting consumption of wine and honey aims to point out analogies and differences in the communication patterns of social habits. The specificity of local patterns and the reference to international models will be contextualized in the structure of the local communities through the comparison between wider distributed patterns of behavior and local specificity. The analysis aims to answer the following research questions: how did Mediterranean connectivity and commodity chain influence the material expression of identities of local elites? Which is the relationship between the Western Mediterranean regional networks and the local identities? How did specific local social structures and international fashion interact to construct ‘glocal’ narratives of power? And finally, which is the role played by the network in the conservation or transformation of local identities in front of the unification of the economic and institutional systems?

By Sea and by Land: some observation on Pre-Roman and Roman terrestrial transportation system in Latium and Etruria between the Mediterranean and European Networks

Francesca Fulminante (Bristol University)

Terrestrial routes can be considered as the result of the interplay of multiple factors: they are essential for permitting inter-settlement cooperative processes (information exchange, trade, defense), and at the same time, they need some level of cooperation to be established. However, since their creation and maintenance require a not negligible amount of resources, transportation routes are affected by competing interests. We can think of each connection between a pair of places as the result of a negotiation that involves the two actors but that can also be influenced, to some extent, by “third parties” as, for instance, a political authority acting on a higher level. In this paper we focus on terrestrial transportation communication networks in Pre-Roman and Roman central Italy within the wider networks of Mediterranean and European connections as a case study and we compare information about Roman age roads to modelled routes based on least-cost path connections among pre-Roman and Roman settlements in central Italy both at the local (urban-rural) and regional level (inter-cities). Our aim is to understand the complex cause relationship between settlements and communication transportation routes. Were routes established to connect previously existing settlement or were new settlements founded along pre-existing established long distance regional and/or interregional connections? Some preliminary analyses seem
to suggest that several of the important Roman roads running along relevant long-distance natural routes across the peninsula (river valleys, ridges etc.) were significant connections well before the Roman time both as long-distance stretches but also for small-scale local communications.

**Maritime Cultural Landscapes of Fishing Communities in Roman Cyprus**

*Maria Michael (University of Southampton, Southampton, UK)*

*Co-author: Carmen Obied (PhD, University of Southampton, Southampton, UK)*

This research explores the tradition of fisheries and fishing techniques on the island of Cyprus during the Roman period. The maritime cultural landscape indicates fishing activities were important in the utilisation of maritime space in the Roman Mediterranean (Westerdahl, 1992). Regarding archaeological, iconographical and written evidence, fishing could be characterised as a small-scale activity for supporting a fisherman’s family, or as an organised societal activity involving fishermen collaborating with fish-salting establishments. The research presented here aims to demonstrate how perceptions of the maritime cultural landscape on the island of Cyprus can help to interpret the role the Mediterranean region played in the cultural, technological and ideological developments of traditional fishing activities in Cyprus. Furthermore, the island’s topography played a key role in how maritime exchanges and fishing practices were developed. Maritime communities relied on accumulated cognitive knowledge and mental-maps of the landscape, often preserved through oral traditions, to navigate and identify key fishing grounds. As with ancient navigation, landmarks and toponyms played an important structural role in the fishermen’s perceptions of the coastal landscape. Fishing practices would likely have been based on specialised knowledge and acquired familiarity of the fishing environment, seasonality and associated fishing gear and techniques, as well as how best to exploit characteristics of different fish species such as their favoured habitats and sea conditions. Thus, this research attempts to examine how the physical Mediterranean environment determines the presence or absence of fishing activities within its maritime landscape and, in turn, to further understand the relationship between fishermen and their maritime environment through fishing activity. Furthermore, the research intends to combine the terrestrial with the underwater archaeological data of the fishing methods from twelve sites in Cyprus in an attempt to acquire a better general understanding of the formative phases of fisheries on the island during the Roman Period. The fish bone assemblages and the iconographical and written data are a supporting class of evidence, in order to determine the development of the fishing technologies and to discover if and when the fishing activities had an influence on the economy and the daily life of the communities of the island. This research forms part of an ongoing project that will contribute towards a more holistic understanding of the relationship between fishermen and their maritime cultural landscape in Roman Cyprus.

**Glocalising identities within the Mediterranean: the case of Fregellae**

*Luca Ricci (Utrecht University)*

I shall explore the relationship between style and identity through the sanctuary of Aesculapius at Fregellae. Moving away from an ethno-cultural interpretation of style, I adopt a semantic approach, highlighting the commissioners’ social identity within the “globalised” Mediterranean. In traditional scholarship, the sanctuary celebrated Rome’s imperialistic ventures in the Eastern Mediterranean. This view derives from a static conception of culture, whereby certain styles could be associated to specific ethno-cultural groups. However, the presence of different styles in the sanctuary points toward a more dynamic interpretation of culture and meaning. According to a semantic approach, styles are applied to different situations, conveying specific ideologies/values, detached from the original meaning, yet implicitly determined by it. In a practical sense, the mechanics of the process can be seen through cultural universalisation and particularisation. At a universal level, the meaning of Hellenistic architectural style, originally determined by the monarchs, had changed, acquiring a civic significance in the wide oikoumene of poles. In this context, the adoption of Hellenistic style in Fregellae’s sanctuary (and institutional buildings) highlights “peer polity interaction.” Having become part of the Eastern communities through their economic dealings, the commissioners employed Hellenistic architecture to communicate with that social system. Particularisation indicates that the innovative, Hellenistic forms were incorporated in the local reality through localised choices. The novel architecture, anchored to traditional features, determined social identity through elite competition within the town. Concurrently, given Fregellae’s important status within the Liris Valley, the sanctuary reasserted the colony’s worth in light of the neighbouring settlements.

**People, Ideas, and Things: A Theoretical Analysis of Koan Mycenaean Identity During the Late Bronze Age**

*Katarzyna Dudlik (Adam Mickiewicz University in Poznan)*

*Co-author: Calla McNamee (Wiener Laboratory, ASCSA), Salvatore Vitale (University of Pisa)*

Long-term research in the Dodecanese has produced a substantial body of data that
have important implications for our understanding of identity and connectivity within the entire archipelago, as well as between specific islands. This can be applied especially to the Late Bronze Age (LBA), when Mycenaean centres participated in the dynamic exchange networks connecting distant regions in the Eastern Mediterranean. This paper is focused on a specific case study concerning the island of Kos. The aim is to investigate the significance of cultural transitions, which involved the circulation of people, ideas, and materials through a critical reconsideration of the different theoretical frameworks applied in the last decades. The island of Kos, as well as the broader area of the Dodecanese, was entangled in different cultural influences during prehistory. From LBA I, the impact of Mycenaean material culture is visible in the archaeological record. During the following phases, with the exception of language and the so-called wanax ideology, all significant features of mainland identity occur on Kos, including crafting technology, mortuary behaviors, cultic objects, and public architecture. Two prominent divergent theoretical approaches have been applied in the Aegean to understand transitions resulting from cultural contacts. Building from colonial theory, the first approach emphasizes the dualism between local and foreigners, arguing that the local community passively accepted Mycenaean culture as a result of political movements in the area. The second, originating out of social constructivist theory, claims that society actively decided to participate in the Mycenaean cultural phenomena by adopting certain behaviors and aspects of material culture. The results of the "Serraglio, Eleona, and Langada Archaeological Project" (SELAP) allow us to expand on the second perspective by considering the Kosan society within the framework of cultural fusion, where local and exogenous practices were deliberately mixed to create a distinctive Mycenaean tradition on the island. This fusion manifests in the occurrence of locally produced Mycenaean objects, as well as Mycenaean cultural behaviors, which are particularly evident in funerary customs. These attributes allow us to understand the reasons and define the strategies of the local elites for expressing Mycenaean identity within the local and the wider Aegean social arena.

Cyprus’ link to the Levant: The ancient city of Sidon and its relation to the island’s Early Iron Age pottery

Kevin Spathmann (Ruhr-Universität Bochum)

At the end of the Bronze Age, scholars have often associated an abrupt change in the cultural environment of the Eastern Mediterranean - often labelled “Dark Ages”. The island of Cyprus, which was linked to the wide-ranging networks especially in the Late Bronze Age, played a prominent role in their development. The island’s geographical location alone would be a stand-alone factor in its development into a “stepping stone” of various influences and ideas, according to many researchers. Before the postulated “collapse” at the transition to the Iron Age, Cyprus is usually described as one primary factor for increasing exchange in the whole Eastern Mediterranean, what cannot be explained by copper trade alone. Ceramic styles based on Cypro-Aegeanizing models appeared for a short time in many places and were themselves adapted on Cyprus. After a period of sharply reduced (“international contacts”), there was finally a revival in economic and cultural points of view. Cypriot products had a stronger presence first in the Levant and later in the western Mediterranean again. The excavations in the Lebanese city of Sayda, the ancient city of Sidon, have uncovered numerous examples of Cypriot imports from the Early Iron Age during the last years of ongoing archaeological activities. My Ph.D. research focuses on this material with the aim to contextualize it within the larger Eastern Mediterranean horizon and to throw some light on this interesting relationship. But even without intensive material exchange a continuous connection between the Mediterranean island and the surrounding lands seems to have existed in the transition period between Late Bronze Age and Early Iron Age. A qualitative analysis of the finds reveals technical and therefore cultural transfer efforts that included visual tastes and know-how in making pottery. In particular, the earliest specimens of Sidon, some of which may be classified as Proto-White-Painted Ware, deserve special focus. Primary influences from the (post-) Mycenaean Aegean in visual appearance are mainly said to be typical for these early types of ware. Such indications lead to thoughts of an Aegean ‘colonisation’ of Cyprus at the end of the Bronze Age with the ‘fall of Mycenaean kingdoms’. But from a technological viewpoint there is still a strong connection to former Cypriot wares like the White-Painted-Wheelmade III of the LC III A era as well as to other ceramic-groups. However, the choice of vessel types in the Levantine center also plays a significant role, as the majority of tableware and drinking equipment is still associated with wine consumption. Cyprus seems to have retained the role it had played at the end of the Bronze Age by supplying Aegeanizing pottery during the Early Iron Age.

Uncovering networks through the study of Nuragic sanctuaries

Valentina Matta (Aarhus University)

To truly comprehend the socio-economic change of an ancient island society it is necessary first to analyze the internal development and then to investigate the external networks and their forms. While forming part of a European Bronze Age inter-linked community, Sardinia saw the development of the unique Nuragic civilization (1800-720 BC), named after its monumental stone-built towers, so-called nuraghi. The Nuragic landscape evolved from the construction of high and complex towers (1800-1200 BC) to extended villages and sanctuaries (1200-720 BC). This latter type of
settlement was mainly characterized by sacred and civil areas, forming new territorial compounds and being a reference hub for multiple communities. The sanctuary corresponds likely to a reorganisation of the society in hierarchical, social and economic terms. With a new way of controlling economic resources, especially metal ores and metal production, the sanctuary became the institutional site for the management and distribution of prestige goods. Furthermore, it was likely the institutional market for metal trading and sharing new ideas with other Bronze Age cultures. These contacts seemed to have evidenced by a range of artefact types like horned-helmet warriors represented in Nuragic statuettes and among different Bronze Age regions like the Aegean area, Atlantic Iberia and Scandinavia. Guided by my main research question that seeks to understand the role of Sardinian networks and metal trade across Europe, the aim of this paper is to present the first part of my PhD project, which focuses on the Nuragic sanctuaries and internal networks analyses.

The Iron Age Adriatic World: Identity and Connectivity Beyond Borders
Leah Bernardo-Ciddio (University of Michigan)

Borders are contentious, liminal spaces; strongly political impositions on territory and landscape, they have limited regard for cultural material realities. The ancient world was one without fixed borders, comprising a patchwork of spheres of influence or interest that blended into and moved away from one another. Despite a keenness to acknowledge this constant flux of people and objects, archaeologists of earlier generations sometimes found themselves at the mercy of modern geopolitics in constructing research methods, forced to think through terrestrial concepts of interaction as driven by national interests. In recent decades, however, we have made great strides towards mitigating this problem as we acknowledge the transcendental qualities of coastal territories, maritime environments, and island networks. We now have generally accepted that a sea is not a barrier, and perhaps not even a simple bridge. In the case of the Mediterranean and its adjacent arms, we have come to understand them as distinct environments that foster high levels of communication, mobility, and connectivity. Recent years have seen a number of case studies in the Eastern Mediterranean. The Adriatic Sea is another environment in which the distinct features of a maritime world have manifested themselves for millennia, and in which a cohesive maritime cultural landscape has emerged at the nexus of its manifold relationships. Through the Early Iron Age, even in the wake of immense changes in the Aegean world and its associated networks of trade and movement, strong connections were maintained between the western coast of today’s Balkan Peninsula and Italy’s eastern coast. The persistence and steady increase of transit and communication between the coasts – facilitated by ease of navigability between southeast Italy and the eastern Adriatic provided by favourable currents and a conveniently-located island chain – resulted in similar material and cultural practices. This was not a uniform trend within this maritime landscape, however; a diachronic approach reveals that peoples inhabiting certain areas within the Adriatic world opted in or out of these relationships and networks through different periods. This phenomenon is best explored through a network-oriented approach to materials circulating through this space and the human connections which they can helpfully illuminate – namely, the trade in amber, metals, and ceramics.

The Strait of Messina: from a dangerous to a crucial connection point
Chiara Matarese (Kiel University)

Since the beginning of the Greek civilization, the “system” of the Strait of Messina has been one of the essential points, perhaps the most important, in the definition of a Mediterranean area. Several studies have highlighted the importance of the Strait as a threshold (Prontera 1987, 2005; Guzzo 2005): it is at the same time póros, (“way”) of the sea, fundamental junction of the navigation, which permits the connection between different trade routes, and pórtmos, (“interruption”). The relationship of the ancients with the navigation is ambivalent. It is in fact known that the Greeks, and the Athenians particularly, were very familiar with this activity (and they elected it to symbolize their national pride) but they were well conscient of the many dangers associated with navigation. A strait is particularly dangerous because it is the meeting point between sea and land, where phenomena that hinder the passage take shape easily (like vortices). The most significant example is undoubtedly the Strait of Messina. For the Greeks coming from the East it connected a more familiar Ionian Sea with a more uncertain and unknown Tyrrhenian Sea. For it there are abundant mythical elements, which already from the time of the wanderings of Odysseus underline the danger: just think of the deadly song of the Sirens, or the passage between two rocks inhabited respectively by the ferocious and monstrous Scylla and by the voracious Charybdis. Nevertheless, it was the meeting and connection point between two different communities: the peninsula and the island. After an introduction about the symbolic meaning of the strait for the Greeks, the paper will examine the case of the two cities located on the two opposites of the Strait of Messina: Reggio and Messina. Not the single story of the two cities is the main topic of my investigation but the history of their articulating in a single bipolar urban system, tended to link two different complexes, two portions of the territory, on the Calabrian side and on
the Sicilian one. This connection took place in many different forms: articulation of traffics through the Strait, linguistic exchanges, encounters and cultural clashes and harsh politicians. All these forms of connection show how people pursued to reduce the double barrier of Scylla and Charybdis, until it was annihilated, until it potentially disappeared. 

Literature

Sea-Storms and Aristocratic Identity in Alcaeus
Ippokratis Kantzios (University of South Florida, USA)

In Alcaeus, the Mediterranean sea is a recurrent self-referential locus. Through the introduction of the image of the “ship of state”, the poet harnesses the figurative possibilities of the sea and incorporates them into his discourse of the declining fortunes of the aristocracy in early sixth century Mytilene. In his nautical passages, Alcaeus not only demarcates the ideological parameters of his hetairia (political/military faction), but also contemplates its increasingly difficult role in a shifting environment as unstable and unpredictable as the sea itself. The poet utilizes the negative connotations of large expanses of water to draw the portraits of his political enemies, the tyrants, who assume the form of a storm and are thus transformed into an elemental force that clearly belongs not only outside the institutions of the polis, but even outside humanity itself (contrast the ship as an expression of techne and civilization). That the tyrants are ungodly figures and at odds with the community is indicated through their contrast with the crew/hetairoi: the latter are depicted cohesively in “we” terms and, even storm-tossed, they can claim a privileged bond with the gods (see, e.g., their appeal to Dioskouroi to cross the Aegean and save them from shipwreck and “chilling death”, fr. 34 V). Just as in Alcaeus’ polis the aristocrats are found at its centers of power, protecting it from tyranny, so in the metaphorical sea-storms they fight for the ship’s survival, while standing at “its center” (fr. 208 V). These adverse conditions force upon the hetairoi a form of trial that prompts them to reassert their identity through remembrance and emulation of their glorious forefathers and their striving to become each of them a dokimos aner (“a trustworthy man”, fr. 6 V). In Alcaeus, the stormy sea provides a framework for the political self-definition of the hetairia through the latter’s quest for the overthrowing of tyranny and the reestablishment of the pedigreed aristocrats in their privileged place. Although in the end neither of these objectives was achieved, Alcaeus’ nautical discourse contributed to their articulation in a way that must have been greatly appreciated by his audience of islanders.

Becoming a Man Ashore - the Role of the Sea in Sappho’s Brothers Song
Laura Schmidt (Institute of Classics/GSHDL, Kiel University)

In 2014, Dirk Obbink edited two Sappho’s songs which were totally unknown so far. One of them is probably nearly complete and contains two names which are identified in ancient testimonies with two of her brothers. For this reason Obbink called the song Brothers Poem (Obbink (2014): Two New Poems by Sappho, ZPE 189). This title is used since then in all references to this new fragment of Sappho, although the song itself does not call the two men “brothers”. The tone of the song and its content indicate that the speaker, the addressee and the two males belong to a close and intimate group, most probably a family. Because of the brothers’ names, this song has been compared to some other fragments of Sappho’s poetry, where a “brother” or a “sister” are mentioned – comparison has been made especially with Sa. 3, 5, 7 and 15. These Brothers Poems – including the new one – have a peculiarity that invites further comparison with other songs of Sappho. It is my aim to show that the Brothers Poems belong to a larger group of Sappho’s songs in which the fear of distress and harm are opposed to the hope for comfort and security. For this opposition the poet uses the image of the sea with its storms and fair weather. I will adduce further songs which refer to the sea (e.g. Sa. 17, 20) to compare with the Brothers song. Sappho’s poet colleague Alcaeus also wrote sea songs which are very famous for their use of the ship and the sea as metaphor for political events. As I will show, in contrast to Alcaeus’ songs, most of Sappho’s sea songs start and end with a specific event, which already includes the connection to the sea. In the case of the new Brothers Poem, it is the hope for her brother’s safe return with his ship. Thus, a purely metaphorical reading (as has been proposed for Alcaeus) can be excluded for them. Since the songs make frequently use of the same characters, similar vocabulary and scenes – all of which separates them from other songs of Sappho – it will become clear that they belong to a cycle of interrelated songs composed by Sappho about her (fictive or real) family and their problems and chances in the society of Lesbos depending on their Mediterranean connections. But Sappho does not remain on this pseudo-biographical level. Starting from specific situations with a maritime and nautical background, she uses these pictures to ponder more generally on the chances and problems of human interaction and relations and their dependence on external, divine forces. In the case of the Brothers Poem, her brother’s absence at sea is the starting point for the metaphor of the storms of life directed by Zeus and this metaphor finally applies for those who stayed back at the island, especially Sappho’s second brother. This integration of what seems to be a completely personal and intimate content with such a generalising
behind. Thus, this paper is also a contribution to our understanding of the social and intellectual history of the Mediterranean World.

POSTER SESSION: Roman Amphorae Trade Network Analysis
Barbora Ruffini (Masaryk University, Faculty of Arts, Department of Archaeology and Museology)
Co-authors: Vera Klontza-Jaklova, Eliska Petrekova, Zuzana Zigova

The main goal of our project was to create a network analysis of Roman amphorae trade, graphically recognize changes that occur over time and reveal hidden commercial patterns, if there are any to be traced. Visualization software that allows designing network of trade routes based on their geographical location but also can set them in specific time frame was a necessity to graphically depict these situations. A large number of social network analyses that provides different understanding of source data and the possibility to manipulate the graph structures in these programs, inspired us to work with network and data analyzing software. Consequently we have decided to use Gephi: The Open Graph Visualization Platform. Gephi is an open-source graph set exploration software that transforms data into interactive and complex graph structures. It provides a real-time visualization of large-scale networks, which makes graph adjustments very efficient and speeds up the exploration process. In addition, many constantly evolving plug-ins can create adapted interface based on individual requirements of specific analysis and produce more valuable results. Our project required additional installation of Geo Layout plug-in. It displays graphs based on their geocoded attributes, such as latitude and longitude, which makes pairing networks with GIS (Geographical Information System) maps very effective later on. Since Gephi converts complex data sets into graphs, a database with specific parameters adjusted for the program interface needed to be created. The Roman Amphora Project developed by Archaeology group at the University of Southampton was used as a primary source. 208 Roman amphorae that were in use from the first century AD onward were selected, as Gephi does not recognize time data before Christ. We worked with four main sections of the amphora type sheet: Date Range, Origin, Distribution and Contents. Necessary data was selected and implemented into our spreadsheet. The database was then extended by 33 additional Roman amphorae from several different sources and the same pattern of collecting and adapting the data to fit needed specifications was maintained. Gephi then converts this database into the networks. These graphs then can be filtered based on their content, typology, time range, import and export parameters, degree of connectivity and set into various layouts according to researchers’ requirements. To form the most accurate analysis, Gephi networks were also paired with GIS maps. We worked with ArcGIS software to create modified environments that provides detailed base layer of specific locations for particular network, which can be adjusted depending on required century. These complex Roman amphorae trade network analyses will then be compared with historical events, war conflicts, political and climate changes. With the ability to compare multiple layers of different attributes over one another, it is possible to study different business relationships and hidden trade patterns that we would not be able to detect without this simulation. The large number of various layouts, filter combinations and statistics enable researchers to work with their questions and hypotheses on a whole different level, as this program has fundamentally endless research potential.

Recalibrating the Digital Humanities for Archaeology: The Mycenaean Aegean
Ray Rivers (Imperial College London)
Co-authors: Paula Gheorghiade (U. of Toronto), Henry Price (Imperial College, London), Tim Evans (Imperial College London), Carl Knappett (U. of Toronto)

Archaeological data presents a paradox. Instead of ‘big data’ we have the very different ‘lots of data’ e.g. a wide range of ceramic evidence. Although this data cannot be taken as simply representative, there is still often just enough to make it possible to address questions about large-scale behaviour of societies and their networks of interactions. For example, despite the lack of systematic archaeological material, a recent attempt to model Phoenician Mediterranean interactions [1] dominantly makes use of geography to form the basis for comparison. This example is couched in a framework of ‘theory modelling’ in which assumptions are made about the agency behind the formation of what, in practice, are exchange networks. The situation is complicated by the presence of more (but not extensive) data. It is challenging to find a middle ground between theory modelling and detailed structuring of data (data modelling), from which agency is inferred rather than assumed. In this talk we shall discuss one approach using a (13,000+ artefact) data set from Late Bronze Age (LBA) Crete put together by one of us (PG) from published catalogues. This data is too much for generic modelling but (with only 1000 ‘useful’ artefacts) too little for data modelling. Nonetheless, combining the data with geography, technology, assumptions about artefact function and general network analysis provides a dynamic avenue through which to explore the role of key Cretan sites during the LBA.

Aegean connections in context: appropriation of urban culture in the Mycenaean Greece
Piotr Zeman (Adam Mickiewicz University in Poznan)

Urbanization, as a social process can be defined in a systematic and relational way, in which it occurs within a closed system, and focuses on the development of functional and structural differences between and inside various settlements. Urbanization understood in this way undoubtedly took place in mainland Greece during Late Bronze Age (Late Helladic phase in local chronology, ca. 1700-1050 BC), with the gradual centralization of administration and economy around the Mycenaean palaces. This led to a distinction of the palaces in the settlement network and the development of lower towns, which together created entities that can be termed palatial towns, with internal structural, functional and social divisions, and a key role in the regional settlement network. This process created an urban culture that was never before present on the European mainland. This paper draws on data from five known and previously researched palatial sites (Dimini, Thebes, Mycenae, Tiryns and Pylos) to illustrate how urbanism during this period was shaped by two factors: 1) the extent of interactions across the Aegean, particularly with Cretan palatial settlements and 2) the local unique character of the Mycenaean palatial town in comparison with Near Eastern and Minoan centers. From the beginning, the development of Mycenaean palatial towns was impacted by contacts within the Aegean sea. Specifically, Minoan Crete, which at the time dominated the region, not only influenced Early Mycenaean material culture, but also at least indirectly affected the political situation and socioeconomic changes on the mainland. This cycle of contacts goes beyond a simple center-periphery model, with Mycenaeans re-appropriating according to local conditions, possibilities and needs. It seems that the Minoan idea of a palace was reshaped to serve a specific purpose of formalizing power. This led to the formation of unique, small scale urban centers heavily entangled with the elite residences and funerary architecture. In comparison with Minoan palatial sites, Mycenaean communities appear to have been dominated by the palaces rising over them. This social dynamic is represented archaeologically in two features: first, massive fortifications are found separating the elite zone from the rest of the community, and second, the elite zone comprises a proportionally large component of the overall settlement size. The Mycenaean warrior-centered identity also evolved, becoming part of a new palatial culture. The latter included ideology of power focused on the king (wanax) and an urbanized hierarchical settlement system, centered around palatial towns. It was the constant interference of cultures existing around the Aegean sea, that made those changes and formation of a unique Mycenaean urban culture possible.

Seafaring Poems in Pindar’s Epinicia and Encomia
Thomas Kuhn-Treichel (Universität Heidelberg)

One of the most salient features of the poetic ‘I’ articulated in Pindar’s poetry can be seen in its ability to establish connections between otherwise disconnected entities, e.g. between persons separated by time or space, the living and the dead, or between humans and gods. When it comes to people separated by space, the act of connecting is often represented as a movement of either the poetic ‘I’ or the poem itself. Some remarkable cases of the latter kind involve the sea: In P. 2.67sq., the poem is ‘being sent’ to Hieron of Syracuse ‘like a Phoenician merchandise over the gray sea’ (τόδε μὲν κατὰ Φοίνικαν ἔμπολον / μέλος ὑπὲρ πολιᾶς ἀλὸς πέμπετα). In N. 5.2sq., the song is summoned to ‘go forth from Aigina on board every ship and in every boat’ (ἐπὶ τόπους ἔλκαδος ὑπὲρ τὰς αἱδῖς, / στεῖχ’ ἀπ’ Αἰγίνα). A slightly dubious case is Enc. fr. 124ab.1sq. M., where the ‘vehicle of lovely songs’ is being sent to Thrasyboulos of Akragas (ἐρατᾶν ὄχημ’ ἀοιδᾶν / τοῦτο <τοι> πέμπω; interpreters tend to take ὄχημα as chariot rather than ship, but even so one is to imagine a movement across the Mediterranean). This paper is not so much interested in the historical reality lying behind this type of song-journey motif but in the sense of connectivity the passages convey. Special attention will be to the role ascribed to poetry: All of the three passages, with differences in detail, are based on the idea of poetry establishing connections across the Mediterranean (one-to-one connections in P. 2 and Enc. fr. 124ab, a one-to-many connection in N. 5). Aspects to be discussed in this context include the relation between seafaring and poetic communication and the interaction between the moving poem and the (seemingly) stationary poetic ‘I’ (which is in fact moving with its poem). A case of special interest is Enc. fr. 124ab, where the metaphor of the vehicle is continued by a first-person plural statement about swimming ‘in the sea of golden wealth to an illusory shore’ (πελάγει δ’ ἐν πολυχρύσοι πλούτου / πάνες ἴσᾳ νέομεν / ψευδῆ πρὸς ἀκτάν): Here the notion of sea and seafaring needs to be examined against the backdrop of the preceding metaphor (and in the context of the genre of encomia). The discussion of the three passages will be supplemented by references to similar concepts in Pindar (e. g., self-referential maritime metaphors in P. 10) in order to round off the overview of the different shapes of maritime connectivity in and through Pindar’s poetry.

Maltese connections: remarks on cultural identity starting from the architectural language between the 4th and the 3rd century BC.
Francesca Bonzano (Catholic University of the Sacred Heart, Milan)

The analysis focuses on the architectural culture developed in the western Mediter-
Chalcidic connectivity between Sithonia and Pallene: transmutations of epichoric identity and resilience through environmental sustainability in the long 5th and 4th c. BC.

Maria Xanthou (Harvard Center for Hellenic Studies)

Until 4th c. BC, the coastal region between Sithonia and Pallene and its hinterland formed a complex geographic space, inhabited by communities with mixed identities. Despite being heavily excavated, this region remains understudied in terms of connectivity, identity, and alterity. So far, its history has focused on Potidaea and Olynthos and their relations with Athens and Macedon. Since their foundation, these two urban clusters occupied significant geographic sites with Potidaea being built on a much-coveted site, right on the Isthmus of Pallene, overlooking Thermaicus and Toronaeus Gulf, while Olynthos lies on two elongated hills situated in a valley, about 2.5 km inland from the sea. Apart from D. M. Robinson’s excavations, Olynthos is also known through the 5th c. BC literary sources (Thuc., Xen.) due to its role as refugee hub (Thuc. 2,70,4; 4,123,4). During the last quarter of the 5th c. BC and the beginning of the 4th c. BC, Olynthos benefitted greatly from the resettlement of inhabitants coming from other coastal cities, thus resulting to its enlargement and the foundation of a federation transcending ethnic and epichoric barriers, the Chalcidic League. Although originally founded as a Corinthian colony, Potidaea eventually became a member of the Athenian league after a two-year siege by the Athenians, its inhabitants’ eventual capitulation in 430/429 BCE, and the loss of its original inhabitants. The town was ultimately resettled serving as a major focal point for the Athenians during the Peloponnesian War. In the post-Peloponnesian war era, Potidaea was returned to its former inhabitants. It became a member of the Chalcidic league, and it was chosen by Spartans as a base during their war with Olynthos. Later, it was captured by Athens, inhabited by Athenian klērouchoi, and, was conquered by Philip, who enslaved the non-Athenian inhabitants. It became a member of the Chalcidic league, and it was chosen by Spartans as a base during their war with Olynthos. Later, it was captured by Athens, inhabited by Athenian klērouchoi, and, was conquered by Philip, who enslaved the non-Athenian inhabitants and rendered the city to the Olynthians. After its utter destruction by Philip, Olynthos and the region formed the polis territory of the new foundation of Cassandreia. The paper sets out to examine the potential link and affinities between these cities and to trace the geographic and social dynamics that were developed between them as geographically-bounded entities. In that sense, it explores the geographic interaction and spatial synergy between the coastal zone and the mainland in Northern Greece. Along these lines, I take as my starting point Hornblower’s (2010) argument of a blurring and mixed Chalcidic identity, which was deepened and furthered through the aforementioned synergy. The aim of the paper is to offer a new appreciation of this geographic region and to emphasize the dynamics of regional communities, coastal areas and the sea, focusing on the mixed identities of Potidaea and Olynthos. My critical analysis focuses on the resilient, symbiotic relation enjoyed by the two cities since the Peloponnesian war. Towards this goal, I examine the inter-
active relation of the cities in question, aiming to introduce an integrated, multi-disciplinary approach to the crucial geographic and historical factors that largely defined them as integral parts of the Chalkidian region, which ultimately formed Cassandria.

**Ovid’s Identity as Exiled Poet**

*Stefan Feddern (Assistant in Classics (Latin Philology), CAU Kiel)*

In the age of 50, Ovid was exiled from Rome (8 AD) by Augustus and relegated to Tomis, situated at the Pontus Euxinus, at the north-eastern frontiers of the Roman Empire, where he arrived almost one year later and where he died in 17 or 18 AD. During his exile, Ovid wrote nine books of elegiac poems, the Tristia (5 books) and the Epistulae ex Ponto (4 books), in which he often compares himself with figures of the Greco-Roman myth, especially with Ulisses (trist. 1,5; Pont. 4,10) and Jason (Pont. 1,4). In my paper, I want to examine these comparisons as expressions of a struggle for identity, given that Ovid grew up and passed the main time of his life in the political-religious atmosphere of Rome and deplores his exile among barbarians as a totally different and depressing cultural surrounding. Ovid’s representation of his desolate situation must be seen as the result of the geographical fact that he is excluded from the Mediterranean world, and his comparisons with mythical figures as reference figures are likely to reflect his wish to keep his former identity.

**To be Greek or not to be: about the “Greekness” of Epirus and Southern Illyria. An overview through urbanism and theatrical architecture in a Mediterranean perspective.**

*Ludovica Xavier de Silva (“Sapienza” University of Rome – Department of Classics)*

Studying theatres can provide an interesting perspective in order to understand how communities saw themselves and which cultural network they were part of. The interest in theatrical buildings in Epirus and Southern Illyria is tied to the ongoing debate about the urbanisation of the territory. Moreover, their theatrical building process has been dated during the reign of Pyrrhus or shortly after, a moment in which the territory was more projected towards a Mediterranean dimension than ever. It has been suggested that the name Epirus itself may have origin from a “maritime perspective”: a land seen from the sea, from a colonial point of view. This must have been the perspective of Greek colonists, a polis perspective, different from the urban organisation of the hinterland. It is well known that polis’ administrative, political and cultural concept was reflected in the creation of a specific urban panoply and that this very idea of a polis seems to have been, for the Greeks of the mainland, a discerning characteristic in their approach towards identity and alterity.

Moreover, an important connection has to be established with the Adriatic context, specifically with Magna Graecia and Sicily. The relationship with these territories not only has to be seen in a commercial and artistic-architectonical perspective, which has lead to the identification of a so-called “Adriatic koine”, but also in relation to the identity building process of these communities. As a matter of fact, the strong connection between Pyrrhus politics and ideological propaganda and the so-called Western Greeks it is a well-known subject. Being also Magna Graecia and Sicily lands where theatres have been the object of a flourishing architectonical experimentation, the perspective here proposed can represent an interesting approach. Thus, studying theatres and their architectural and morphological features, as well as analysing their position and functions, can provide important data in order to answer some essential questions. What role did these buildings have in the cities and in the territory addressed? Did these theatres have characteristics or features that might give them a proper Illyro-epirote identity instead of a Greek one? Did the Epirotes see themselves as Greek and, if so, to what extent did they involve the connection between Greek identity and the polis in their self-representation? Did these buildings share characteristics that are common to the entire Adriatic network? Which analogies and/or differences can we establish between the self-representation, especially if connected to a specific idea of urban organisation and planning, of the Western Greeks and the one of the Epirotes and Southern Illyrians? To what extent an identity concept tied to a specific form of urban development actually shaped the landscape and/or met a local resistance to it and which differences can be detected in this process from the Hellenistic period to the Roman one?

**Black Sea networks, monumental burial traditions and elite display in the late Classical and early Hellenistic period**

*Jane Rempel (University of Sheffield)*

The ancient Black Sea was not only physically connected to the Mediterranean but also a conduit for trade and cultural interaction between the two regions, beginning in earnest with the foundation of early Greek settlements in the seventh century BCE and increasing with the interests of Athenian empire in the fifth century BCE. By the fourth century BCE, the rise to prominence of new or newly dominant regional powers meant that the communities living around the Black Sea were part of emerging and sometimes volatile networks that included the Aegean region but also the Balkans, the Eurasian steppe, the Caucasus and Anatolia. This paper will discuss the intersection
of these networks through the lens of the monumental burial traditions that became prominent in the Black Sea—as well as the Aegean—during the fourth century BCE. The massive burial mounds, architectural chamber tombs, lavish gold and silver grave assemblages from especially the western and northern regions of the Black Sea, but also found in the eastern and southern areas, have been well-studied in the context of Scythian, Thracian, Colchian cultural traditions. A significant lacuna, however, is the way in which monumentalising burial practices and strategies of elite display developed contemporaneously in the coastal, primarily Greek, settlements of the Black Sea. By shifting focus from regional variations to a holistic view of the mound, architectural or otherwise monumental burial traditions around the Black Sea, the interaction and connectivity of elite networks associated with, but not exclusive to, ancient Greek settlements around the shores of the Black Sea emerge. In particular, this paper will discuss case studies from the south coast (Turkey), in order to tease out the ways in which local particularities and regional relationships intersect with the wider Black Sea network of elite display. The evidence for monumental mound and architectural burials from around the coastal settlements of Sinope and Amisos will be considered as key components of a network that not only responded to adjacent Paphlagonian and Pontic practices of monumental burials but also connected the region to a larger Black Sea vocabulary of elite display.

**Sea routes of amber around Europe. The dynamics of Baltic amber distribution during the IIInd millennium BC**

**Janusz Czebreszuk (Institute of Archaeology, Adam Mickiewicz University in Poznań, Poland)**

The problem of the Baltic amber (succinate) reaching the Aegean (since the first half of the IIInd millennium BC) is one of the mostly discussed issues regarding the relations of the Mediterranean with other parts of Bronze Age Europe. Marine routes are the key factors in these considerations. Following presentation is focused to discuss the main essential aspects concerning the role of the marine contacts in spread of the amber, both through the Mediterranean Sea as well as the seas encircling Europe from west and east—up to the Baltic Sea.

**From sea to desert. The Mediterranean influences on the inland Hurrian culture and vice versa**

**Yasmine Mahmoud (Università degli studi di Pavia)**

There is no doubt that the Mediterranean played a pivot role in the ancient times, not only as a route for travelers and merchants, but also as a carrier of influences between the cities. Although Urkesh, which is a city dating back to the forth millennium in north east Syria, is a Hurrian religious center, with a very distinct and particular ethnic culture, and despite the fact that it is very distant from the Mediterranean (about 580 to 600 km of distance between Tell Mozan and the Mediterranean coast line) this does not mean that it was not influenced by other cultures across the sea. It also contributed to the Mediterranean culture in its own way as I will present in my paper. The distance is not only in terms of kilometers, but also because of the contrast of landscapes, which was and still characteristic of ancient Syria and Syria today, between the eastern Mesopotamian dimension and the western Mediterranean. Human representation is a key aspect of the artistic culture of ancient cities of the 3rd and 2nd millennium, whether the representation depicts a deity, a cultic figure to be used in a ritual, or a portrait of someone. The body of terra cotta human representations in Urkesh, exhibit in some cases Egyptian influences. Here the Mediterranean not only played the role of a cultural and artistic influence carrier, but it also conveyed the perception of beauty of the artist from a faraway place. The Mediterranean transported the faces, the expressions and the emotions depicted in the representation. And this is something that holds a symbolic depth in the intercultural exchange. The faces of people who never met, traveled in a static form and met, and yet better, left a permanent influence on the culture. A major cultural and religious center in Mesopotamia, the inland Hurrian city of Urkesh left its cultural marks on other civilizations. The best example is the one left on the Mediterranean ancient city of Ugarit on the Syrian coastline in Latakia province. Ugarit, the Phoenician city had a very strong identity, but this did not mean that it was not influenced by other culture. The Hurrian hymn that accompanied the oldest music score ever discovered, is the ultimate testimony. And this influence probably traveled further than Ugarit through the Mediterranean. The final aspect of this paper will discuss the influence that the Mediterranean is still playing to this day in keeping the connection alive between people, through the ancient connections that we study. We are brought together from across both ends of the Mediterranean, in sharing a common goal in the protection, the preservation and development of the archaeological site of ancient Urkesh (modern Tell Mozan). The faces of two world meet from both ends, transcending the differences in cultures, and even absorbing the different cultures that completes us as humans, and aid us is in preserving the Mediterranean’s ancient connection that brought people together, and revive them. And furthermore, we can see how modern western Syria draws inspiration from a remote city like Urkesh, remote both in time and space.
Archaeology and Syrian Identity: ‘Urkesh Gate’ a good Tale from Syria
Keynote lecture: Hiba Qassar (PhD in museum studies, AVASA)

Tell Mozan, ancient Urkesh, is an archaeological site located in North-Eastern Syria, a region well known for its rich ethnic and religious diversity. Prior to the conflict, an eco-archaeological park in tell Mozan pictured an area of 54km square and engaged 20 modern villages. One of the various aspects of this park was to focus on the local society and bring cultural, social and economic benefits to local community. Urkesh Gate project was a small part of the whole vision and was dedicated to strengthen local women.

This paper will discuss the role of archaeology in Syria in constructing diversity among the Syrian society. It will argue how Syrian identity was constructed, and the changes it went through during the last years of war. It will then present the role of archaeology in constructing inclusive identities through the case of Tell Mozan, ancient Urkesh. Finally, through the case of Urkesh Gate, it will present the impact of fostering archaeological knowledge and engaging locals on the Syrian identity.

8 Territoriality in Europe in the Bronze and Iron Age

Wednesday March 13th until Friday March 15th, Room 106

WED 15:30 POSTER SESSION Spatial-comparative analysis of archeological sites from Late Neolithic and Early Bronze Age in north-western Poland
Marcin Lawniczak (Adam Mickiewicz University - Poznań, Poland)

THU 13:30 Discussion

13:30 Territoriality in Southern Europe in the Bronze and Iron Age
Keynote lecture: Simon Stoddart (University of Cambridge)

14:20 Settlement structure and pit zone alignments in north-western Jutland, 800-200 BC
Astrid Skou Hansen (Holstebro Museum)

14:40 No borders, no nations: linear earthworks in pre-christian Southern Scandinavia
Arjen Heijnis (Aarhus University)

15:30 Iron Age Territories in Central and Northern Europe
Oliver Nakoinz (JMA, Kiel University)

15:50 Celtic Fields in Schleswig-Holstein and Denmark - Status of Research
Volker Arnold (retired), former: Museum for Archeology and Ecology Albersdorf

16:10 Linking Bronze Age agricultural innovation with the allocation of land for crop growing in northern Germany
Wiebke Kirleis (Institute for Prehistoric and Protohistoric Archaeology, Kiel University)

16:30 Territoriality and social complexity in the North-West of the Mediterranean during the Iron Age: a multidisciplinary perspective
Silvia Valenzuela-Lamas (Consejo Superior de Investigaciones Científicas (CSIC-IMF))

16:50 Discussion

FRID 08:30 Separated by time and distances? Borders and distinct cultural regions in the south-west Baltic area during the LN/EBA transition
Hendrik Raese (Institute for Prehistoric and Protohistoric Archaeology, Kiel University)

08:50 Modelling the political structure of the Koscian Group of Unetice culture
Janusz Czebreszuk (Institute of Archaeology, Adam Mickiewicz University in Poznań, Poland)

09:10 The matter of border – transition from the Late Neolithic to the Early Bronze Age in the Lower Oder Region
Sebastian Teska (Adam Mickiewicz University)
Territoriality in Europe in the Bronze and Iron Age

**Keynote speaker:** CS. Stoddart, University of Cambridge

**Session organizers:** S. Valenzuela Lamas, D. Knitter, O. Nakoinz*, S. Schaefer-Di Maida*, W. Dörfler, I. Feeser, D. Filipovic, W. Kirleis, J. Kneisel, H. Raese

Territoriality has become a viral research topic, and it raises questions about the nature and (dis)continuity of settlement areas, which are the focus of our session.

Different modes of spatial occupation characterised the Bronze and Iron Age in Europe, ranging from farmsteads and groups of burial mounds to (political) territories, as indicated by the ‘Celtic fields’, cooking-pit fields, linear structures, and fortifications, as well as by palaeoenvironmental and economic proxies. This session aims to explore how different types of territorial organisation shape the spatial system of interaction.

Do parts of the landscape represent areas of influence or even “territory”, to which the (economic) activity of individuals or communities were limited? Are there aspects of landownership and property rights that are detectable in the archaeological record? We are also interested in the temporal aspects of the settlement locations. Is there a long-term, continual bond between the settlement areas and the visible inhabitants, despite some evident changes in the agricultural regime and material culture? Were there changes in land-use, such as in the intensity of crop cultivation, or a shift of economic focus from plant to animal husbandry (pasture farming), or different strategies of animal husbandry? Can these be connected to specific modes of spatial organization?

These aspects touch on social interaction shaped by territoriality (and vice versa) and we wonder whether territoriality caused conflicts, or if it helped reduce/resolve them? Did territoriality emerge as a result of population growth?

We are especially interested in discussing the following aspects:

- Modelling of settlement and funerary landscapes
- Pollen data and soil morphology as a basis for the reconstruction of landscape use
- Spatial analysis in relation to regional settlement dynamics
- Small-scale/local human mobility

We invite contributions addressing case studies, indicators, models, theories and interpretations from the following, but not limited to, fields of study: material culture, archaeobotany, archaeozoology, soil science, archaeometrics, palaeoentomology, stable isotopes, modelling, spatial analysis, and ethnography.
Territoriality in Southern Europe in the Bronze and Iron Age

**Keynote lecture: Simon Stoddart (University of Cambridge)**

This paper analyses the distinctive features of Mediterranean territoriality in the first two millennia BC, concentrating on the Italian and Greek peninsulas, and where possible, the intervening spaces of sea. Issues such as cyclicality and stability will be addressed against the different environments provided by these two distinct regions and their subregions. A short history of the application of territoriality will be given, not least because both regions have witnessed important theoretical and methodological innovations, notably different models of economic, social and political development and extensive survey data sets. These increasingly open access data sets were often collected from extensive agricultural zones by large survey teams. Of the themes proposed by the session the following themes will be particularly addressed: Modelling of settlement landscapes, Pollen data as a basis for the reconstruction of landscape use, Spatial analysis in relation to regional settlement dynamics. For this purpose, big data sets of settlement sites, pollen cores and radiocarbon dates, collected recently by scholars will be deployed to understand the changing features of the Italian and Greek landscape. Questions will be raised about the degree to which nucleated centres controlled their apparent territories and what this might imply about political control of the landscape. To what extent did territoriality evolve around these major nucleated settlements? To what extent did rural settlement contribute to the organisation and exploitation of the territory? What was the degree of mobility between different nucleated centres and between city and countryside? A number of case studies will be developed to flesh out the broader trends of territoriality in these two key millennia of human development.

**Settlement structure and pit zone alignments in northwestern Jutland, 800-200 BC**

**Astrid Skou Hansen (Holstebro Museum)**

Over the past years, our knowledge of the settlement structure in northwestern Jutland, from the late Stone Age to early modern times has grown extensively, due to large-scale excavations, aerial archaeology and metal detector finds. The area north of the river Storå is interesting, as it sits at the very edge of the Weichelian ice sheet. This means that the inhabitants had access to both resources associated with the sandy heath to the south, and the heavier moraine soil to the north. During the late Bronze Age and earliest Iron Age, the settlement pattern in the area consists of small, single or double farm settlements. These settlements were scattered throughout a landscape dominated by both natural demarcations i.e. river valleys, and by monumental sacral structures i.e. clusters and rows of burial mounds. This pattern changes with the emergence of larger settlements during the 4th century BC. The establishing of larger settlements coincides with the construction of several pit zone alignments, thus indicating either a rethinking or a reinforcement of the perception of the landscape by the inhabitants. In this paper, I wish to present a case study, giving an example of the changes in land-use occurring during the middle of the first millennium BC and the derived change in spatial organization. I will also touch on the interrelation between social dynamics and resource use, as it applies to the interpretation of the spatial analysis.

**No borders, no nations: linear earthworks in pre-christian Southern Scandinavia**

**Arjen Heijnis (Aarhus University)**

Various linear earthworks appear in the archaeological record of Iron Age Southern Scandinavia. Particularly the Jutland peninsula features the site types ‘pit zone alignments’ and ‘long walls’, though neither of those feature types are exclusive to this region or time period. But can these monuments be considered as evidence for a territorial landscape division on a military/political basis, in parallel with defended
Iron Age Territories in Central and Northern Europe

Oliver Nakoinz (JMA, Kiel University)

Territoriality is a much discussed issue in prehistory and history. Currently it is again a burning topic for Bronze and Iron Age research. This talk first presents some basic concepts and facts on territories including a definition and the role of territories in social contexts. Different types of territories are discussed as well as the relevance of territories in different research approaches such as central place research. The theoretical considerations end with some comments on using models. Finally, theoretical and empirical models of territories from South West Germany and Denmark are presented.

Celtic Fields in Schleswig-Holstein and Denmark - Status of Research

Volker Arnold ((retired), former: Museum for Archeology and Ecology Albersdorf)

Surface Lidar data, more and more publicly available, cover increasing areas in a sufficient quality. They lead to knowledge of numerous Celtic Fields in Schleswig-Holstein and Denmark. Small more or less rectangular close-packed field parcels forming coherent systems, which are still recognizable on favourable terms. Meanwhile more than 1000 Systems are registered mainly in ancient forests, in Denmark also in actual and forested heathland. More than 50 systems cover more than one square kilometer: distinctive territories, whose outer borders were subject of dynamics and remain thus vague. Otherwise system sizes are found sometimes which may be cultivated by only one single farm. Prevailing on sandy soils at least parts of the parcel borders seem to be created in form of narrow embankments. Obviously long-term ploughing and cultivating lead to increasing raising and widening of the parcel borders of its own volition, combined with an increasingly through-like form of the parcels. An investigation of a faintly pronounced parcel border in the Riesewohld forest, Dithmarschen, came to a cultivation span of ca. 600 years. Dates from other systems resulted in similar or even longer time spans. Regularly traces of manuring are found in the ploughed soil of the parcel borders in the form of intensified broken house litter. The wide layout diversity of the systems is mainly dependent on soil type and relief. Thus there are many differences in upper and lower moraine areas. An overall development becomes apparent from more or less quadratic parcels to narrow oblonge-sized ones. While the former were ploughed crosswise with ards as proved occasionally, extremely long and small parcels may be cultivated bidirectional possibly by a mouldboard plough. Small ridge-and-furrow systems were created respecting the old Celtic Field parcel borders in some Danish systems, which may indicate a partial continuity over the “dark ages” after the migration period. It remains still vague which and to what extent parcels lay fallow or were used as pastures. Anyway, the forming of the parcels may be much more a result of soil cultivation than of grazing. A further scope of duty is the dating of the systems and their usage periods. Certainly insufficient first dates cannot exclude that Celtic Fields may origin during the early Nordic Bronze Age, though the known buildings show still no evidence of stables. Definitely they are present since the younger Nordic Bronze Age, together with the beginnings of indoor housing of animals, which could be initiated by climatic decreases and is evident by changed house layouts. Contemporarily a stationary agriculture was possible over centuries which may have replaced prevailing migrating cultivation. Animal housing leads to an accumulation of manure, bedding and litter which was spread at the parcels for fertilisation, together with soil material prevailing from wet grounds. All this represents a coequal change to the agrarian “revolution” at the beginning of the neolithic.

Linking Bronze Age agricultural innovation with the allocation of land for crop growing in northern Germany

Wiebke Kirleis (Institute for Prehistoric and Protohistoric Archaeology, Kiel University)
Co-authors: Dragana Filipovic1, Almuth Alseleben2, Henrike Effenberger3

1 Institute for Prehistoric and Protohistoric Archaeology, CAU Kiel
2 Almuth Alseleben, Academy of Science and Literature, Mainz, Schleswig
3 Henrike Effenberger, Effenberger Archäobotanik, Drage

Intensive archaeobotanical investigations on prehistoric sites have recently been carried out in northern Germany within different research programmes, i.e. at Kiel in the frame of SPP1400 and CRC1266, and within the programme “Settlements of the Bronze Age” at the Academy of Science and Literature, Mainz, in Schleswig. Combined with the high-resolution absolute chronology, the qualitative and quantitative archaeobotanical data for the period from the Neolithic to the younger Bronze Age now offer a comprehensive picture of the development of crop production. In particular, towards the younger Bronze Age, numerous newcomer crops broadened the spectrum. Each crop species possesses particular traits and has specific preferences e.g. with respect to soils and water access. The different needs may account for specific management systems. While oil plants and legumes seem to be garden crops, most large-seeded
cereals are associated with extensive cultivation with low labour input. The analysis of certain characteristics of arable weeds allows us to identify different scales of crop growing, from intensive to extensive, and its seasonality, i.e. growing of summer or winter crops. Different crop and weed species have different needs for successful growth and these may be interpreted in relation to the allocation of specific areas and plot sizes to particular crops. We will present the development of the spectrum of crops and corresponding weeds over time and discuss innovations and changes in the light of different modes of spatial organization reflecting different modes of agricultural production.

Territoriality and social complexity in the North-West of the Mediterranean during the Iron Age: a multidisciplinary perspective
Silvia Valenzuela-Lamas (Consejo Superior de Investigaciones Científicas (CSIC-IMF))
Co-authors: Nieto-Espinet, A., Trentacoste, A., Guimarães, S.
Recent archaeological and bioarchaeological research has provided new insight into the organisation of production in Iron Age communities in present-day Catalonia and southern France. In this context, increasing territoriality and social complexity had significant consequences for the development of this area. This contribution will provide a synthesis of the changes in material culture, settlement pattern, archaeozoological, archaeological, and isotopic data from the 7th to the 3rd c. BC in the north-west of the Mediterranean basin. These data suggest that the introduction and spread of iron technology was accompanied by a notable increase in population. This technological change, coupled with the spread and influence of Mediterranean trade, had profound consequences on animal husbandry and the socio-political organisation of the Iron Age communities in the region.

Separation by time... and distances? Borders and distinct cultural regions in the south-west Baltic area during the LN/EBA transition
Hendrik Raese (Institute for Prehistoric and Protohistoric Archaeology, Kiel University)
In the south-west Baltic region and especially in Mecklenburg-Western Pomerania and northern Brandenburg, generations of archaeologists have collected a wealth of information on single and stray finds, burials and hoards from the Late Neolithic to the Early Bronze Age. A number of studies by different researchers indicated on these discoveries that a significant interaction with the Early Bronze Age Únětice culture to the south took place in this area during the local Late Neolithic (~2400-2000 BCE) which is visible not only in the material culture. The proper establishment of the Early and Older Bronze (~2200-1500 BCE) in the region meanwhile shows a shift in contacts to the Nordic Bronze Age in the North-West. Recent results from the “Beethoven”-project – which is jointly based at the universities of Poznań and Kiel and studies the transition from the Late Neolithic to the Early Bronze Age and the formation of power agglomerations in the south-western Baltic area – display a distinct separation of stray finds and hoards with metal objects connected to the Únětice culture and the Nordic Bronze Age. The distribution of the metal hoards seems to indicate a sharp border between the different zones of influence and therefore could be interpreted as markers of territoriality. This poses the question of whether the different sources of influence are only to be found in the distribution of metal finds or, beyond that, also in the other types of finds and their distribution. By quantifying the variability of the total material culture, it shall be discovered if the impact of the origins of the metal finds affects more than just the local hoard customs. Additionally, an assessment of the effect of environmental variables (e.g. slope, aspect, soil, etc.) by using a predictive model will be presented. Based on the model it should be possible to decide if the settlement system in the region is influenced by more than nature and maybe in the same way disrupted as the hoard distribution.

Modelling the political structure of the Kościan Group of Únětice culture
Janusz Czebreszuk (Institute of Archaeology, Adam Mickiewicz University in Poznań, Poland)
Co-Authors: Johannes Müller, Marzena Szmyt, Mateusz Jaeger
Just a brief look at the distribution of the finds of Únětice culture suggests that the Kościan Group stands as a clearly outlined unit in terms of its spatial extent. It is situated on the northeastern edge of the Únětice world, thus emphasizing the specific of the discussed group. Regarding the recently proposed hypotheses concerning the political aspect of the Únětice world, we may ask if the present state of the observed archaeological data concerning the Kościan Group, reflects the political aspects of this Early Bronze Age societies. This question is the key point in the following presentation and considerations.

The matter of border - transition from the Late Neolithic to the Early Bronze Age in the Lower Oder Region
Sebastian Teska (Adam Mickiewicz University)
The Lower Oder Region in a dawn of the Bronze Age was dominated by the phenomenon of Corded Ware Culture in its local variation. Despite incremental influence – firstly, from Bell Beaker Culture, then from Únětice Culture – transition point between two periods cannot be distinguished doubtlessly. Also the course and the pace of cultural changes is still not clear. Moreover, there is a matter of the Oder
Barrows landscape. Comprehensive research on funeral rites from the Bronze Age on the borderland of Silesia and Greater Poland (Las Krotoszyn)

Mateusz Stróżyk (Poznań Archaeological Museum)

The presentation concerns the funeral rite of Tumulus Culture (TC) community located on the border of Silesia and Great Poland. The matter relates to the period ca mid-2nd millennium BC, ie the years 1550-1300 BC. In central Europe the period is directly connected with cultural crossroads, between the end of the Early Bronze Age (protocyvilisation) of the Unetice culture and the emergence of a new cultural model in the form of the so-called Lusatian Urn Field. It is a period of dynamic changes, at the same time, on the physical plane landscape / environment as well as worldview culture. The area of the Krotoszyn Forest proved to be a very good determinant of these changes. Application of a whole package of modern non-invasive procedures, to wit: spatial analyses in GIS environment of the digital elevation model (DEM) obtained during airborne laser scanning (LiDAR/ALS), magnetometric prospection, geological and paleoenvironmental analysis helped to extract the most of the informative potential of Krotoszyn Forest. The procedures provide a basis for building a model presenting the formation of the spatial layout that ensued from the activities of TC communities. Accumulated information (from single objects to the whole region) allow isolating landscape preferences that might have made Bronze Age communities choose specific settings for their cemeteries and single barrows. Achievement of mentioned analyses thus led to creation of a model describing the principles which had possibly guided TC communities from the Silesia-Great Poland borderland during the construction of ritual sites in the landscape. In presentation will be shown the results of the project which was in the course of implementation from 2013.

Singen revisited. Gender-related Mobility Patterns and Territoriality in Early Bronze Age Central Europe

Julia Katharina Koch (CRC 1266, Kiel University)

The cemetery of Singen (Lkr. Konstanz, Baden-Württemberg, Germany) is commonly interpreted because of its rich variety of metal objects as one important site in the Early Bronze Age landscape of Central Europe and as a landmark within the development of bronze metallurgy. The material includes local and regional types as well as objects from far away like a faience bead in a girl’s grave or the so called Atlantic daggers in the burials of elder men. Also the gender-differentiated burial rites demonstrate influences from different directions. Those results were reasons enough to re-analyse the material of Singen as a case study in the BMBF-research project “life course reconstruction of mobile individuals in sedentary societies in Bronze and Iron Age Central Europe” (Leipzig University, funded 2009-11, publication in preparation).

The project included an integration analysis of the material first at the individual level with the question how much foreign, regional and local marks show each grave. In comparison to the known social-archaeological and physical anthropological data and especially to the archaeometric isotope results of the project it was possible to define social groups with different (inter)cultural expressions. The discussion was focused to particular possibilities of those social groups to influence the cultural identity of the Singen community. The paper will pick up the question which relevance has had marks showing a locality or non-locality for the Early Bronze Age people in Singen. Is a territoriality remarkable in the material and burial display of different social groups?

Late Bronze Age settlements in the eastern part of the Great Hungarian Plain

Polett Kosa (Eotvos Lorand University, Institute of Archaeological Sciences)

The aim of this presentation is to introduce the settlements of the Late Bronze Age Gáva cultural complex. Previously we had only a few detail about the settlements of this period that can be charac-terized by the Gáva ceramic style. This phase of the Rei. HaA2-B1 is rather unknown regarding the settlements and the everyday life of their inhabitants, so we have to collect all information from all the excavations that we
know to date to gain a full picture. How well did they exploit natural resources? What was their relationship with the water resources? What kind of settlement structure did they have and can the settlement types be classified? Is there and what kind of connection is between the set-tlement types? To answer these questions, several satellite settlements will be discussed and introduced. Two “mega-size” sites (Baks, Poroszló) with extremely intensive find materials and two smaller (Biharkeresztes, Berettyóújfalu), but similarly significant and decisive settlements will be presented. By collecting their special features and find materials, it can be demonstrated that numerous interesting changes took place during this period, which transformed not only the structure and position of settlements, but the economic system and the everyday life of the people.

**Settlement network in Bronze Age of southern carpathian basin**

Hrvoje Kalofatić (Institute of Archaeology, Zagreb, Croatia)
Co-author: Bartul Šiljeg, Institute of Archaeology, Zagreb, Croatia

Eastern Croatia is a region situated between three mayor central european rivers: Dunav, Drava and Sava. It is optimal for archaeological landscape research with remote sensing techniques due to its characteristics as it is a lowland area with fertile land divided on large agricultural plots. Fertile soil provided important basis for the human occupation and large plots provide better visibility of archaeological remains. Combined usage of satellite imagery and aerial photography compared with results of systematic field survey provide completely new insight on land occupation, settlement pattern and subsistence strategy in the Bronze Age of eastern Croatia. Regular usage of UAVs significantly increased discovery of new sites. The result is identification of large network of archaeological sites attributed to Bronze Age throughout the area. Some known and excavated sites could for the first time be viewed more accurately, in their entirety and within their landscape. Change in settlement pattern through time can be documented from Early Bronze Age to Late Bronze Age. We can also observe gradual spatial dispersion of Bronze Age settlement network regarding the probable existence of central sites and settlement hierarchies.

**Spatial organization and territorial control in South Sardinia (Italy) during Bronze and Iron Age**

Valentina Matta (Aarhus University)
Co-authors (in order): Cabras Marco - Archaeological Museum of Nuragic Civilization (MU. NU.) – Villa Verde, Sardinia (Italy); Porcedda Federico - Ph.D. Candidate, Doctorado en Historia y Artes – Arquelogía y Cultura Material, Universidad de Granada; Cicilloni Riccardo-

**Department of History, Cultural Heritage and Territory, University of Cagliari (Italy).**

The Nuragic civilization developed in Sardinia (Western Mediterranean) during the Bronze Age and First Iron Age (1800-720 BC) and it is named after its stone-built towers, so-called nuraghi. The towers are distributed across the whole island (circa 8000 monuments). Landscape analysis observed that they do not spread out in the territory casually, but tend to form clusters in a varied way. Thus, Nuragic communities adapt their settlement’s system to elements of the landscape morphology and to the surrounding resources like agriculture and husbandry, mineral means, while having also a function related to the defense of the land. Therefore, considering the strategic position of the towers and their monumentality, the Nuragic communities might have considered visibility and closer access to natural resources as significant features for the position of the nuraghi. In fact, recent studies of ancient landscapes supported the idea of visibility in relation to themes of territory and influence. Therefore, is this theory applicable also to the Nuragic towers during the Bronze Age? The aim of this paper is to investigate the concept of territoriality during the Bronze Age in Sardinia, using the visual-perceptive aspects and the mobility systems across different territories as main elements, trying to investigate the relationship between settlements and landscape. The research proposes some cases of important settlement systems pertinent to the Nuragic civilization in particular, in the territories of Marmilla and Sarcidano (South-West Sardinia), interested by a great number of Nuragic sites.

**Violent Build-Up: How Population Concentration in Iron Age Southern Scandinavia Resulted in Increasing Military Conflict**

Timmis Maddox (Independent)

The Iron Age of southern Scandinavia (150-750 AD) is becoming increasingly recognized as a period defined by the emergence of a new regional tradition of prehistoric urbanism which both concentrated and centralized local social groups. Focal settlements such as Gudme, Uppåkra, and Sorte Muld—large sedentary settlements with clear urban characteristics—drew together a previously scattered populace through their social and administrative centrality, creating/maintaining collective identities which further drove the overall transition towards concentration. Yet as this trend towards agglomeration took place, southern Scandinavia also experienced a rise in military conflict. As shown by the various weapon deposits and land/sea fortifications found throughout the region, Iron Age southern Scandinavia began to experience conflict on a regional scale, often involving hierarchically-organized armies numbering in the thousands. Philosopher David Campbell (1998) argues that once a people ties its concept of political identity and security to a single place, it is inevitable
that everyone outside of that place becomes an enemy and a potential threat. Drawing together archaeological evidence of military conflict—including the southern Scandinavian weapon deposits and land/sea fortifications—and interpretation of sites such as Gudme and Uppåkra, this paper analyses the socio-cultural effects of population agglomeration during the Iron Age. In doing so, it argues that as Iron Age southern Scandinavian societies began to concentrate, military conflict increased throughout the region as a new definition of territoriality developed—particularly one associated with the collective identities linked to the focal settlements and the socio-cultural entities they came to embody.

16:40 The Taz Selkup: Ethnoarchaeological insights on migration, ethnicity and material culture of hunter-fisher-reindeer herders in the Siberian taiga
Henny Piezonka (Institute for Prehistoric and Protohistoric Archaeology, Kiel University)

17:00 Discussion

FRI 08:30 From hunting and fishing to herding. Strategies of adaptation among forest-steppe populations in Western Siberia in the 2nd millennium BC
Sabine Reinhold (Eurasia-Department, German Archaeological Institute)

08:50 Molecular footprints of animal husbandry in two ecological zones in Eastern Mongolia: implications for archaeological research
Natalia Eguez (Kiel University)

09:10 Abandoned cities in the steppe. Ethnoarchaeological research at early modern religious and military centres in nomadic Mongolia
Jonathan Ethier (Institute for Prehistoric and Protohistoric Archaeology, Kiel University)

09:30 Beyond counting sheep: and interdisciplinary review of the Medieval British pastoral landscape
Roxanne Guildford (University of Edinburgh)

09:50 Discussion

10:30 Catching the Past – Fishing techniques from the Lower Danube Region in the 5th mill. BC and today
Mihaela Savu (Graduate School Human Development in Landscapes)

10:50 Fortifications and topography – ethnographical examples for the usage of landscape as an element of defensive systems
Andy Reymann (Goethe-University Frankfurt; LOEWE-Project “Prehistoric Conflict research.”)
11:10 Landscapes of communal frames, economic inequality and social signaling in Nagaland, North-East India
Maria Wunderlich (Institute of Pre- and Protohistoric Archaeology, Kiel University)

11:30 Scales of Documentation – Remote Sensing and Structure from Motion (SFM) Documentation of Megalithic Monuments in Eastern India
Knut Rassmann (DAI)

11:50 Discussion

13:30 Ridge and Furrow Cultivation – New research approaches with new perceptions
Theresa Langewitz (Martin Luther University Halle-Wittenberg)

13:50 The Skulls of the Isle of the Dead Musira (Tanzania). A historical-anthropological research on funerary customs, burial rites and family associations
Barbara Teßmann (Museum für Vor- und Frühgeschichte Berlin) and Marius Kowalak (Berliner Gesellschaft für Anthropologie, Ethnologie und Urgeschichte)

14:10 Discussion

10 ABSTRACTS

Layers of landscape: Anthropological and ethnoarchaeological perspectives
Keynote speaker: S. Reinhold (Eurasia-Department, German Archaeological Institute)
Session organizers: M. Wunderlich*, H. Piezonka
*corresponding, m.wunderlich[at]ufg.uni-kiel.de

Currently, ethnoarchaeology is regaining importance in archaeological understanding and interpretation. One field of interest concerns the roles, meanings, and agency of landscape and its material ‘footprints’. Comparative approaches at the interface of anthropological and archaeological research, and especially the integration of expertise of contemporary communities can lead to a deeper understanding of the entanglement of people with different physical and conceptual layers of landscapes. This concerns for example, natural features and their cosmological dimensions, possible roles of landscape and resources in the reproduction of social structures, its entanglement with society and culture as an agent, and the archaeological visibility of these various aspects.

In our session we will discuss various case studies from different parts of the world that cover a wide socio-economic spectrum. We are interested in looking at hunter-gatherer, herder, and farming, and also industrial societies in different environmental settings from the subpolar regions to the subtropic areas. Particularly welcome are contributions on new methodological approaches and on theoretical aspects. Modern documentation methods such as spatial statistics, 3D documentation, DEM etc. have recently opened up entirely new possibilities for bridging quantitative spatial data with qualitative information from within the societies. Our aim is to explore the potential and limitations of such integrated archaeological-cultural anthropological research and see how this can contribute to a broader and more differentiated understanding of enculturated landscapes.

POSTER SESSION: Red for the dead: ethnobotanical perspective on Cornelian cherries and their meaning in Mesolithic funerals at Vlasac, SE Europe
Dragana Filipovic Institute for Balkan Studies, Belgrade, Serbia
Co-authors: Milica Fetić Akšić, Faculty of Agriculture, University of Belgrade, Serbia; Dragana Dabić Zagorac, Innovation Center, Faculty of Chemistry Ltd, University of Belgrade, Serbia; Maja Natić, Faculty of Chemistry, University of Belgrade, Serbia.

Cornelian cherry (Cornus mas L.) is a small deciduous tree or a bush that grows...
spontaneously in and near oak forests in central and southern Europe and southwestern Asia, and can live up to 200 years. It is known mostly for its edible fruit – orange or red drupes the size of olives and with sharp astringent taste. It is, however, also known for its tough and durable wood, which was highly valued in the Greek and Roman world and is described in ancient texts as an essential material from which weaponry and tools were made. Cornelian cherries are nowadays consumed fresh, but are more commonly turned into jams, juices, alcoholic drinks and similar products.

In traditional medicine, the bark and leaves are also used. It does not surprise then that, in some communities, the tree has a special place in life and plays an important role in celebrations and rituals. The history of use of Cornelian cherry fruit in Europe goes back more than eight millennia, at least to the time of earliest farming settlements in the Balkans. Cornelian cherries were perhaps collected as food, but myriad other purposes are possible, as suggested by their role nowadays and in recent history. In the Mesolithic cremation graves discovered at the site of Vlasac in eastern Serbia, in the Danube Gorges region, charred fruit stones of Cornelian cherry were encountered, in one case in significant number. An idea has been put forward, that Cornelian cherries may have represented an element of the funerary ritual and that their red colour may have given them a symbolic role, linked with life/death. We explore this assumption by experimentally testing the potential of Cornelian cherry fruit and stone to become preserved in cremation fires. We also look into ethno-botanical records to try and grasp the role that this plant could have played in the Mesolithic burial ritual and beyond.

Experiencing landscape – ethnoarchaeological perspectives for ‘landscapes’ and ‘taskscape’

Keynote lecture: Sabine Reinhold (Eurasia-Dept. DAI, Berlin)

How did prehistoric people approach the natural environment in which they lived? Today, we would call it ‘landscape’ and imply therein a culturally-shaped scenery which has, up until a certain point, accumulated layers of social meaning over centuries and millennia. A land deliberately or unconsciously shaped by the everyday practice of its inhabitants with artificial additions such as buildings, villages or monuments, with an infrastructure created by humans and with scars manifested as intrusions into the vegetation and soil or erosion in areas following intensive usage. Perhaps they would have called it a ‘taskscape’, as this environment was the land from which they drew their livelihood. It intertwined them in a wide-ranging spectrum of activities related to economic, social, political or ritual responsibilities. Or perhaps they would instead have called it a ‘lifescape’, the land with which they are entangled and which they occupy both physically as well as cosmologically.

Landscapes – per the definition of the British social anthropologist Tim Ingold, namely, “an array of related features” – are present in the structure of our archaeological sources and their embeddedness in geographical settings. To analyse it, we can utilise mapping, correlations to the environmental background and chronological differentiation of our sources. But when it comes to ‘taskscape’ – or, “an array of related activities” – we have to reconstruct them using the incomplete remains of these once-performed activities and their relation to space. Experimental and ethno-archaeological approaches have proven to be eye-opening in many ways for the understanding of how specific activities could have been performed and what remains might result therefrom. A recent ethno-archaeological study by Peter Jordan on the landscape use and conception of Siberian hunter-gatherers demonstrated that the knowledge of native populations is an additional, indispensable source for the understanding how the activities were structured. Hunter-gatherers as well as pastoralists’ strategies to inhabit land are very different from our own everyday experience, settled in a (post-) agricultural surrounding. They require different viewpoints and different layers of information – they need anthropological and ethno-archaeological perspectives in order to understand them as former ‘lifescapes’.

Landscapes of reindeer herding: land-use dynamics and human-reindeer relations in northern Sápmi c. 700–1800 AD

Oula Seitsonen (University of Oulu)

Domestication of reindeer commenced amongst the Sámi of northern Fennoscandia from 8th century AD, and was accompanied by major cultural changes. This presentation focuses on the diachronic changes in the land-use, interand intra-site settlement patterns and human-environmental relations of Fjell Sámi in northern Sápmi, their homeland stretching across the northern shore of Europe. Ongoing research takes a host of GIS analyses as its starting point, focusing especially on two pivotal periods: 1) the initial domestication of reindeer within a hunter-fisher-gatherer society (c. 700–1050 AD); and 2) the shift to nomadic large-scale reindeer husbandry (c1500–1600/1800 AD). The initial shift from hunting-gathering and fishing based livelihoods to small-scale reindeer herding during the Middle Iron Age changed people’s everyday lifeworlds, environmental perception and human-reindeer relations. This is mirrored in the archaeologically for example by changing campsite organization and structures, most importantly by the introduction of so-called rectangular hearths in the archaeological record. Both the intrasand inter site spatiality of the hearth sites as well as their placing in the landscape differs from the earlier hunter-gatherer sites. Also, the shift to large-scale nomadic pastoralism from Middle Ages is reflected in the archaeological record by similar changes in landuse and camp-site organisation. Nomadic pastoralist sites appear at different locations and with differing features than
the previous rectangular hearth sites, which appear to have been related to the small-scale use of domesticated reindeer. Nomadic pastoralists followed their herds through the landscape year around, "...always coming and going, like migratory birds!", as Sámi elder Gáijóháš has famously stated. The pastoralist landscapes should not be approached as purely anthropogenic constructs. Instead, the agency of animals and things should be acknowledged in a pluralistic perspective. The changes in the herding strategies as well as land-use mirror also important diachronic changes in the human-reindeer relations and encounters.

Sámi place-names and prehistoric hunter-gatherer landscape knowledge in Arctic Europe. Linking ethnographic and archaeological data

Marianne Skandfer (Tromsø University Museum, UiT - The Arctic University of Norway)

Sámi place names and landscape terminology relates to reindeer herding and a spectrum of hunting, fishing and gathering practices. Key elements inherent in the Arctic Norway landscape are critical points along travelling or migration routes, distinct landscape shapes to navigate by and places where different resources can be found. Place names together with narratives refer directly or indirectly to how and which animals move through a particular landscape at a particular time of year, weather conditions, or seasonal-specific good places to dwell. They help people navigate through an unpredictable and highly varied environment. Large rock carving sites established around or shortly after 5000 BC in northernmost Europe were placed at transition points between landscape types, typically at coast-inland transitions. It has been suggested that the rock surfaces, into which figures are carved, are representations of real landscapes, with rivers, lakes, sea and mountains. In that case, a careful selection of key animals and key topographical elements can be suggested to be represented in the rock carvings. The paper explores similarities and differences in how landscape is perceived, as expressed in Sámi place-names and landscape terminology, and Stone Age material. It is argued that ethnographic information can have broad significance for understanding resource management and decision-making strategies in prehistoric northern hunter-gatherer communities, in their meetings with landscapes and animals.

The Taz Selkup: Ethnoarchaeological insights on migration, ethnicity and material culture of hunter-fisher-reindeer herders in the Siberian taiga

Henny Piezonka (Institute of Pre- and Protohistoric Archaeology, Kiel University)
Co-authors: Vladimir Adaev (Tyumen, Russia), Olga Poshekhonova (Tyumen, Russia)

Ethnoarchaeological approaches can greatly contribute to our understanding and interpretation of the archaeological record left by Stone Age hunter-fisher societies of Northern Eurasia by integrating analogies, questions of archaeological visibility, and indigenous knowledge. The northern parts of the Western Siberian taiga have until now remained poorly studied in archaeological and ethnoarchaeological terms. This is mainly due to the difficult accessibility of this remote region for field research. Since 2013, various Early Modern sites (settlements and burial grounds) as well as contemporary settlement structures associated with the Selkup in the taiga between Ob’ and Yenisei have been newly discovered and investigated. In the course of the 17th and 18th centuries, Selkup groups have migrated north into this region from Tomsk province, and in the new territories at the river Taz have partly preserved their nomadic ways as foragers up until today. In the course of the relocation, the material and spiritual culture was transformed under the influence of the neighboring ethnic groups. The Selkup newcomers met local communities of Entsy, an ethnic group related to the Nenets, and in a long series of small-scale fighting and also larger battles the Selkup gradually evicted them from the territory. This history is not only vividly remembered among the Taz Selkup communities even today but has also been inscribed into the landscape by toponyms and stories. A new feature adopted in the north is small scale reindeer husbandry, supplementing economic approaches and in turn affecting seasonal cycles, mobility within the landscape and associated settlement systems and life ways. Thus, the sub-recent, historically documented Selkup migration is of immense potential both from an anthropological and archaeological point of view because it allows us to trace the causes and mechanisms of adaptation to the new environments and its effects on material and immaterial culture, language, ethnic self-perception and inter-group relations against the background data from the southern original homelands. Ethnoarchaeological fieldwork of a Russian-German team which started in 2016 on the upper Taz is focusing on temporary settlements of the early modern period up until present times, shedding light on changing patterns of landscape use and site location, seasonal cycles, subsistence economy, dwelling types, customs and rituals. By combining various strands of evidence (archaeological and ethnoarchaeological survey and excavation, ethnohistory, cultural anthropology and oral history) we can trace the complex processes connected to the Selkup establishment in this region and their appropriation of the landscape. We can also test the material footprint of these processes as well as its restrictions, indicating just how much caution is needed when there is only the archaeological record left for the reconstruction of past conditions, relations and realities.

From hunting and fishing to herding. Strategies of adaptation among forest-steppe populations in Western Siberia in the 2nd millennium BC

SESSION 10
Sabine Reinhold (Eurasia-Department, German Archaeological Institute)  
Co-author: Zhanna Marchenko (Institute of Archaeology and Ethnography Siberian Branch of the Russian Academy of Sciences (IAET SB RAS)

One of the most important adaptations of societies at the northern frontier of the Eurasian steppe belt was the transition from a hunter-gatherer to a pastoral economy during the Bronze Age. There are several hypotheses regarding the timeframe and the trajectories of this development: but if, when, why, and how this transition happened is still largely unknown. Archaeological approaches have so far argued from the presence of domesticated animals in the find assemblages from the 3rd millennium BC, but the adaptation of a food-producing way of economy based on herded animals addresses a much wider spectrum of ideological and cognitive topics than purely economic ones. How did human practice change with the challenge of an entirely new spectrum of activities? How spatial patterns of activity and food production? How was the shift from hunting to herding mastered in terms of contrastive worldviews? Modern societies with respective economic practices reveal strong differences in the perception of animals and humans as part of contrarily integrated cosmological systems. Initiated by Tim Ingold’s article ‘From trust to domination’ 2002, differences in perception but likewise in everyday practice is discussed. The ethnography of Siberia offers a broad spectrum of comparative studies in the use and conceptualisation of landscape, exploration areas, as well as habitation and burial places. We will draw from this data and the debate on changing cognitive systems during the transition from foraging to producing economies and try to evaluate data from Western Siberian Bronze Age cemeteries in the Baraba steppe where such an economic shift is discussed, most likely associated with an advance of new populations into the forest-steppeand forest-zone. Did the everyday practice of the local and new communities indeed changed dramatically? How was cultural and economic interaction operated? Were there consequences in activity pattern, in the shaping of foraging or pastoral landscapes? And, do we find indications for changes in the perception of animal-human interrelations between foraging and pastoral communities, as e.g. postulated by Ingold in the prehistoric data from Siberia?

Molecular footprints of animal husbandry in two ecological zones in Eastern Mongolia: implications for archaeological research

Natalia Eguez (Kiel University)  
Co-author: Ms. Cheryl Makarewicz (Kiel University)

The seasonal usage and relative intensity of occupation of pastoralist camps, are an important temporal variable in mobile societies, but difficult to directly detect in the archaeological record. Molecular proxies concealed in soil lipids hold great potential for palaeoenvironmental reconstruction when applied to organic-rich archaeological pastoral contexts. The analysis of plant n-alkanes extracted from livestock dung provides insights into animal diet composition and, by taking advantage of environmental seasonality that impacts floral growth, fodder management. To this end, we conducted compound-specific carbon stable isotope analysis of plant n-alkanes on caprine dung deposits deposited in pastoral nomadic winter campsites located in two contrasting phytogeographic zones, the forest-steppe and desert-steppe in Eastern Mongolia. Here, we conduct carbon isotope analysis (δ13C) of plant n-alkanes of dung deposits associated with pastoral nomadic winter campsites in Mongolia in order to explore the origin of plant organic matter ingested by livestock and evaluate potential biomolecular signatures associated with the intensity and duration of dung deposition. Preliminary results suggest that intensity of stalling, and the composition of plants ingested by livestock are identifiable in dung samples recovered from corrals with this method. In particular, δ13C values in plant n-alkanes in dung deposits are unusually low compared to carbon isotope values of nalkanes derived from soil control samples recovered from landscapes with minimal, if any, anthropic activity. These results highlight the importance of ethnoarchaeological studies in identifying biomarkers at the molecular scale that convey information on pastoralist animal exploitation practices.

Abandoned cities in the steppe. Ethnoarchaeological research at early modern religious and military centres in nomadic Mongolia

Jonathan Ethier (Institute of Pre- and Protohistoric Archaeology, Kiel University)  
Co-authors: Birte Ahrens, Martin Oczipka, Henny Piezonka, Christian Ressel, and Sampildovdov Chuluun

Towns and cities have been an integral part of the Mongolian nomadic society for more than a millennium, and abandoned urban sites from various periods dot the land, inscribing memories of lost empires and long-gone alliances into the cultural landscape. The relation between sedentary urban and mobile herder lifeways has constituted a key cultural, economic and political factor in one of the major pastoralist formations in Eurasia. In the 21st century, it is gaining increasing importance in the negotiation of the conception as well as the future of Mongol national identity. Instances of urbanization in Mongolia have a long-standing and specific history, starting with the mighty capitals of the Medieval steppe kingdoms, continuing with colonial institutions in the Early Modern period and the establishment of administrative and industrial centres during the socialist period, and culminating today with an unprecedented rural exodus into the modern capital of Ulaanbaatar and a few other major cities. The era in which most modern cities on Mongolian soil are rooted is
the period of Manchu rule during the Qing dynasty in the 17th to early 20th centuries. It is this period which saw the establishment of Buddhist monasteries as centres of trade, education and permanent settlement, and the installation of colonial military posts. Subsequent political developments connected to the end of the Manchu rule and the rise of socialist policies in the early 20th century led to the abandonment or, in the case of monastic sites, to forced destruction of many of these urban focal points, leaving the places inscribed in the topography as ruins and evermore diminishing structures. Nevertheless, local oral traditions, place names and conceptions of regional enculturated landscapes have partly preserved the memory of those lost cities and in cases may refer to them in the narratives on local historical roots and the backward projection of identities into a pre-industrial past. Since 2017, a Mongolian-German pilot project combines archaeological, geo-information, historical and ethnographic methods to trace the entanglement of social, political and cosmological dimensions of abandoned Manchu period urban settlements. In the research area located in central Mongolia, selected monastic (e.g. Old Shankh monastery) and military settlements (in the Khangai Mountains) are investigated to gain insights into two contrasting models of Manchu period urbanism and their changing perception over time. Surface surveys, high-resolution aerial photography and digital elevation models conducted in 2018 enable the detailed assessment layout and architecture of the sites themselves, of previously unknown structures in the vicinity and of the surrounding natural landscape. In this paper, we will present the first promising results of this ongoing investigation and outline our expectation for future research which is planned to include small-scale excavations, the documentation of local knowledge and narratives as well as archive work on written sources. We will show the value and potential of archaeological and ethnoarchaeological studies of Mongolia under the Qing regime and indicate how this research project will contribute in reopening this influential past at the heart of the Mongolian identity and lifeways.

**Beyond counting sheep: and interdisciplinary review of the Medieval British pastoral landscape**
*Roxanne Guildford (University of Edinburgh)*

Zooarchaeological research analyses faunal remains to explore the relationship between animal husbandry and cultural and environmental change in the past. To further this research agenda, quantitative methods in archaeology must evolve toward better interpretations of large, aggregated data sets that can illuminate patterns across human landscapes. The application of computational archaeology to zooarchaeology opens scope for the study of both regional trends and inter-site variability for increasingly complex data sets integrated with environmental, geographic, or temporal variables. The advent of open-source software and open data in archaeological research further allow for dissemination of large bodies of information, interdisciplinary meta-analysis, and accessible reproduction of results. This project is part of an ongoing Ph.D. thesis that examines the intensification of sheep husbandry in relation to wool production during the Medieval period in Britain, using computational and zooarchaeological methods to refine previous interpretations of economic changes in farming. Datasets from published assemblages are presented in case studies that move beyond descriptive approaches and visualization based on derived metrics, towards interpretations that explore statistical variation in faunal assemblages associated with reorganization of the pastoral landscape. Advancement in zooarchaeological methodology that considers synthesizing multidisciplinary data and technology will assist in future collaboration within research teams, create new perspectives on site variability, and enhance our current understanding of past socio-environmental relationships.

**Catching the Past - Fishing techniques from the Lower Danube Region in the 5th mill. BC and today**
*Mihaela Savu (Graduate School Human Development in Landscapes)*
*Co-author: Michael Müller (Freie Universität Berlin)*

The Danube Delta represents the largest European wetland, as well as one of its most diverse deltas, characterized by a rich biotope, which houses 30 types of ecosystems. Another significant feature is the particular population dynamics, represented by at least 13 different ethnical groups. Given the abundance of water bodies and various fauna species, among traditional activities, fishing constitutes one of the most long-lasting ones, alongside sheep and cattle breeding, beekeeping or the harvesting of medicinal plants. To this day, only few places are suitable for practising agriculture which are barely defended from periodical floodings. With all this in mind, we conducted a short-term ethnographic survey in two fishing villages located in the Danube Delta and in one town from the Lower Danube region in Bulgaria. Sfântu Gheorghe, the first village surveyed, is placed at the mouth of the Danube into the Black Sea. There, in the 18th century AD, the Cossacks or “haholi”, who are of ethnic Ukrainian origin, settled while fleeing from the Russians. The second village, Milla 23, is located on one of the navigation channels of the Danube. Here settled a community of Russian Lipovans (Starovers), which fled from Russia in the mid 17th century. While from the 15th century the Cossacks were already seen as a group practising hunting, fishing, beekeeping, etc., the Lipovans’ circumstances of settling imposed on them a similar trajectory, determining them to direct their occupation mainly towards fishing. These groups did not only bring their traditional clothes, architectural styles or celebrations with them, but also particular fishing techniques and instruments. This
way, the Lipovans rapidly became famous for building narrow black fishing boats, or "lotcas", for fast navigation among reed. In 1916, Grigore Antipa, a Romanian biologist, collected and illustrated fishing utensils used for capturing different species of fish in Romania. Most of the techniques described by him in his book are only focused on the targeted species and the fishing medium, and less on the cultural aspects. Hence, the third location selected for surveying was chosen for comparison grounds. Through the collected information, we try to understand the practice of fishing from prehistoric times, considering the few known categories of possible instruments used at the time, the landscapes dynamics and fauna availability, the fish specimens identified in the zooarchaeological record, as well as the poor preservation of organic material, and furthermore, the lack of navigation instruments or vegetal fibres. Although the modern communities studied by us have certainly not much to do with those from a few millennia back, we wanted to observe which techniques are used to target certain fish species in the Danube nowadays and to see if any of these techniques are comparable to the ones we reconstructed for the 6th and 5th millennia BC. We were also interested in examining how much, if at all, was transmitted in matters of tools and methods from one ethnic group to the next and also what impact the industrialization during Communism and after had on the communities, especially regarding the practice of fishing.

**Fortifications and topography – ethnographical examples for the usage of landscape as an element of defensive systems**

*Andy Reymann (Goethe-University Frankfurt; LOEWE-Project “Prehistoric Conflict research.”)*

In the past decade, the study of prehistoric forms of warfare has reached a new climax. Overcoming the old way of interpreting prehistory as a “pacified past”, new research has been done on weapon technology, human remains with signs of violence, battle fields, iconography showing early warriors, and also on fortified places, which could have been places of greater conflicts. But many times, archaeologists in Europe were focusing especially on those remains of prehistoric fortifications, which were fitting into an eurocentric model of being “defendable”, meaning those kinds of walls, ramparts and ditches, which can be dated into Bronze and Iron Age – the times, it is said, when societies became more complex and therefore “invented” real warfare. Other types of fortifications were most often ignored. Not only, because they are hard to trace in the archaeological record, but also because the corresponding societies were not considered to be capable of conducting real and elaborated forms of warfare. But recent archaeological, ethnographical and ethno-archaeological investigations show quite the opposite – warfare was conducted long before societies evolved to states and fortifications were erected on a usual and very effective base even among non-sedentary and highly mobile groups. The projected talk will focus especially on some often neglected and ignored types of fortifications, like the usage of a defensive landscape for settlements, the inclusion of plants, hedges and fences into defensive considerations and several other defensive element, erected defend a group in the case of an suspected upcoming conflict. Ethnographical sources and case studies from different parts of the world will be shown to give an impression about those quite wide variability of defensive features, which tell us, that it doesn't need a "complex society", to build complex defensive systems.

**Landscapes of communal frames, economic inequality and social signaling in Nagaland, North-East India**

*Co-Author: Ditamülu Vasa (Nagaland University)*

Despite being only marginally known in European archaeology, North-East India offers a rich environment of diverse case studies, which can be classified both as archaeological, as well as ethnoarchaeological and offers insights into the production of social landscapes. Within the naturally and socially variable landscape of North-East India, Nagaland stands out as an example of recent megalith building activities. The erection of standing stones and megalithic monuments stopped around 60 years ago but left impressive markers in the hilly landscape of Nagaland. Megalith building in the southern part of Nagaland can be characterized as a framework in which partly contradicting actions of social reproduction were performed. Embedded in the construction of megalithic monuments is a series of feasting activities that can involve high investments of personal property. Therefore economic inequality and competitive behavior of different actors are involved in strategies to cope with the investments required for megalith building. Those circumstances are met by and partly fostered communal strategies, cooperation and solidarity among individuals and groups.

During the course of ethnoarchaeological fieldwork in the southern part of Nagaland in 2016, it was possible to document the complex and meaningful spheres of habitation, interaction and economic activities. Within these spheres, or layers of landscape, megalithic monuments can be seen as an important conjunctive element, bridging the gap between the communal frame of habitation and the economic activity zones. This organization of landscape integrates and connects the economic zones, as foundation of economic inequalities, into a social frame. Therefore, Nagaland offers a rich example of the meaningful entanglements of spheres of social reproduction and conditions within the landscape of daily life.
In human history, landscape transformation through agricultural activities is tremendous all over the world. An example of man-made landscape modifications are ridges and furrows widely distributed in Northern and Western Europe. These agricultural remains are characterized by ridges up to 1 m high and up to 17 m wide and lengths often more than 400 m. It is commonly assumed that ridge and furrow cultivation occurred through the use of sod-turning ploughs in medieval times. Soil was accumulated towards the center by moving circular during single-sided ploughing which led to a gradually development of ridges and furrows. However, there are critical voices suggesting to reconsider the i) development; ii) benefit; iii) cultivation technique and iv) age of ridge and furrows, at least at some locations. Our interdisciplinary project, funded by the German Research Foundation (DFG), aims to clarify the mentioned points in the Altmark region and the foothills of the Harz Mountains in Northern and Central Germany, where wide forest areas are still covered by ridge and furrows. Beside the evaluation of LiDAR data and historical written sources, field descriptions of ridge and furrows were performed and soil samples were taken for subsequent laboratory soil analysis. In addition to standard soil analyses, state-of-the-art methods including stable isotope and molecular markers such as δ13C, δ15N, black carbon, Δ5-sterols and bile acids will be conducted. Additionally, we used various dating methods such as OSL, radiocarbon dating and diagnostic artifacts (e.g. ceramics). OSL as well as radiocarbon dating revealed that at least some ridge and furrows might be created much earlier than commonly known – if an earlier soil cultivation independent from ridge and furrow can be excluded. Furthermore, some ridge and furrow soil profiles show a well-preserved fossil topsoil (fAh) in +/- 40-50 cm soil depth. It can therefore be assumed, that additional other techniques than ploughing might be used for ridge and furrow formation. Our first laboratory investigations showed that nutrient stocks (P, N) of ridge and furrows differ within the same but also between the two study regions. Especially the differences within the same region with comparable soil texture and vegetation cover, might indicate different manuring practices. We will clarify this question by using the mentioned molecular markers in order to identify ancient input materials such as animal and human excrements. The first results of our study strongly suggest that ancient ridge and furrows are highly diverse and need to be individually considered depending from their time of origin, (historical) natural landscape conditions but also regarding the cultural background and available resources at the time of formation.

The Skulls of the Isle of the Dead Musira (Tanzania). A historical-anthropological research on funerary customs, burial rites and family associations

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Scales of Documentation – Remote Sensing and Structure from Motion (SFM) Documentation of Megalithic Monuments in Eastern India

Knut Rassmann (DAI)
Co-authors: Johannes Kalmbach, Tiatoshi Jamir

The wealth of megalithic monuments in Eastern India is widely known and presented in a great number of publications. The long research tradition, however, focused on cultural aspects like feasting and social relations and much less on the monuments themselves. Consequently, a systematic recording of the monuments is still a desideratum. Results of the first systematic fieldwork in southern Nagaland were published in a study by M. Wunderlich in 2018. The study is based on the recording of size via GPS coordinates of several hundreds of monuments in the periphery of selected villages. Additionally, photographs were taken of each monument. In some cases groups of monuments were documented by SFM models generated from these pictures by conventional cameras. These SFM models delivered valuable results regarding the size of objects, their preservation, and microtopography, however, for the recording of larger groups of standing stones the application of conventional cameras is insufficient. In order to optimize the documentation workflow, a drone was introduced in a second field campaign in 2018. In addition to the Nagaland specimen, exceptional monument groups in Manipur and Megalaya were recorded. The combination of drone and conventional camera photography enabled us to document the monuments on different scales, i.e. from single monuments to groups of monuments and finally within the context of the adjacent villages. The SFM software together with the GPS coordinates of the photos give us the precise location and measurements of the monuments. The combination of SFM and high resolution satellite images facilitates embedding the data into the surrounding landscape on a broader scale and is further helpful for the correction of the coordinates.

The fieldwork in 2018 was used to introduce the SFM software and the application of drones to our colleagues at the Kohima University. Preliminary results confirm the high potential of drone based SFM models for the documentation of megalithic monuments. A systematic use of this workflow is tailor made for a systematic recording of the megalithic landscapes in Eastern India.

Ridge and Furrow Cultivation – New research approaches with new perceptions

Theresa Longewitz (Martin Luther University Halle-Wittenberg)
Co-authors: Mechthild Klam (State Office for Management and Archaeology Saxony-Anhalt) Katjia Wiedner (Martin Luther University Halle-Wittenberg)
Barbara Teßmann (Museum für Vor- und Frühgeschichte Berlin) and Marius Kowalak (Berliner Gesellschaft für Anthropologie, Ethnologie und Urgeschichte)

In 2011, the museum for pre- and protohistory Berlin (MVF) took over several anthropological collections from the Charité, including the so-called ‘S-collection’ of Felix von Luschan. Together with the Rudolf Virchow Skull Collection, the MVF’s collection comprises some 11,000 skulls and several hundred skeletons, making it one of the largest skull collections in the world. By taking over these collections, the MVF has set itself a difficult task, as some of the collections are related to the colonial history of the German Empire. The interdisciplinary project on the recontextualisation of human remains from Africa with a colonial acquisition background is a pilot project investigating the provenance of 1196 skulls from the former German East African collections of Felix von Luschan, Rudolf Virchows and other parts of the collection. With the help of anthropological research methods and historical source research in cooperation with scholars from the societies of origin, the mutual interdependencies of the acquisition circumstances are to be clarified.

Rising from Lake Victoria in northwestern Tanzania, the island of Musira shapes the surrounding landscape of the city of Bukoba. Today known as a fishing and former prison island, it served in pre-colonial times as a burial place for parts of the local population, primarily high-ranking male Haya. On the basis of the historical research and the anthropological research results, the change of use of the island and the living conditions of the indigenous population will be examined.

11 Social resilience to climate changes with perspectives on the past 5000 years

Wednesday March 13th until Friday March 15th, Lecture hall
Session organizers: L. Yang, M. Weinelt, J. Seguin, I. Unkel, J. Kneisel, A. Ribeiro

WED 15:30: POSTER SESSION Analysis of the Evolution of Extreme Drought Events Based on Complex Networks - Take Dingwu Qihuang as an example
Xianshuai Zhai (Faculty of Geographical Science, Beijing Normal University, China)

POSTER SESSION The Africa Story: Social Resilience to Climate Changes with Perspectives in the past 5000 years
Queen Linda Chinovina (University of Zimbabwe)

POSTER SESSION Disentangling climate and human factors in the settlement of the Maori in the North Island of New Zealand: A multi-proxy approach
Ronald Lloren (Department of Earth Sciences, ETH Zürich)

POSTER SESSION Historical Environmental Extreme Events in China: Magic, Mysteries, and Challenges
Hongming He (Faculty of Geosciences, South China Normal University)

POSTER SESSION Holocene sediment transfer and monsoon variability with human settlement in the Godavari River of Peninsular India: Inferences from Mineral Magnetism
Y. R. Kulkarni (Department of Civil Engineering, Gharda Institute of Technology, Khed- 415708, India)

POSTER SESSION Transmission pathways of China’s historical climate change impacts based on a food security frame work
Jia He (Faculty of Geographical Science, Beijing Normal University)

POSTER SESSION Modeling the social resilience of mountain communities to climate change extreme events: A case of Northern areas of Pakistan
Muhammad Abid (Centre for Climate Research and Development, COMSATS University, Islamabad, Pakistan)
THU 08:30 Megadrought, Collapse and Resilience at 4.2 ka BP across West Asia
Lecture hall
Keynote lecture: Harvey Weiss (School of Forestry & Environmental Studies, Yale University)
09:00 The Roman Empire: on the brink of collapse?
Paul Erdkamp (Vrije Universiteit Brussel)
09:20 Boom and bust cycles in Neolithic Europe: climate sensitivity or social dynamics?
Kai Wirtz (Helmholtz-Zentrum Geesthacht, Germany)
09:40 The Toledo Mountains, a resilient landscape and a landscape for resilience. Hazards and strategies in a mid-mountain complex in central Spain
Reyes Luelmo-Lautenschlaeger (CSIC-UAM)
10:30 Social resilience to climate changes in the Lake Ladoga basin during the past 5000 years
Tatyana Sapelko (Institute of Limnology RAS, St.Petersburg, Russia)
10:50 Cold and dry winters 4200 years ago in the Northern Hemisphere and their impact on human societies
Aurel Persoiu (Institute of Speleology, Romanian Academy, Cluj Napoca, 400006, Romania)
11:10 Paleo-climatic impacts and socio-cultural system resilience along the historical Silk Road
Liang Emlyn Yang (GSHDL, Kiel University)
11:30 The Utopia of the mountain: resilience and collapse of a social-environmental system
Alessio Cinti (MIUR - Italian Ministry of Education)
11:50 Discussion

10:30 Impact of climate change and resilience of human societies in Eurasian continent during the last millennium
Keynote lecture: David Dian Zhang (School of Geographical Sciences, Guangzhou University, Guangzhou, Guangdong Province, China)
11:30 Temperature changes and difference of hydro-climatic pattern between centennial cold and warm periods in China for the past 2000 years
Keynote lecture: Jingyun Zheng (Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences)
14:00 NEO-ARABIA: Analysis of sustainability and reorganisation of Arabian coastal Neolithic socio-ecological systems during the Mid-Holocene period (6.2-2.8 ka BC)
Jean-Francois Berger (UMR 5600 CNRS, University of Lyon, France)
14:20 Response of cultural evolution to climate change during late prehistoric and historical periods in the Hexi Corridor, northwest China
Liu Yang (College of Earth & Environmental Sciences, Lanzhou University)
14:40 Bell Beakers and the 4.2ka event: when worlds collide?
Jos Kleijne (Institute for Prehistoric and Protohistoric Archaeology, Kiel University)
15:30 How was the ancient trans-Eurasia culture exchange affected by climate change?
Guanghui Dong (College of Earth & Environmental Sciences, Lanzhou University)
15:50 How to ‘downsize’ a complex society: experiments with agent-based models to assess the resilience of Indus Civilisation settlements to past climate change
Andreas Angourakis (University of Cambridge)
16:10 Rethinking the 8.2 cal BP event: Resilience and Collapse in the Konya Plain in Central Anatolia
Peter Biehl (Department of Anthropology, University of Buffalo)
16:30 Long-term socio-ecological change in Cambodia Part 2: the exacerbating influence of control structures and material inflexibility on social resilience
Tegan Hall (University of Sidney)
16:50 Discussion

FRI 08:30 Temperature changes and difference of hydro-climatic pattern between centennial cold and warm periods in China for the past 2000 years
Keynote lecture: Jingyun Zheng (Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences)
09:00 Resilience and Landscape Transformation during the Bronze and Iron Age in a Mountain Steppe (Tsaghkahovit Plain, Armenia)
Amy Cromartie (Cornell University; ISEM, Université de Montpellier)

09:20 Climate change and the grain price anomaly around the turn of the 19th century in North China Plain
Yanjun Wen (Faculty of Geographical Science, Beijing Normal University, Beijing 100875, China)

09:40 Is landscape intensity resilient? A comparative view from South Asia
Adam Green (University of Cambridge)

10:30 Impacts of recurring extreme climatic events on societies and landscapes in Provence and Southern French Alps during the past 800 years
Nicolas Maughan (Aix-Marseille University)

10:50 Temperature changes during the past millennium along the Ancient Silk Road and Social events
Zhixin Hao (Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences)

11:10 Aridization and social resilience in Argentinean Andean prehistory
Malena Pirola (Instituto de Arqueología, FFyL-UBA / CONICET)

11:30 Ancestral Puebloan maize farmers in Utah distribution and growing season length using a statistically downscaled climate model, 850-1450 CE
Marcus Thomson (International Institute for Applied Systems Analysis (IIASA), Laxenburg, Austria)

11:50 Discussion

13:30 Political Participation and Social Resilience to Climate-Related Disasters
Keynote lecture: Peter Peregrine (Lawrence University, Appleton, Wisconsin USA)

14:00 Integrating collapse theories to understand robust designs for social-ecological systems governance
Cathy Rubinos (Universidad Del Pacifico, Lima Peru and Center for Behavior, Institutions and Environment, ASU)

14:20 How Europe and the Qing Dynasty Endured the Little Ice Age: Social Resilience, Norms, and Adaptable Governance
Susann Handke (Erasmus School of Law, Rotterdam)

14:40 The role of swidden agriculture in contributing to long-term socio-ecological resilience in north-east Cambodia
Rebecca Hamilton (School of Culture, History and Language, The Australian National University)
The topic of this session is interdisciplinary and can be of broad interest to geologists, historians, archaeologists, geographers, paleo-environmentalists, paleo-climatologists, and cultural-sociologists. The session is expected to advance our understanding of the interaction between cases of socio-cultural resilience and climate change in time and space, and to utilize this knowledge in supporting current sustainable development at the local, regional, and global levels. The topic of social resilience in this session may further relate to sessions of complex social networks (Nakoinz, et al., Session 6) or marine connections in the Mediterranean regions (Rutter, et al., Session 7), as network connects are an essential feature of social systems.

**POSTER SESSION: Analysis of the Evolution of Extreme Drought Events**

**Based on Complex Networks - Take Dingwu Qihuang as an example**

Xianshuai Zhai (Faculty of Geographical Science, Beijing Normal University, China)

Co-author: Su Yun

Dingwu Qihuang as a famous drought in the historical period of China, explored its specific evolutionary process in the human-environment couple system providing empirical evidence for understanding the impact of climate change and major disasters and the adaptation mechanism. Based on the historical literature data, this paper uses complex networks to reconstruct the evolution process of Dingwu Qihuang from 1876 to 1879, identifying key evolution events and core evolutionary paths, and analyzing each of them in detail according to the elements of "disaster origin→disaster process→response. To analyze in detail the transmission process of disaster impact in the human-environment couple system. (1) The complexity of the disaster event evolution reached its peak in 1877, and the network has no scale characteristics in 1876-1879, indicating that there are key nodes affecting network evolution grain failure and high food prices. Therefore, when the extreme climate impact is transmitted in the human-environment couple system, the production system and the economic system are the transfer stations that control the impact transmission, while the economic system and the political system adjust and feedback the transmission of the disaster impact to prevent further transmission. (2) With the development of drought, the role of extreme climate in the evolution process of disasters is gradually reduced. The level of delivery is also reduced by the complexity, the number of systems passing through is reduced, but the system level at the beginning of delivery is higher when the extreme climate impacts in the human-environment couple system. (3) According to community analysis, different disaster events can be transmitted to different levels of the human-environment couple system in beginning of drought. But with the development of drought, the phenomenon is not obvious.
This paper analyses the relationship between social resilience and climate change by tracing the trends from prehistoric, historic and contemporary. It made use of document analysis and desktop analysis to decipher data on the history of social resilience and climate changes in old cities up to the current cities globally, regionally and at a local level. Social resilience is here defined as the capability of a human social system to cope with stresses, maintain its function and evolve into a more sustainable society with respect to climate stresses. There has been much debate on adaptation to climate change where studies have focused on how human species may adapt, have adapted, or are adapting to climate changes looking at how the society can respond to such. The missing link in the existing scholarship has been of the traces on trends in climate changes thus prehistoric, historic and current. There has not been much link between social resilience and climate change rather the solutions to climate change for long have remained scientific. The effects of climate change can be traced from as early as the 19th Century where people lived in caves and their lifestyle was more nomadic hence referred to as the paleo-climatic period. With time due to changes in climate people began to settle leading to the formation of societies and communities. Caves became their homes and keeping of livestock and crop cultivation (agricultural activities) defined their economic and social structure. In Egypt, for example, the Nile River would attract people due to the availability of water and this gave shape to a settlement. However, during flooding they would come up with some alternatives such as the use of the canal system. With time, most of the African cities were colonised and this had an impact on their lifestyle. There were some changes in the way they lived and their place of habitation. In Southern Africa, most countries were characterised by a primitive way of life and as soon as they were colonised some people migrated to other areas for safety and protection against the invaders. The colonial system led to the period of historic era where cities were now being formed adopting for example the British way of life. During this period, there was less focus on climate. However, as cities grew and developments in the cities began to grow some of the activities have contributed to the changes in climate change. Contemporary societies are modernised and the activities are controlled and influenced by technology. Due to this technology, they are adapting to changes hence withstanding the shocks and stresses faced. As such, strengthening of adaptation mechanisms might enhance a reduction in social vulnerability by encouraging people or the community to work together in dealing with the threat of climate change hence social resilience.
The Middle to Late Holocene monsoonal variations largely impacted the fluvial regimes and the early human settlements in the Indian subcontinent. We studied the mineral magnetic properties of floodplain sediments from the Godavari drainage basin and AMS 14C dated core sediments from the Godavari delta. Our results showed that the characteristic ferrimagnetic mineralogy of the Deccan basalt dominated the floodplain sediments all along the Godavari River and the Middle to Late Holocene sediments in the delta. A general increasing trend in ferrimagnetic mineralogy is observed from Middle to Late Holocene sediments with the events of abrupt increase in Deccan source during ~4.9 and ~3.2 cal ka BP which coincides with the expansion of Jorwe culture of Maharashtra. The increased influx from the Deccan source near 3.2 cal ka BP suggests intensified erosion in the Western part of the basin as a result of decreased vegetation cover. We suggest that this phenomenon greatly influenced the adaptation and cultural practices of the Jorwe culture during the Middle Chalcolithic period in this region.

POSTER SESSION: Holocene sediment transfer and monsoon variability with human settlement in the Godavari River of Peninsular India: Inferences from Mineral Magnetism

Y. R. Kulkarni (Department of Civil Engineering, Gharda Institute of Technology, Khed-415708, India)

Co-authors: S. J. Sangode1, D.C. Meshram1, K. Nageshwar Rao1 and Yoshiki Saito2
1 Department of Geology, S.P. Pune University, Pune, India
2 Department of Geo-engineering, Andhra University, India
3 Estuary Research Center, Shimane University, Japan

POSTER SESSION: Transmission pathways of China’s historical climate change impacts based on a food security framework

Jia He (Faculty of Geographical Science, Beijing Normal University), PhD student
Co-authors: Yun Su, Xiuxi Fang, Jingchao Teng

There are still many uncertainties about how climate change affects the development of human society. The impact of climate change is likely to be weakened or amplified by the response and adaptation of the reciprocal feedback process after entering the socio-economical subsystem. The study of the climate change impact processes is the basis for understanding the mechanisms of climate change impacts. Furthermore, long-term research of climate change impacts can provide historical similarity and experience for current or future adaptation of climate change. Ancient China was traditionally an agricultural country. Its food production safety, food supply safety and food consumption safety reflect the impacts of climate change being transferred from a production subsystem, to a population subsystem to an economic subsystem.

Based on a conceptual framework of food security, we selected 10-year resolution sequences of grain harvest grades, famine indices, and economic levels in China over the past 2000 years (206BC-1911AD) to quantify and recognize the main transmission pathways of climate change impacts during cold and warm units of climate change. Our results were as follows: (1) According to the transmission relationship climate change–grain harvests–famines–economic levels, there are 16 main transmission pathways, including 10 pathways starting from cold units and 6 pathways starting from warm units. (2) The main pathway is dominated by natural factors and socio-economic factors, with each factor set accounting for approximately 50%. However, the probability of the main pathways with socio-economic influence leading toward negative developments was 60% for cold units, and the probability of the main pathways with socio-economic influence leading towards positive developments was 66.7% for warm units. According to the main pathway led by natural factors, all transmission pathways in cold units (100%), 14.7% of the depressed economy may be more directly related to climate change. However, 32.3% of the prosperous economy may have a more direct relationship with climate change in warm units (100%). (3) Famine is the most important link in the climate change influence on transmission chains regulated by socio-economic factors. Famine reflects both poor harvests due to the natural production subsystem and a lack of grain allocation by the socio-economic subsystem or the government’s ability to eliminate famine. Thus, there may be another pathway of transmission, such as, climate change–agricultural yield/grain production–economic prosperity–famine relief (social vulnerability).

POSTER SESSION: Modeling the social resilience of mountain communities to climate change extreme events: A case of Northern areas of Pakistan

Muhammad Abid (Centre for Climate Research and Development, COMSATS University, Islamabad, Pakistan)

Climate change is a reality and affecting the human societies in multiple ways by interacting with socioeconomic and natural systems. In order to enhance the resilience of human societies to climate change and related extreme events, a full understanding of factors that contribute to the vulnerability and resilience of society to multiple climatic impacts is required. This study is designed to fill the important research gaps in understanding the resilience of mountain communities in Pakistan through modeling their resilience using multiple indicators from social as well natural systems. This study first developed a hypothetical model of social resilience where social resilience is measured considering social, economic, historical, environmental and institutional factors. Further, the interactions between individuals, community and institutional are
The study findings show that social capital and social beliefs and social structures play an important role in building social resilience. It is also observed that people living in joint family system and are well-connected to their social networks have more indigenous knowledge of historical changes in climate and natural systems and hence are more resilient. Moreover, we found that historical information on past extreme events is essential in shaping local perceptions and resilience as such knowledge is seen to be used by the communities to the improved formulation of resource management strategies. In other words, we could say that the present nature and complexity of socio-ecological systems is heavily contingent on the past and could be understood more by going back to decades and centuries. Similarly, institutional factors particularly access to infrastructure facilities, credit and information are also crucial in determining social resilience. The findings of this study will not only fill a significant research gap in structuring and measuring the social resilience of mountain communities but also identify gaps in current social systems that needs to be filled to improve their social resilience to ongoing and future climatic changes.

Megadrought, Collapse and Resilience at 4.2 ka BP across West Asia

Keynote lecture: Harvey Weiss (School of Forestry & Environmental Studies, Yale University)

Decadal to century-scale megadroughts are a recently discovered but now well-documented feature of the Holocene. A major and much-discussed example is the abrupt global megadrought and cooling at ca. 4.2-3.9 ka BP (ca. 2200-1900 BC). Data for this megadrought are derived from analyses of lake and marine sediments, glacial and speleothem cores, and treerings. In the eastern hemisphere, these high-resolution proxy records extend across the Mediterranean to East Asia and Australia and across the African continent, from Algeria to South Africa. In the western hemisphere, the proxy records extend from Greenland and Iceland to the Caribbean, across North America down the western coast of South America from Peru to Patagonia and the Antarctic. The very highest resolution records for the 4.2 ka BP megadrought include, prominently, the estimated 30% reduction in precipitation delivered by the Mediterranean westerlies in the eastern hemisphere, where they provided for dry-farming and irrigation agriculture across the Aegean, Levant, Anatolia, Mesopotamia, and Iran, and the Indian Summer Monsoon that controlled Indus and Nile valley river flows. Here, widely distributed and organizationally different, cereal-agriculture-based societies collapsed synchronously and coincident with the megadrought. The archaeological record for these societal collapses includes (1) intensive regional settlement surveys (2) high-resolution radiocarbon dating for abrupt abandonments in dry-farming domains across the scales of settlement, from villages to cities, and (3) epigraphic and radiocarbon data for the collapses of the region-wide, expanding Mesopotamian Akkadian Empire and the Nile-based Egyptian Old Kingdom. In these rain-fed agriculture regions, the adaptive societal response linked with abandonment was resilient habitat-tracking to riparian, paludal and karstic refugia along the banks of the Euphrates River and the karst-spring fed Orontes River. The abrupt desiccation also forced pastoralist tribal groups, Amorites, to seek refugia along and down the Euphrates River. This infiltration of southern Mesopotamian urban kingdoms prompted their dynasts to construct the “Repeller of the Amorites” wall recorded in contemporary records. The wall proved porous, however, and within a few generations the former pastoralists’ descendants became the Amorite rulers of Babylon. Indeed, the megadrought at 4.2-3.9 ka BP, serendipitously the best-documented period in cuneiform sources for southern Mesopotamia, was previously understood to represent inherently maximizing irrigation-based agriculture and hypertrophic city growth, but its anomalous character, a function of demographic and subsistence forces unleashed by the 4.2 ka BP megadrought, now encourages environmental historicization.

The Roman Empire: on the brink of collapse?

Paul Erdkamp (Vrije Universiteit Brussel)

During the past decade, several studies have related the rise of the Roman Empire – in terms of economic prosperity, population, political stability and military power – to the Roman Climatic Optimum, and its subsequent decline to the so-called Late Antique Little Ice Age. Adverse climate change is generally thought to have disrupted the food supply, leading in turn to misery and increased mortality, and to social and political
unrest. However, a thorough analysis of the causal links between climate change and agricultural productivity on the one hand, and agricultural productivity and the food supply on the other, is often missing. Two elements of the ‘climate change scenario’ of the fall of the Roman Empire will be discussed. First, the use of the metaphor of a ‘tipping point’: the Roman Empire is argued to have been on the brink of sustainability in terms of population and resources. The ‘tipping point’ metaphor allows to argue that relatively minor societal shifts due to climate change had major historical consequences without being accused of environmental determinism and mono-causality. It will be argued, however, that there is no good reason to assume that the Roman Empire had reached the ceiling of sustainability. Moreover, the impact of changes in temperature and precipitation are much more diverse and complex than more or less intuitively assumed in some of the recent studies. Cereals and pulses were the staple foods of the Roman world and the fluctuations in temperature remained well within the range of growing conditions of the main crops. The intuitive link between adverse climate change and famine is generally based on instances of extreme weather and on the experiences of peoples who lived on the margins of the biological requirements of arable crops, such as the extreme north or semi-arid regions. If we want to test the hypotheses regarding the demographic, economic and political consequences of climate change in less clear-cut cases, we should go beyond intuitive conjectures and analyze the consequences of climate change for agriculture more thoroughly. This brings us to the second element: the concept of ‘carrying capacity’. It is often claimed that warm periods increased the carrying capacity of the land and thus allowed populations to grow and prosper, while cold periods exactly did the opposite. The balance between land and population brings us back to Malthusian pressure, with the added element that climate change means that not only population is a varying factor, but that also the carrying capacity of the land varies independently of human action. However, the argument is based on the wrong assumption that population levels are determined by an environmentally determined carrying capacity of the land. In reality, agricultural production is not only determined by such ecological factors as soil, yields and weather, but also by such societal factors as the structure of landholding, the extent of (under)employment, of specialization and of market integration. In other words, it is an oversimplification to argue that climate change lowered the carrying capacity of the Roman world, causing a breakdown of the political institutions and economic structures of the Roman state.

With the arrival of agropastoralism across western Eurasia, local population densities rapidly increased. This boom in population density can be understood as the result of social and technological transformations supporting higher reproduction rates. Maximum population densities and boom durations, however, differed between European regions, as revealed by our reanalysis of the integrated EUROEVOL data set. Also, the population declines (‘bust’) following each local boom lasted from a few decades to many centuries, a pattern that again differed greatly between regions. Some regions even exhibit multiple boom and bust cycles. We investigated the correlation of the different bust timings and intensities for the period 8,000-3,500 BP with a large paleoclimate variability data set: we found a poor correlation of long-term trends in population dynamics with climate anomalies and a moderate coincidence between bust periods with climatic events. Using a mechanistic numerical model of socio-technological dynamics we estimated the relative importance of environmental perturbation and endogenous societal transformation in shaping regional population cycles. Model results suggest that robustness of a region against endogenous and exogenous collapse factors mostly depended on its socio-technological history.

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**Boom and bust cycles in Neolithic Europe: climate sensitivity or social dynamics?**

*Kai Wirtz (Helmholtz-Zentrum Geesthacht, Germany)*

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**The Toledo Mountains, a resilient landscape and a landscape for resilience. Hazards and strategies in a mid-mountain complex in central Spain**

*Reyes Luémo-Lautenschlaeger (CSIC-UAM)*

*Co-Authors: Sebastián Pérez-Díaz, José Antonio López-Sáez Olivier Blarquez César Morales-Molino*

The Toledo Mountains is a mid-elevation range that separates the Tagus and Guadiana basins in the central part of the Iberian Peninsula. The location of these mountains allows the development of a typical Mediterranean vegetation with some Atlantic influence. Consequently, typical broadleaved evergreen Mediterranean vegetation currently dominates the regional landscape, but with the remarkable presence of more mesophilous species refuged in sheltered and more humid microsites such as gorges (e.g. Prunus lusitanica, Taxus baccata) and mires/bogs (e.g. Betula pendula subsp. fontqueri, Erica tetralix, Myrica gale). Palaeoecological data from this area suggests that this territory has been even more diverse in the past (e.g. Corylus woods seem to have disappeared and Betula populations significantly retreated in recent times), what resulted essential for the long-term development of local human communities. First, these mid-elevation ranges offered a number of diverse and valuable natural resources like wood, charcoal, honey or wax. Furthermore, the Toledo Mountains played a major role as hunting reserve allowing the local settlers to survive harsh climatic oscillations or economic and political instability. Finally, clearance of the natural thick Mediterranean vegetation using fire created pasturelands for livestock support, also permitting the establishment of crops when population grew up and more fertile...
Social resilience to climate changes in the Lake Ladoga basin during the past 5000 years

Tatiana Sapelko (Institute of Limnology RAS, St. Petersburg, Russia)
Co-author: Dmitry Gerasimov Peter the Great Museum of Anthropology and Ethnography RAS, St. Petersburg, Russia

Lake Ladoga is the largest freshwater reservoir in Europe. People lived on its shores from the beginning of the Holocene period. During the entire Holocene period the outlines of the Ladoga shores experienced serious changes. Changes of the lake in size and level, as well as ecology were traced basing on numerous paleolimnological studies. Development of landscapes throughout the Holocene also depended on formation of paleobasins on its territory. Thus, in the Atlantic period, the territory of the north-western Ladoga area was under the waters of a deep cold-water ancient Ladoga Lake. Our research covers the study of small lakes in the Lake Ladoga basin area and the study of archaeological sites on the north-western and southern Ladoga shores. Our research covers the study of small lakes in the Lake Ladoga basin area and the study of archaeological sites on the north-western and southern Ladoga shores. As our studies show, the beginning of the settlement of the coastal areas of the lakes is fixed by the pollen spectra of small lakes and archaeological sites. The pollen records of small lakes sites we used to reconstruct of the climatic conditions changes under which previous cultures flourished or declined, providing an ecological context to help interpret social change. There are two catastrophic events can be traced in the Late Holocene Ladoga history. First is a breakthrough of the Saimaa Lake to the Ladoga circ. 3900 cal. BC. It caused rather dramatic rise of the water level and inundation of the ancient people settlements of the Ladoga shore. In the Lake Saimaa area water level dropped down and the coastal line became several times shorter, so the availability of coastal resources for human subsistence rapidly reduced. After this catastrophe Early pottery Sperrings tradition was replaced by Typical Combware tradition both in Saimaa and Ladoga areas. The Neva river breakthrough and rapid decrease of the Ladoga water level circ. 1200 cal. BC affected subsistence of the ancient population as well. Large areas of the former Ladoga bottom covered by fertile lake sediments provided good conditions for developing of early agriculture. Before the event hunter-gatherers subsistence was the only subsistence of the people on the Ladoga shores. After the event early farmers spread along the coasts from the Volkhov river area. As our studies show, after the Ladoga Lake waters receded, people always returned to the shores of the lake with the same constancy in the north-western and southern shores of the lake. The study was financed by Russian state budget as a branch of research project 0154-2019-0001.

Cold and dry winters 4200 years ago in the Northern Hemisphere and their impact on human societies

Aurel Persoiu1,2
Co-authors: Monica Ionita3, Harvey Weiss4

1 Emil Racoviță Institute of Speleology, Romanian Academy, Cluj Napoca, 400006, Romania
2 Stable Isotope Laboratory, Ștefan cel Mare University, Suceava, 720229, Romania
3 Alfred Wegener Institute, Helmholtz Center for Polar and Marine Research, Bremerhaven, 27570, Germany
4 School of Forestry and Environmental Studies, Yale University, New Haven, USA

The 4.2 ka BP climate event was a ca. two–three hundred year period of synchronous abrupt megadrought, cold temperatures and windiness manifest globally. Coincident societal collapses and habitat tracking, particularly in regions where archaeological data are both extensive and high–resolution, have attracted the attention of many paleoclimatologists and archaeologists since the event’s first observation. Causal explanations for the 4.2 ka BP event are based on the amalgamation of seasonal and annual records of climate variability manifest across global regions dominated by different climatic regimes. The present study investigates the spatial manifestation of the 4.2 ka BP event during the boreal winter season in Eurasia, where climate variability is a function of the spatio-temporal dynamics of the westerly winds. We present a multi-proxy reconstruction of winter climate conditions in Europe, west Asia and northern Africa between 4.3 and 3.8 ka BP. Our results show that, while winter temperatures were cold throughout the region, precipitation amounts had a heterogeneous distribution, with regionally significant low values in W Asia, SE and N Europe and local high values in the Carpathian Mountains, and E and NE Europe. Further, strong northerly winds were dominating in the Middle East, and E and NE Europe. Analyzing the relationships between these climatic conditions, we hypothesize that in the extra-
Paleo-climatic impacts and socio-cultural system resilience along the historical Silk Road

Liang Emlyn Yang (GSHDL, Kiel University)
Co-authors: Hans-Rudolf Bork, Xiuqi Fang, Steffen Mischke, Mara Weinelt, Josef Wiesehöfer
This study introduces, by literature reviews, the issue of the links and processes behind climate change, environmental change, and socio-culture change in a historical perspective in the ancient Silk Road region. Analyses of the changes and development of the socio-environment system in this significant area enhance our understanding on the regular patterns of coupled natural and social evolution, and is thus of important theoretical and practical significance. We argue that the cross-cutting theme has been to reach beyond simple explanations of environmental or human determinism, but social resilience under environmental impacts. Preliminary results indicate that local communities was able to reinforce their resilience through simple but effective initiatives, such as investing infrastructures, sharing responsibilities, diversifying livelihoods, networking recoveries. The findings further highlight the importance of understanding how human society maintains living under environment stresses in a long historical period. We conclude both that climate conditions significantly influence human socio-cultural systems and that the social-culture systems are certainly resilient to climate impacts. The study also summarizes the scope of the recent book "Socio-Environmental Dynamics along the Historical Silk Road" by illustrating the specific topics, research areas, focused time periods and the inner relationships of its 22 chapters.

The Utopia of the mountain: resilience and collapse of a social-environmental system

Alessio Cinti (MIUR - Italian Ministry of Education)
The relationship between human communities and the environment consists of a dynamic balance in which different factors contribute. The climate and its oscillations over time are one of these variables; however, it is evident that, although it plays an important role, it is not the first cause that triggers a social-environmental system. If on a global scale this statement proves difficult to demonstrate, instead on a local scale, it finds a definite confirmation: every climatic oscillation left on the field those who won and those who lost; in the first ones, the factors that determined their resilience were already intrinsic to the social-environmental system that underlay them. External influences, however, can cause the system to collapse and the climate worsening can only be an aggravating factor of an already compromised situation. This paper analyzes the evolution of the relationship between Man and Environment of a community of the Central Apennines (Massa Trabaria, between Marche, Tuscany and Emilia Romagna - Italy), between late Antiquity and the Renaissance. This social-environmental system that managed to find an equilibrium when the previous one breaks down (late Antiquity), succumbs to a Utopia imposed from the outside (Renaissance) that definitively changes its characters and leads it to an irreversible crisis. While Utopia remained as it is, its effects on this mountain community still were tangible, together with the worsening of the climatological conditions that have helped to make it fail. In the end, Utopia remains on paper and moves to the written page, becoming a critique of that power that has tried, in vain, to make it a reality.

Impact of climate change and resilience of human societies in Eurasian continent during the last millennium

Keynote lecture: David Dian Zhang (School of Geographical Sciences, Guangzhou University, Guangzhou, Guangdong Province, China)
Co-author: Qing Pei (Department of Social Sciences, The Education University of Hong Kong, Lo Ping Road 10, TaiPo, Hong Kong)
Climate change has created great impacts in agrarian societies across Eurasian continent in historical times due to the consequential change in land carrying capacity. When humans facing the changes, they have three general options: cultural adaptation, migration and resource redistribution. Nevertheless, the quantitative assessments of these options has rarely been systematically investigated at large scales. By numerical analyses of the variations in climate, population size, war number, economy, migration and agricultural production at macroscales, we show that the latter two options often are the choices of the Old World societies, which often led to social disturbances and ecological disasters in ancient China and European Middle Ages and Early Modern Era, although some improvement of agricultural techniques and peaceful redistribution of resources had partially mitigated the impact at local and short time scales. However, industrialization, use of fossil fuel and changes in societal organizations in Europe, has greatly mitigated the impact of the change in 19th century and lifted humans to another homeostatic plateau of civilization.

tropical Northern Hemisphere, the 4.2 ka BP event was caused by the strengthening and expansion of the Siberian High, which effectively blocked the moisture-carrying westerlies from reaching W Asia, and enhanced outbreaks of cold and dry winds in that region. We further discuss the societal impact of these events across transect from eastern Europe through western, southern and eastern Asia and examine how these impacts translated into societal collapses and/or habitat tracking.
NEO-ARABIA: Analysis of sustainability and reorganisation of Arabian coastal Neolithic socio-ecological systems during the Mid-Holocene period (6.2-2.8 ka BC)

Jean-Francois Berger (UMR 5600 CNRS, University of Lyon, France)  

NeoArabia is an interdisciplinary and multi-scalar project, dealing with the very long term of the Arabian Neolithic (6200-2800 BC) by a latitudinal transect of ~1000 km, documented by the French Archaeological Missions of the Ministry of Foreign Affairs from Ra’s al-Khaimah, in the Northern United Arab Emirates (UAE, 25.5°N-55.6°E) to the Dhofar region, in the South of the Sultanate of Oman (16°N-53.45°E). Focused on environments/landscapes reconstructions and the mobility of coastal human communities, it intends to test the societal resilience at scales from the site to the region, using socio-environmental scenarios. In this region, highly productive marine environments, favoured by coastal upwelling, compensate in part for relatively limited inland resources. This led to intense exploitation of marine and lagoon-deltaic resources from the Neolithic onwards. We propose to develop an integrated approach incorporating evidence from Neolithic occupation sites and their immediately surrounding environment (lagoons, mangroves, estuaries), to wider regional contexts (delta activity, marine SST and upwelling activity, monsoonal air masses). Neolithic Eastern Arabia offers an exclusive exploratory research opportunity on the role of climate stress, dominate the scientific (popular) literature for Prehistoric societies. Climatologists working with the theoretical resilience model argue that reorganization is an important component of long-term adaptive cycles, a topic that is not sufficiently studied in both social science and ecology. Resource stress can be created or intensified by both climatic change and human impacts on the environment, for example by reducing the availability of some resources. A comprehensive examination of these interconnected processes, exploring links between types, durations, and magnitudes of resource stress and human responses, is necessary to understand how resource stress contributes to human decisions regarding settlement and landscape use. Based on the resilience model, we intend to explore the process of reorganisation of the eastern Arabian Neolithic communities in terms of geographic location strategies, economic and technological adaptations, evolution of social structures, and behaviour aimed at avoiding or reducing impacts. We want to understand which technological innovations (fishing techniques, advances in ocean navigation) or socio-ecological/economical choices (spatial and social reorganisation, food specialisation or diversification, changes in seasonal mobility...) prevailed and why. One of the main uncertainties in the field of Neolithic archeology deals with our knowledge of the continuity-discontinuity of settlements and the temporal status of occupation (seasonal or not). Some sites with wide trench or multiple soundings (UAQ2, RWY-1) are therefore questioned in this sense to control the site formation processes. Interpretations and theories regarding the origin of these causes are often overlooked when explaining the development of socio-cultural and economic divergence. This has often led to deterministic over-interpretation. Neoarabia will address these assumptions and provide direct and robust arguments to assess the question of environmental determinism. This project which functions since 20 months is still in a phase of multi-data acquisition and the presentation will be focused on the methodological, conceptual aspects and to the first concrete results, discussed in a way of socio-ecological interactions at different spatio-temporal scales.

Response of social evolution to climate change during late prehistoric and historical periods in the Hexi Corridor, northwest China

Liu Yang (College of Earth & Environmental Sciences, Lanzhou University)  
Co-authors: Zhilin Shi, Shanjia Zhang, Guanghui Dong

Culture evolution in relation to climate change in ancient times has been widely concerned and discussed in recent decades, while the trajectory for the changing human-land relationship throughout prehistoric and historical periods and mechanism behind it has not been clearly elucidated. In this work, we review the results of radiocarbon dating, archaeobotanical and zooarchaeological studies from Neolithic and Bronze sites, and summarize the information of population, wars and disasters recorded in historical documents in the Hexi Corridor of northwest China, and compare them with high-resolution paleoclimate records, to study how social system response to climate change in different periods in ancient times in the area. Our results suggest climate change had contributed to the frequent transformation of human subsistence strategies, and then influenced culture evolution during late Neolithic and Bronze periods (~ 2800-100 BCE) in the Hexi Corridor, which was also affected by trans-Eurasia culture exchange that emerged post ~2000 BCE. During historical period (121 BCE-1911 CE), however, social development in the Hexi Corridor was primarily affected by changing geopolitical patterns instead of local climate change, indicating human-environment interaction was much complicated in that period than prehistoric era. Climate change might have affected the rise and fall of powerful regimes in
Bell Beakers and the 4.2ka event: when worlds collide?
Jos Kleijne (Institute for Prehistoric and Protohistoric Archaeology, Kiel University)

Around 4200 BP, changes in temperature, humidity and precipitation affected the Eurasian ‘low- and mid-latitudinal’ climate and ecosystem (Walker et al. in press). This drastic climatic change, the ‘4.2ka event’, is nowadays even chosen as the global start of the Late Holocene or Meghalayan period (Cohen et al. 2018, Walker et al. in press). Coincidentally, societies such as the Akkadian Empire and the Egyptian Old Kingdom experienced droughts, failed harvests and famine, decreasing population sizes and a general collapse of settlements (e.g. Weiss 2015; Stanley et al. 2003). However, it is unclear whether this climatic change also took place in mid-latitude Western and Central Europe, and if it had any effect on societies here. In the middle of the 3rd millennium BC, the cultural phenomenon of the Bell Beaker appeared in Western and Central Europe. This widespread phenomenon, characterised by its specific burial ritual of single inhumation graves and distinctive thin-walled S-shaped pottery vessels, lasts until the first centuries of the 2nd millennium BC. Past studies into the relationship between climate and society in Western and Central Europe have focused primarily on site specific and regional evidence (see papers in Mellier et al. 2015). Outcomes have been inconclusive, reflecting the complex relationship between climate and society. By reviewing cultural and social transformations between various regions, and correlating the available vegetation and climate reconstructions, the impact of the 4.2ka event on Western and Central Europe is targeted. So, do we see any social and cultural changes around 2200 BC, taking place during the Bell Beaker phenomenon in Western and Central Europe? And if so, can we correlate these changes with the climatic event around 4200 BP or provide models for a causal relationship?

How was the ancient trans-Eurasia culture exchange affected by climate change?
Guanghui Dong (College of Earth & Environmental Sciences, Lanzhou University)
Co-author: Liu Yang

Culture exchange along the ancient Silk Road played an important role in shaping political and economic landscape in the Eurasia in the past 2000 years, while the earliest trans-Eurasia culture exchange emerged during the fifth Millennium in Eurasian Steppes. The spatiotemporal variation of culture exchange across the Eurasia and its relation to climate change has not been well understood. We reconstruct mid-late Holocene climate change in central and east Silk Road, and discuss its impact on the development of trans-Eurasia culture exchange in late prehistoric and historical times. Our results suggest climate change was an important driving force for some key events of transcontinental culture exchange in the old world, which was responsible for the shift of major passageway in prehistoric Eurasia, and the abandonment of Dunhuang area by government of Ming Dynasty (1368-1644 AD), which is suggested as a significant event for triggering the end of the ancient Silk Road.

How to ‘downsize’ a complex society: experiments with agent-based models to assess the resilience of Indus Civilisation settlements to past climate change
Andreas Angourakis (University of Cambridge)

The development and decline of the urban phase of the Indus Civilisation (c. 2500-1900 BC) provide an ideal opportunity to investigate social resilience and transformation in relation to a variable climate. The Indus Civilisation extended over most of the Indus Basin, which includes a mix of diverse environments. Indus farmers made use of a wide range of food production strategies. The resulting social diversity was conditioned, among other factors, by partially overlapping winter and summer rainfall systems. It is clear that there were changes to these two weather systems between 4.3 and 4.1 ka BP, but the impact of these processes appears to have been varied, and patterns of urban decline, change and transformation were also not uniform. We present an agent-based modelling (ABM) simulation addressing the potential diversity of agricultural strategies adopted by Indus settlements in different sociocultural scenarios in Haryana, NW India. This work is part of the multi-disciplinary TwoRains project and brings together research on material culture, settlement distribution, food production and consumption, vegetation and paleoenvironmental conditions. The preliminary model aims to assess the implications of different food production strategies for the sustainability of urban population and the resilience of such strategies in the face of changes in the intensity and variability of winter and summer rainfall.

Rethinking the 8.2 cal BP event: Resilience and Collapse in the Konya Plain in Central Anatolia
Peter F. Biehl1, Jana Anvari2, Eva Rosenstock1, and Patrick Willett1,4

1 Department of Anthropology, University at Buffalo, SUNY
2 Institute für Urgeschichte, Universität zu Köln
3 Einstein Center Chronoi und Institut für Prähistorische Archäologie, Freie Universität Berlin
4 Department of Archaeology, Katholieke Universiteit Leuven
Because of the site’s long uninterrupted sequence from ca. 7100 to 5500 BC, Çatalhöyük and its environment are a good case study to scrutinize the multifaceted evidence and short- and long-term impact of and adaptations to the 8.2 event. This paper will discuss the most recent debates in the context of the site of Çatalhöyük in general, and the latest results of the research on its West Mound in particular. It shows that the beginnings of Çatalhöyük West at ca. 6100 BC overlapped seamlessly with the end of the older East Mound, and that the adaptations to environmental changes associated with the 8.2 event are characterized by resilience including a gradual spatial transformation of the settlement within the confines of the East Mound around 8.2, followed by a relocation to the West Mound and a final abandonment of the settlement 5500 BC – including the other settlements on the Konya Plain. With its distinctive pattern of traits resembling the classic levels of the East Mound, traits first attested on the later levels of the East Mound and newly developed features, the data from Çatalhöyük West represent both resilience and collapse surrounding the 8.2 event in Central Anatolia.

Long-term socio-ecological change in Cambodia Part 2: the exacerbating influence of control structures and material inflexibility on social resilience

Tegan Hall (University of Sidney)
Co-authors: Rebecca Hamilton, Dan Penny, Josephine Gillespie

For communities across the Southeast Asian mainland during the past millennium, episodes of societal fluorescence, decline and mobility have been linked to climate changes (Lieberman and Buckley, 2012) and regional economic patterns to a lesser extent (Reid, 1988, Hall, 1985). Through this time, various iterations of Khmer society persisted across the landscape, including the extensive kingdom that dominated much of the mainland between the 9th and 15th centuries C.E. The 15th century waning of political power in Angkor, this kingdom’s capital, and its gradual depopulation along with several cities within its territory, is a particular episode of mobility and rupture that ostensibly presents as a case of weakened social resilience in the face of heightened climate variability (Buckley et al., 2010, Hua et al., 2017, Yamoah et al., 2017). However, two aspects of this narrative are worthy of further investigation. First, placed in the context of long-term climate records and socio-ecological dynamics (R. Hamilton, this workshop) the climate variability of the 14th and 15th centuries should not have been catastrophic for mainland communities. Second, recent palaeoenvironmental and archaeological research indicates that the attenuation of land use within Angkor (Penny et al., in review) and at two (at least) secondary centres elsewhere in the kingdom (Penny et al., 2014, Hall et al., in press) was complex and protracted and had begun a century or more before the climate crises of the preceding centuries, while other centres maintained populations throughout these centuries of climate instability (Hall et al., 2018). Therefore, what characteristics of these communities and Khmer society overall, during this period of Cambodia’s history, accounted for this variability in mobility and rupture? This paper presents a multi-faceted explanation for social vulnerability in urban-agrarian populations through this important transition period in Southeast Asia, and discusses its implications for contemporary land management approaches in the context of ongoing climate changes. Buckley, B. M. et al. 2010. Climate as a contributing factor in the demise of Angkor, Cambodia. PNAS, 107, 6748-6752. Hall, K. R. 1985. Maritime Trade and State Development in Early Southeast Asia, Honolulu, University of Hawaii Press. Hall, T. et al. 2018. Re-evaluating the occupation history of Koh Ker, Cambodia, during the Angkor period: a palaeo-ecological approach. PLOS ONE, 13, e0203962. Hall, T. et al. in press. The environmental context of a city in decline: the vegetation history of a Khmer peripheral settlement during the Angkor period. JAS: Reports. Hua, et al. 2017. Radiocarbon dating of a speleothem record of palaeoclimate for Angkor, Cambodia. Radiocarbon, 59, 1873- 1890. Lieberman, V. & Buckley, B. 2012. The impact of climate on Southeast Asia, circa 950- 1820: new findings. Modern Asian Studies, 46, 48. Penny, D. et al. 2014. The environmental impact of Cambodia’s ancient city of Mahendraparvata (Phnom Kulen). PLOS ONE, 9, e84252. Penny, D. et al. in review. Palaeo-botanical evidence from central Angkor, Cambodia, indicates gradual decline in occupation rather than catastrophic 15th century collapse. Reid, A. 1988. Southeast Asia in the Age of Commerce 1450-1680, New Haven, Yale University Press. Yamoah, K. A. et al. 2017. Societal response to monsoonal fluctuations in NE Thailand during the demise of Angkor Civilisation. The Holocene.

Temperature changes and difference of hydro-climatic pattern between centennial cold and warm periods in China for the past 2000 years

Keynote lecture: Jingyun Zheng (Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences)
Co-authors: Zhixin Hao1,2, Xuezhen Zhang1,2, Quansheng Ge1

1 Key Laboratory of Land Surface Pattern and Simulation, Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences, Beijing
2 University of Chinese Academy of Sciences, Beijing

This study presents an up-to-date overview on temperature and hydro-climate reconstructions in China for the past 2000 years. Multi-proxy synthesized reconstructions show that temperature variation in China has exhibited significant 50–70-yr, 100–120-yr, and 200–250-yr cycles. Results show that the amplitudes of decadal and centennial temperature variations were 1.30℃ and 0.70℃, respectively, with the latter significantly correlated with long-term changes in solar radiation, especially cold periods, which were corresponding to sunspot minima approximately. The most
Rapid warming in China during the past 2000 years occurred at AD 1870–2000, may primarily be attributed to global warming induced by the anthropogenic increase of in greenhouse gas concentrations. However, the warmth in the 20th century may not be unprecedented for the last 2000 years, as data shown that mean of temperature in the periods AD 981–1100 and AD 1201–1270 were comparable to that in the 20th century. The ensemble mean of dryness/wetness spatial patterns in eastern China across all centennial warm periods illustrated a tripole pattern: dry in south of 25°N, wet from 25°–30°N, and dry to the north of 30°N. However, for all centennial cold periods, this spatial pattern also exhibited a meridional distribution. Moreover, the simulation revealed that the increase in precipitation over the monsoonal regions of China (especially for the region between 25°N and 30°N) within the 20th century warming period may be attributed to the Inter-decadal Pacific Oscillation (IPO) and the Atlantic Multi-decadal Oscillation (AMO) primarily. In addition, the general characteristics of impacts of climate change (especially for the warm/cold fluctuation at centennial scale) on the human dimensions in Chinese history were also reviewed.

### Resilience and Landscape Transformation during the Bronze and Iron Age in a Mountain Steppe (Tsaghkahovit Plain, Armenia)

Amy Cromartie (Cornell University); ISEM, Université de Montpellier)

1 Department of Anthropology, Cornell University, Ithaca, New York, USA;
2 l’Institut des Sciences de l’Évolution de Montpellier (ISEM), Université de Montpellier, UMR 5554 CNRS, Université de Montpellier, Montpellier, France

Co-authors: Claire Blanchet (Univ. Grenoble Alpes, Univ. Savoie Mont Blanc, CNRS, EDYTEM, 73000 Chambéry, France Cheima Barhoumi: l’Institut des Sciences de l’Évolution de Montpellier (ISEM), Université de Montpellier, UMR 5554 CNRS, Montpellier, France); Erwan Messager (Univ. Grenoble Alpes, Univ. Savoie Mont Blanc, CNRS, EDYTEM, 73000 Chambéry, France); David Etienne (Univ. Grenoble Alpes, Univ. Savoie Mont Blanc, CNRS, EDYTEM, 73000 Chambéry, France Sébastien Joannin: ISEM, UNR 5554 CNRS, Université de Montpellier, EPHE, IRO 226, CITRAD, Montpellier, France; LGL TPE, UMR 5276 CNRS, Université Lyon 1, Villeurbanne, France)

The steppe region of the Mountainous Caucasus has been home to human communities practicing agriculture and pastoralism for almost 6000 years. In the area around Mount Aragats, the highest mountain peak in the country of Armenia, inhabitation of the surrounding Tsaghkahovit plain during the Bronze and Iron Age has pointed to periods of settlement and abandonment of this high-mountain region coinciding with periods of cultural transformation of these human communities. The contribution of climate and anthropogenic change, however, in shaping the plant and human landscape to date have not been fully studied. In this paper, we will present the results from our first phase of paleoecological research from the lake site of Shenkani, which is part of an intensive lake coring program led by a French / American / Armenian team. We will present these data with 20 years of archaeological exploration from the region by American / Armenian archaeological project named Project ArAGATS. We will present the results of a multi-proxy approach combining pollen, non-pollen polymorphs, charcoal and geochemical analysis from this core along with archaeological excavation. These results have reviled a changing steppe landscape at 4700 BP during the Early Bronze Age Kura- Araxes II horizon and again starting at 1000 BP during the Iron Age. In addition, charcoal reconstruction has revealed changes in fire intensity throughout the Bronze Age which would have had a considerable impact on human communities in this region. In this paper we will investigate how changes in the plant landscape may have contributed to settlement and landscape dynamics in this high mountain region and consider the influence of a changing plant landscape in transforming and building resilience in these Bronze and Iron Age communities.

### Climate change and the grain price anomaly around the turn of the 19th century in North China Plain

Yanjun Wen (Faculty of Geographical Science, Beijing Normal University, Beijing 100875, China), PhD student

Co-authors: Xiuli Fang, Yang Liu, Yikai Li

Impact of climate change on social development in historical period has been important hot spot during recent decades. As the interaction between climate change and the response of human society, economic subsystem with enough resilience can help to prevent climate risks from evolving into a population crises. From the view of food security in historical China, grain price could be regarded as a indicator of the resilience of economic subsystem for buffering the balance between grain supply and food consumption to cope with the impacts including climate extremes. Based on the wheat price of Baoding Prefecture since 1736, linkages between climate change and grain price anomaly in North China Plain around the turn of the 19th century was explored in this paper. The main findings are as below: (1) The mean grain price and fluctuation range significantly increased after 1781, while the variation and periodicity of the de-trend grain price greatly enhanced. Then a shocking grain price spike emerged from 1810 to 1820. (2) The grain price anomaly had an evident correspondence with climate transition to colder and drier with greater variability. The negative correlation between precipitation and grain price was remarkably heightened from 1780 to 1810, indicating more sensitivity of grain price to precipitation. (3) The impact of extreme droughts was the direct cause of the grain price spike in North China Plain. In addition to the bad harvest for colder climate and continuous severe droughts, the decreased social resilience also played an important role for the
Is landscape intensity resilient? A comparative view from South Asia

Adam Green (University of Cambridge)

South Asia’s varied and dynamic environments have been home to diverse agricultural societies for over five millennia, but there is considerable variation in how long particular societies appear to have lasted. These differences can provide insights into what makes societies sustainable for long periods of time, and what makes them resilient to change. This paper will present data from northwest India collected by the Land, Water and Settlement, TwoRains, and TIGR2ESS projects, which have identified the location of hundreds of settlements dating to the entire span of human occupation in the region. Many of these settlements belong to the Indus Civilization (c.2600-1900 BC), home to South Asia’s first complex society. It will also introduce data from south India’s archaeological record, which will serve as a comparative example of social change under very different environmental conditions. The concept of ‘landscape intensity,’ which considers number, size, and distance between settlements, will be introduced as a means of comparing signature archaeological landscapes from different periods. Societies appear to adopt varying degrees of landscape intensity under different climate conditions – some build cities, some build settlements in new locations, some build tanks, some construct irrigation networks. The objective of the paper will be to address the general question: Is landscape intensity resilient? As a result, it will be possible identify forms of collective action, coordinated endeavors among households, communities and settlements, that were resilient for long periods of time and those which appear to have been prone to shocks and disruptions.

Impacts of recurring extreme climatic events on societies and landscapes in Provence and Southern French Alps during the past 800 years

Nicolas Maugham (Aix-Marseille University, I2M, UMR-CNRS 7373/ECCOREV)
Co-author: Mr. Georges Pichard, Aix-Marseille University

Both urban and rural Mediterranean societies have always coped with specific climatic constraints (i.e. summer hot waves, persistent droughts, violent and flashy floods) causing agricultural, economical but also health disasters; these events are key factors of the dynamics of coupled human and ecological systems throughout history in this part of the world. In the case of the Provence area and the Southern French Alps, if various aspects of the environmental and climate history during the Little Ice Age have already been explored, especially from the 18th to mid-19th century, consequences due to unusual recurring extreme climatic events on the long run since the early 13th century have been neglected notwithstanding available specific regional historical archives in Southeastern France. Therefore, a long-term analysis of the impact of these strong climate fluctuations, both on urban and rural societies, but also on landscapes, in a comparative perspective between two adjacent areas, with distinct topographies, soils and natural resources, thus appears original and interesting. First, after describing the hydro-climatic context in Southeastern France during the LIA (using the newly created HISTRHONE database, http://histrhone.cerege.fr/), we will present major social, economic and sanitary outcomes as well as ecological crises (e.g. important soil erosion or severe frostcaused mortality of trees) due to these extreme climatic events which impacted this area together with their effects on urban and rural dynamics. Then, we will see if it’s possible to highlight significant differences about the socio-environmental consequences of these events between lowland/coastal areas and mountainous regions of the Southern Alps.

Temperature changes during the past millennium along the Ancient Silk Road and Social events

Zhixin Hao (Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences)
Co-author: Jingyun Zheng

Based on the recently published multiproxies temperature reconstruction series (longer than 1000 years) along the Ancient Silk Road, combined with the dry and wet condition variation reconstructions, the general characteristics of temperature changes were analyzed and the regional differences of dry and wet condition variations were compared for the Medieval Climate Anomaly (MCA, AD950-AD1250) and Little Ice Age (LIA, AD1450-AD1850). The main conclusions are: the centennial temperature variations during the past 2000 years experienced warm epochs in the 1st-3rd century, the latter part of the 7th century to the early of the 11th century, the mid-12th century to mid-13th century, and since the 20th century; and cold epochs during the 4th century to the early 7th century, the middle of the 11th century to the early 12th century, and the end of the 13th century to the mid- 19th century. The phases of warm and cold condition and fluctuations at decadal-centennial temporal scales differed among the various regions. The wet and dry condition variations during the MCA and LIA also exhibited regional differences, which was larger during the MCA than the LIA on the Guanzhong Plain and in the Hexi Corridor of China, and the climate was dry during...
the MCA and wet during the LIA in the arid region of Central Asia. The climate was drier during the MCA than the LIA in the south of Scandinavia and the middle and northern parts of Europe, and in the central part of this region the variation was large during the LIA. In contrast, Finland, northern Scandinavia, and Russia had wetter climate during the MCA. The Mongol invasion of Europe and the vanished ancient City of Loulan could have possible linkage with the Abrupt climate change.

Aridization and social resilience in Argentinean Andean prehistory
Malena Pirola (Instituto de Arqueología, FFyL-UBA / CONICET)
Co-author: Dr. Marcelo R Morales (Laboratorio de Diatomeas Continentales, DBBE, FCEN, UBA / CONICET), Dr. Hugo D Yacobaccio (Instituto de Arqueología, FFyL-UBA / CONICET)

The disruptive effects of droughts on human societies have been widely studied, both in current settings and among past societies. For example, intense and recurrent short-term droughts associated to the Medieval Climate Anomaly (MCA) have been considered one of the main causes behind the collapse of the Mayan and Tiwanaku centralized polities between 900 and 1300 AD. At a larger scale, more gradual but long-reaching aridization associated to the mid-Holocene Climate Optimum has been used to explain the abandonment of large areas of the Tropical and Sub-tropical Andes highlands in South America. To fully understand environment-society interactions it is necessary to explore, not only the full range of variability involved in environmental processes -graduality, periodicity, duration, and intensity, but also the baseline patterns of human organization, which ultimately determine the strategic responses available to human groups to mitigate -or even take advantage of- the impacts of environmental change and ensure societal reproduction. In this paper we compare two environmental change scenarios involving aridization in the Andes highlands of NW Argentina (Puna): the mid-Holocene arid period and the Medieval Climate Anomaly. We review the previous research that strongly suggests that mid-Holocene widespread and long-lasting aridity prompted the reorganization of mobility, settlement and subsistence patterns in this region, as well as a change in human-animal interactions that ultimately derived in the local domestication of camelids, giving birth to a transhumant pastoralist way of life that is still active today. In turn, we analyse the paleoenvironmental evidence that suggests the installation of an aridization process associated to the Medieval Climate Anomaly and we review the available dates to test the proposed link between aridization and the development of large agricultural sites with water management facilities in the northern sector of the Argentinean Puna. At the same time, camelid pastoralism continued to be a predominant subsistence strategy in this area of the Argentinean Puna, complemented with hunting of wild camelids, which suggests that herds could have been used as a way of food storage as part of a comprehensive risk management strategy. Here we compile and analyse the available evidence of faunal composition and mortality age patterns in archaeological sites with ACM-compatible chronologies, in order to evaluate the response of pastoralist groups to ensure herd sustainability in the face of shorter drought. While many research efforts have focused on the negative impacts of droughts on human societies, we consider the two processes cited here as good examples of social resilience, driven mainly by flexibility of social, technological, and mobility organization, but also made possible by the characteristics of environmental change itself. These two instances of increased aridity in the Argentinean Andes highlands prompted social change that led to substantial increases in social complexity, intensification of resources, technological development and modifications of short and long distance social networks to ensure social reproduction. However, certain responses to increased aridity may, in time, reduce societal flexibility and weaken the capacity of social groups to react effectively to prolonged drought. A reduction of mobility and tethering to water control features could be such a case.

Ancient Puebloan maize farmers in Utah distribution and growing season length using a statistically downscaled climate model, 850-1450 CE
Marcus Thomson (International Institute for Applied Systems Analysis (IIASA), Laxenburg, Austria)
Co-author: Glen M. MacDonald

The rise and decline of complex, maize-farming Ancestral Puebloan (AP) cultures in the American Southwest coincides with the warm, climatically consistent Medieval Climate Anomaly (ca. 850-1350 CE) and transition to the cool, hydrologically variable Little Ice Age (ca. 1350-1850 CE). The impact of temperature stress on the growth of AP maize crops remains an open question. We statistically downscaled a climate model (CESM LME) to map changes to cumulative growing degree days for maize (cGDD, 30/10°C) over Utah between 850 and 1449 CE. We compared downscaled CESM-derived cGDD changes over Utah to local AP (“Fremont”) archaeological site occupations from radiocarbon-dated artifacts mapped as spatially discrete, chronologically summed probability distributions (SPDs). We then analyzed correspondences between Fremont SPDs and cGDD between 850 and 1449 CE. In general, we found (1) high Fremont occupation intensity coincident with high, low-variability cGDD, and low occupation intensity coincident with, or following, periods of volatile cGDD; (2) intensified occupation of high-elevation Colorado Plateau sites during the MCA, followed by a retreat to lower-elevation sites driven by a proxy-identified drop in mean annual temperatures; and (3) these occupation changes occurred in spite of the greater temperatures and variability in cGDD at low-elevation sites. We speculate that the interannual variability of growing conditions was greater than the modelled cGDD variability and this may have prompted higher tipping points to occupation changes.
seasons, and the risk of staple crop failures, was a crucial determinant of Fremont subsistence strategy decision making, site occupation, and migration.

**Political Participation and Social Resilience to Climate-Related Disasters**

**Keynote lecture: Peter Peregrine (Lawrence University, Appleton, Wisconsin USA)**

Scholars of disaster response and management hypothesize that societies providing greater local participation in decision-making and which have more community coordination and governance organizations are more resilient to climate-related disasters. This paper tests this hypothesis using a cross-cultural research design and a sample of archaeologically-known societies that have experienced catastrophic climate-related disasters. The paper finds that societies allowing greater political participation appear to provide greater resilience to catastrophic climate-related disasters, generally supporting the predominant hypothesis guiding contemporary disaster response and management.

**Integrating Collapse Theories to Understand Robust Designs for Social Ecological Systems Governance**

**Cathy Rubinos (Universidad Del Pacifico, Lima Peru and Center for Behavior, Institutions and Environment, ASU)**

**Co-author: John M. Anderies (School of Human Evolution and Social Change, School of Sustainability and Center for Behavior, Institutions and Environment, Arizona State University (ASU))**

The world is facing new environmental challenges that may trigger the collapse of some social-ecological systems (SES). It has been forecasted that more extreme weather events may be much more common in the decades to come due to climate change. Although we have an idea of what climatic events to expect in each region, we know less about how SES can cope with these challenges. We study The Peruvian Piura Basin, which has been exposed to harsh environmental events associated with the El Niño Southern Oscillation for centuries. The Piura basin was even home of an ancient civilization named Moche, which collapsed due to a combination of factors, but strong El Niño events was one of them. To analyze the robustness of The Piura Basin to flood events, we used as guidance the robustness framework and different hypothesis from prominent collapse theories, and carry out a longitudinal study from collected secondary and primary data. We found that the Piura basin is very fragile based on almost all of the predictions of collapse theories (specially with respect to selfish elites, centralized governance, systems interconnection, anticipation capacity and sensitive dependence on resources), but the biggest strength is its growing stock of social capital.

In small steps, user associations have been collectively working towards solutions for water conservation and public-infrastructure maintenance. There is a long way to go yet to be entirely robust, but with the right policies to encourage the strengthening of these associations, the Piura basin could become more robust to future El Niño events. This study also provides methodological and theoretical insights that can contribute to theory building for robust SES, which is an urgent endeavor.

**How Europe and the Qing Dynasty Endured the Little Ice Age: Social Resilience, Norms, and Adaptable Governance**

**Susann Handke (Erasmus School of Law, Rotterdam)**

The Little Ice Age occurred between the 17th and 19th centuries. The cooling that was felt in many parts of the Northern Hemisphere was caused by several volcanic explosions. The consequences of cooler temperatures particularly affected societies in Europe and China. In the 17th century, large parts of Europe and China experienced long periods of social unrest, societal collapse, and war. In China, the Ming Dynasty was defeated by the Manchus who invaded the Chinese territory from the north and established the Qing Dynasty in 1644. During the following decades, the Qing rulers succeeded in both re-unifying China and pacifying nomadic tribes on the empire’s northern and north-western flanks. In Europe, a new order emerged after the signing of the Treaty of Westphalia in 1648. This treaty formed the basis of the modern system of sovereign states in which states in principle seek to resolve conflicts through negotiations rather than war. This paper examines how societies in Europe and China responded to climatic change in the past and developed social mechanisms that helped to maintain stability. These mechanisms had to overcome the consequences of population decline and socio-economic collapse following wars, epidemics, and famine. The paper particularly studies how European states and the Qing Dynasty managed to endure the aftermath of the cooling period and developed forms “adaptable governance” – i.e. malleable norms and institutions that ensured some degree of social resilience. The paper takes the emergence of international law and, in particular, the modern system of sovereign states in Europe as well as the adaptation of Ming institutions during the Qing Dynasty as case studies of social resilience. It first explores the effects of cooling on societies in western and central Europe and China during the 17th century. Then, it shows how ruling elites and society succeeded in responding to these crises by establishing and maintaining norms and institutions that stabilised the states and regional order. The paper argues that both cases reveal important lessons on climate resilience and the relevance of norms and institutions when dealing with instances of climatic and ecological stress.

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The role of swidden agriculture in contributing to long-term socio-ecological resilience in north-east Cambodia

Rebecca Hamilton (School of Culture, History and Language, The Australian National University)

Co-authors: T. Hall, D. Penny and J. Gillespie

Analysis of palaeoenvironmental data archived in lake sediments from the dry tropics of Cambodia demonstrates that the past 5,000 years have been punctuated by multiple, protracted droughts. Several of these, particularly those occurring between 4300 and 1540 cal. yrs BP, appear to far exceed in both severity and duration the drought events of the last millennium. This is of consequence given that these more recent, lower magnitude climate perturbations have been attributed to disrupting the large-scale social and economic networks of Angkor in the 14th and 15th centuries, suggesting low resilience of these systems to environmental change. This study highlights the potentially catastrophic impacts that earlier, more severe climatic extremes may have had on socio-ecological systems in Cambodia. However, there are few datasets that are of a sufficient temporal length to test this hypothesis. This study uses a multi-proxy, palaeoenvironmental approach to examine the long-term dynamics of swidden-based societies in Ratanakiri Province, north-east Cambodia, with a particular focus on environmental response to extreme climate events. The persistence of fire activity across the duration of the record (with the exception of the late 20th century conflict period), suggests the continued presence of swidden practice at the site through time. Low-scale anthropogenic burning for agriculture appears to heighten the beta-diversity of the landscape, contributing to the stability of the surrounding forests in the face of climate extremes. These results suggest long-term, coupled socio-ecological resilience. This has implications for future forestry management in north-east Cambodia, including the important role of long-fallow swidden practices in forestry – a approach that is often inconsistent with current management strategies.

12 Archaeohydrology – natural water supply and cultural water demand in the past

Tuesday March 12th, Room 204

Session organizers: I. Unkel, T. Kluge, E. Zagana, M. Finné

TUE 08:30 Archaeohydrology: A discipline at the interface of archaeology, hydrology, and hydraulic engineering

Kai Wellbrock (Technische Hochschule Lübeck - University of Applied Sciences)

Co-author: Matthias Grottker

08:50 Flood Risk Management in Classical Antiquity. The case of the sanctuary of Amphiarao at Oropos

Anna Androvitsanea (Technical University of Berlin)

09:10 Archaeology between the Danube and the Timiş rivers: multi-proxy investigations of the Pančevački Rit alluvial plain near Belgrade, Serbia

Dragana Filipovic (Institute for Pre- and Protohistory, Kiel University; Institute for Balkan Studies, Serbia)

09:30 Discussion

10:30 Monsoon, climatic anomalies and society in late medieval India: introduction to the MANDU Project

Anne Casile (Research fellow, IRD (French National Research Institute for Sustainable Development), PALOC)

10:50 The remain of supply water systems in soltaniyeh plain, Zanjan, Iran

Mahsa Feizi (phD Candidate at University of Tehran and Lumière University Lyon 2)

11:10 Reconstruction of Vaqf-Abad Qanat in the Urban Landscape of City of Yazd in Two Historical Periods (13th and 20th Century)

Semsar Yazdi Ali Asghar (Senior advisor to the International Center on Qanats and Historic Hydraulic Structures (ICQHS))
11:30 Mediaeval and post-mediaeval artificial water reservoirs like a sources of information about landscape, vegetation and subsistence practices changes
Libor Petr (Department of Botany and Zoology, Faculty of Science, Masaryk University, Czech Republic)
11:50 Discussion

13:30 Hydrogeological investigation in the ancient region of Stymphalos
Keynote lecture: Eleni Zagana (Department of Geology, University of Patras, Greece)
14:00 Stalagmites as archaeohydrological archives: a case/cave study from Korinthia (N-Peloponnese, Greece)
Tobias Kluge (Heidelberg University)
14:20 Resilience patterns in the Argolis - a model approach to investigate land-use characteristics under changing climatic conditions
Wolfgang Hamer (CRC 1266, Kiel University)
14:40 Discussion

15:30 Water management for bathing facilities: its effects in the landscape and cityscape of Catina and Syracusae (1st BC – 4th AD)
Paola Santospagnuolo (Freie Universität Berlin - Institute of Classical Archaeology)
15:50 Evaluating the influence of climate on the Late Bronze Age collapse in the eastern Mediterranean
Lydia Bowler (University of Reading)
16:10 Water availability and hydrological soil properties around the ancient settlement of Stymphalos (Greece)
Ingmar Unkel (Kiel University)
16:30 Discussion (including Summary by the Organizers)
Archaeohydrology – natural water supply and cultural water demand in the past

Keynote speaker: Eleni Zagana (Department of Geology, University of Patras, Greece)
Session organizers: I. Unkel*, T. Kluge, E. Zagana, M. Finné
*corresponding chair, iunkel[at]ecology.uni-kiel.de

Archaeohydrology investigates water in an archaeological context and searches for connections between natural water supply, natural hydrological conditions, and socio-cultural developments of human societies in the past. We invite papers related to this definition of archaeohydrology which can range from rivers to drops, from seas to mountain lakes, from fertile soils to deep gullies, from climate to culture, from early Neolithic farmers to medieval hydraulic engineers, as long as the subjects correspond to a historical or archaeological period and are related to water. The session deliberately focusses on hydrological aspects of the climate-culture-interaction topic. Specifically, we want to encourage a closer look at the hydrological hazards to societies. This would mean in humid areas like Northern Europe for example flood events, in more arid regions like the Mediterranean or the Middle East dry periods of different scale and magnitude. While contributions from the natural science perspective may focus, for example, on the natural water availability, carrying capacity of environments, and aspects of variability in the hydrological system, contributions from the archaeological perspective may focus for example on adaptation and management strategies of different societies, and the resilience or vulnerability of certain societies to hydrological hazards.

We also welcome papers dealing with eco-hydrological aspects of ancient water management, with hydrological-cultural modelling, or papers which discuss new developments in proxies applicable to archaeohydrological research. With this session we want to contribute to a more specific view of the role of hydrological climate patterns in the development of societies, going beyond the often simplistic view of a general climate change. While contributions from the natural science perspective may focus, for example, on the natural water availability, carrying capacity of environments, and aspects of variability in the hydrological system, contributions from the archaeological perspective may focus for example on adaptation and management strategies of different societies, and the resilience or vulnerability of certain societies to hydrological hazards.

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Archaeohydrology: A discipline at the interface of archaeology, hydrology, and hydraulic engineering
Kai Wellbrock (Technische Hochschule Lübeck - University of Applied Sciences) Co-author: Matthias Grottker

The need of hydrological approaches became increasingly evident in archaeological projects within recent years. This is even more applicable in arid and semi-arid environments when water availability had to be ensured by means of specific water management and engineering. Water abundance and reliability including the development of innovative water management has been the major cause for the development of early permanent occupations in arid environments or promoted the sustainable city life. Diverging archaeological and hydrological understanding and concepts in hydraulic analysis created an urgent need of a discipline at the interface of both subjects.

Works of this discipline, to be called archaeohydrology if defined from the hydrological and hydraulic perspective, are presented by several archaeohydrological case studies from prehistory and antiquity. The contribution will focus on the technical methods needed in archae-hydrology; hydrological approaches and appropriate support from sub-disciplines will be explained. It is stressed that not only hydrological concepts, but also the technical manipulation of natural water resources by means of hydraulic engineering should be taken into account. It is highlighted which additional questions are likely to be answered by archaeohydrological approaches.

Hitherto, hydrological research in archaeology is dominated by rather technical (hydrological, engineering) than societal (archaeological) aspects and aims. Research practice in water history projects clearly points out the imperative need for multidisciplinary approaches, with methods and research agendas of their own right, in order to achieve the understanding of hydraulic structures and the lessons they might provide for present-day sustainable water management.

Flood Risk Management in Classical Antiquity. The case of the sanctuary of Amphiaras at Oropos
Anna Androvitsanea (Technical University of Berlin)

Identifying and interpreting the traces of an ancient water culture is a challenging task. In this paper, we make use of an interdisciplinary approach, drawing from hydrological modeling and archaeological research in order to investigate the effect of flood risk management in ancient hydraulic infrastructures and contemplate on the awareness of flooding risks in antiquity. We focus on the sanctuary of Amphiaras in Attica. The sanctuary is located in a deep and steep-sloped gorge within which flows a river. The gorge consists largely of lacustrine-fluvial coarse deposits, enabling percolation and seepage and has a steep slope (22 %). The river drains a broader basin of circa 1700 hectares to the Aegean sea. We show that, subsequent to extreme amounts of precipitation, the river would overflow its cross section and flood the surrounding areas, including the sanctuary. As the sanctuary is built next to the river, water management has been a concern, a fact attested to both by the architectural remains and by inscriptions dated to the 4th century BCE. Using a simple hydrological
which building projects in the sanctuary had been designed, tendered and implemented, as well as their significance in a ritual, societal and urban context.

Archaeology between the Danube and the Timiş rivers: multi-proxy investigations of the Pančeavački Rit alluvial plain near Belgrade, Serbia
dragana Filipovic (Institute for Pre- and Protohistory, Kiel University; Institute for Balkan Studies, Serbia)
co-authors: Milorad Igljatović, belgrade City Museum, Serbia Jelena Bulatović, Laboratory for Bioarchaeology, University of Belgrade, Serbia Kristina Penezić, Biosense Institute, University of Novi Sad, Serbia

The area of about 400 square kilometres delimited by the Danube and the old and new beds of the Timiş river near Belgrade was, until mid-last century, a mosaic of low-lying wetlands and dry higher ground, and frequently flooded. Nowadays, it is an area split between densely populated Belgrade suburbs and highly fertile agricultural land. Few decades ago, surface prospection documented traces of potential archaeological sites scattered over this area and dating from different prehistoric and historic periods. This demonstrated that, despite being prone to flooding and waterlogging, the area was an attractive location for anthropogenic activity, possibly including residential use, for millennia before modern day drainage and engineering works. Recently, a multidisciplinary study was completed aimed at evaluating the potential of the area for inhabitation and use during prehistoric and historic times and at identifying the likely locations of short- or long-term settlements. In the initial phase of research, the methods included surface survey by field walking, examination of satellite and aerial photography, geophysical prospection and geoarchaeological coring. The results were used to create GIS-models of the terrain, informed also by the available data on soil and vegetation cover. In the second stage, the assumptions based on GIS were tested in a case study that included excavations of one of the detected sites and the archaeobotanical and zooarchaeological analysis. The multi-proxy approach enabled initial reconstruction of the pre-industrial landscape and an assessment of the favourability of the area for human occupation. It also allowed assumptions to be made about the land use and land management, and the overall quality of life in the past in a hydrologically rich and dynamic environment. This paper presents the research process and outcomes.

Monsoon, climatic anomalies and society in late medieval India: introduction to the MANDU Project
Anne Casile (research fellow, IRD (French National Research Institute for Sustainable Development), PALOC)

This presentation will introduce the newly ANR (French National Agency of Research) funded project called MANDU, focusing on the interplay between societal change, hydroclimatic variability and water management from a landscape perspective in late medieval times, a period of both significant climatic disturbances and sociopolitical/cultural upheavals in India. On the archaeological ground, the late Medieval is a most poorly documented period of the history of India, and our understanding of the big scale society change that took place remains limited in a number of ways. Scholars have paid little attention to the environment in general and to the role of climatic variability in particular. Scientific advances on climate change and a growing network of paleoecological proxies from Asia have recently unraveled long unknown aspects of the Indian monsoon behavior over the past two millennia, pointing to important variations of the summer monsoon and the occurrence of climate extremes in late medieval times. What were the impacts of climatic anomalies and related environmental disasters on society, and on the transformations of the cultural landscape that took place in late medieval times? How society responded to hydroclimatic extremes? How did people live in and transform the environment to adapt to monsoon rain variability in a semi-arid environment? What can the study of the long-term lives of water bodies tell us about vulnerability, adaptation and resilience in the face of climatic disturbances? These interrelated questions are all inherent in land/waterscape histories, and resonate with present concerns about climate change in general, and water scarcity in particular. The ambition of the MANDU project is to address the same and open ways to interdisciplinary research on impacts and feedbacks between society, climate and environment during the first half of the last millennium in India. To investigate the above questions, the project will aim to trace continuities and discontinuities in
the historical land/waterscape, and analyse them in ways that give insight into the nature of change, vulnerability and adaptation, and into the ability to absorb perturbations or shocks. The research will focus on the region of Malwa in Central India (Madhya Pradesh) and carries its field investigations on the area of Mandu, a famous historical place known as the capital of the Malwa Sultanate from c. 1400 CE. Situated in the semi-arid part of Malwa, it is now a vast rural area inhabited by adivasis of the Bhil tribal community, one of whose major concerns relates to water scarcity and insecurity. Untouched by recent urbanisation, the area of Mandu encompasses rich archaeological records of long-term human occupation, cultural and institutional changes underpinned by a variety of processes, and offers potential from scientific perspective to investigate various facets of the society-climate-water interplay in late medieval times. To explore the landscape and watersheds sensitivity and vulnerability to hydroclimatic variations through time and the ways society adapted, the project will have recourse to a variety of disciplines by bringing together scholars from the humanities, social and environmental sciences.

The remain of supply water systems in soltaniyeh plain, Zanjan, Iran

Mahsa Feizi (pH.D Candidate at University of Tehran and Lumière University Lyon 2)
Co-author: Nasim Feizi (pH.D. Candidate to university Tarbiat Modares)

Soltaniyeh plain located in the north-western of Iran, approximately 35 km to the east of the town of Zanjan. The plain is very important in term of strategy. The reason for this is that the central and northwestern of Iran are connected together by this plain. Natural condition, including Favorable geological condition, abundant precipitation, geology structure, low slope, and sufficient moisture created a supportive environment for human settlements. In the summer of 2016, an archeological survey was conducted therein, in which 90 sites and a large number of ancient water supply systems were registered. This plain has taken his name from a city which the Mongol Ilkhan built in 1304 A.D therein. The construction of the city lead to a series of changes in the region’s landscape and it marked a turning point in the cultural continuity of locality. The author set out to explain the way in which the human has used the potential environment to reach the water and how this usage changed to provide a systematic network of water supply which must have supported a city. Soltaniyeh plain, with relative height about 1800-2000m from sea level, is surrounded in the north and south by mountains. Calcareous geological structure caused a deeps groundwater, at the foothills, in the mountains, so that, once these aquifers reach hard and impenetrable stones, springs are flows. There are a large number of such springs which irrigate the plain in the north and south. The result of the archeological survey, the GIS analysis and the Statistical Analyses show that the springs are the most important sources to supply the water for human settlement. They profited these springs with different structures such as low-depth dams, canals, watercourse and floodgate which some of them remained until now. There are several deep aquifers in the different part of the plain. In the southern mountains, a network of faults has created a complex and deep underground water which progressed to the center of the plain. In addition, in the plain, there are about 150 to 200 meters of alluvial deposits with high permeability and rich in term of aquifers. However, the underground water of southern mountain and its northern side also join in them. On the other hand, its geological structure keeps the surface of these underground water high. In each part, once the slope of grounds and depth of underground water reached the minimum level, Qanats have been made. As noted in written sources, with the construction of the city, a large number of Qanats were made, such immense construction required an adequate knowledge of the hydrology science, a huge number of workers and a Supportive power which were provided very well during the construction of the city. The result of the archeological survey, the study of written sources, the GIS Maps and the cluster analysis show that there is three group of human settlements in the different part of the region. In addition, in three group, springs, rivers and Qanats, are three manners of supplying water, respectively. In the second group, which located in the central and southeastern of the plain, and is at almost 1949 m above sea level, are situated the sites of around and inside the city. These sites have maximum coherence with Qanats and springs. In addition, several canals carried the water from the southern mountain to the city and a large number of Qanats were used for water supply and the irrigation of garden and farms.

Reconstruction of Vaqf-Abad Qanat in the Urban Landscape of City of Yazd in Two Historical Periods (13th and 20th Century)

Semsar Yazdi Ali Asghar (Senior advisor to the International Center on Qanats and Historic Hydraulic Structures (ICQHS))
Co-author: Ameneh Karimian, Architectural Designer and Researcher

The 700 year old Vaqf-Abad Qanat has provided water for drinking and urban usage in the city of Yazd (Iran) until the late 60s. Recent developmental projects, climate change and the modern city’s infrastructures such as performing the city’s potable water network has affected the role of qanat in the people’s lives and the urban context. As a result qanat, its related structures and its pathway are going into oblivion. The lack of information on the exact pathway of this qanat and its related hydraulic structures led us to carry out this research. Therefore, as a first step the historical texts and documents related to Vaqf-Abad qanat, the interconnected mansions and hydraulic structures has been reviewed. In order to have a better understanding of the city’s
texture in the 13th century, the city and its defensive wall has been closely investi-
gated. After compiling and analyzing the existing information, a 2 dimensional image
of the city with a focus on Vaqf-Abad qanat’s pathway has been reconstructed. In the
second part of the study, the books, documents and endowments of the past 100 years
existing on this qanat have been studied. Through field investigations and interviews
with the local practitioners of different neighborhoods of the city, the exact pathway of
the qanat was recognized. Then the pathway was illustrated on the recent city’s map.
Key words: Qanat, Vaqf-Abad, Yazd City, Reconstruction, mapping

Mediaeval and post-mediaeval artificial water reservoirs like a
sources of information about landscape, vegetation and subsistence
practices changes in Czech republic.

Libor Petr (Department of Botany and Zoology, Faculty of Science, Masaryk University,
Czech Republic)
Co-Author: Petr Kočár
First distinctive human impact to major river stream in Czech republic is recorded in
Mikulčice. Early mediaeval stronghold on Morava river existed in 9th century AD, there is several bridges and river bank reinforcement. The high mediaeval period brings increasing of human utilisation of water streams and construction of artificial fishponds. Fish breeding was induce by fasting and difficulty of herring import. First fishpond is known from Prague dated to 12th century. The peak of fishpond building is dated to 15th century and early postmediaeval period. Fishponds sometimes cover former landscape including forest remains. Fishponds are still neglected by archaeology research, dam construction was investigated in Smolina in peripheral Western Carpathians region. Fishpools create new wetlands habitats and contains paleoecological record. Mediaeval colonisation and founding of new villages cause urgency of water supply. One way was building of artificial water reservoirs, such as small dammed ponds or pit hole. This structures are preserved in deserted villages, sometimes has still wet infill, which provide excellent pollen record about landscape changes after settlement decline (Petr and Vareka submitted). The mining activities and metal processing needs water and energy provided by water. This activities leads to construction of metal washing and building of pond for propulsion. This construction had only short life, depending on mining process, quickly were abandoned and vanished due to deforestation and subsequent erosion. Recent remains are investigated in context of mountain archaeology and shows changes in landscape relief. Fishponds and water stream were employ to hemp leaching. First evidence hemp processing in Czech republic is known from alluvial castle in Veselí nad Moravou dated to mid of 13th century. Several early post mediaeval pound were used to hemp leaching recorded in pollen and macroremains record. This activities ended during 19th century. The historical landscape was fill up of small streams and water reservoirs, which keep up water balance in deforested cultural landscape. Industrialization and field connection during 20th century vanished this network and reduced volume of accumulated water. Landscape turn over to drought sensitive.

Hydrogeological investigation in ancient region of Stymphalos
Keynote lecture: Eleni Zagana (Department of Geology, University of Patras, Greece)
Co-authors: Eleni-Anna Nanou (Department of Geology, University of Patras, Rion, 26500 Patras, Greece), Ingmar Unkel (GSHDL, Kiel University)
The karstic environment (polje) of Stymphalia located at Northeastern Peloponnese is known not only from the ancient mythology, the fighting of Heracles with Stymphalian birds, but also from the ancient Greek and Roman periods. The surrounding area is characterized from large karstic springs, the front of Stymphalia – Driza springs and Kefalari spring, which discharge the karstic groundwater system named Ziria. The importance of water in the evolution of the ancient and the Roman city is an issue that our ongoing research aims to investigate. Nowadays the water management of the area is crucial as the springs water is used for drinking water supply of the city of Corinth, while a big debate is in progress for the further use of the spring water for the drinking water supply of city Kiat. Water sampling of the springs is carried out for the last two years in a monthly basis, while the water level of Stymphalia springs is measured in a daily basis. The first results of this study are presented in this presentation.

Stalagmites as archaeohydrological archives: a case/cave study from Kefalari (N-Peloponnes, Greece)
Tobias Kluge (Heidelberg University)1,2
Co-authors: Tatjana Sarah Münster1, Elisabeth Eiche2, Martin Finne3, Ingmar Unkel5
1 Institute of Environmental Physics, Heidelberg University, Germany
2 Heidelberg Graduate School for Fundamental Physics, Heidelberg University, Heidelberg
3 Institute of Applied Geosciences, Karlsruhe Institute of Technology
4 Department of Archaeology and Ancient History, Uppsala University
5 Institute for Ecosystem Research, Kiel University
Caves have been occupied by humans since pre-historic times for various purposes. Indicators are archaeological artefacts such as pottery, but also soot layers that settled on the cave surfaces. Speleothems are carbonates that form quasi-continuously in many caves and allow a precise dating of enclosed soot layers. The speleothem carbonate also contains many proxies that enable the reconstruction of the paleoen-
Environment and paleoclimate. We analysed several speleothems from the Peloponnese that were carefully selected from caves used for religious devotion in the antique Greek period. U-Th analysis provides age constraints for the individual soot layers to originate between 2.5 and 3.2 ka BP. Independent estimates based on pottery suggests ages of cave occupation between 2.5-2.7 ka BP. Stable isotopes of the speleothem carbonate (δ18O, δ13C) are used together with clumped isotopes and elemental ratios to infer the paleoclimatic history at the cave region. Preliminary data suggest significant variation in the paleoclimatic conditions during the Holocene growth period of the speleothems. For quantitative paleoclimate assessment clumped isotopes will be evaluated together with carbonate δ18O to infer rainfall changes and its potential influence on water availability for the local societies. Acknowledgements: We thank Norbert Frank, Andrea Schröder Ritzrau and Rene Eichstädter for support in U/Th sample preparation and analysis; Denis Scholz and Regina Mertz for analysis of elemental ratios. We are grateful for support by Chryssa Contaxi and Dimitris Karoutis.

Resilience patterns in the Argolis - a model approach to investigate land-use characteristics under changing climatic conditions.
Wolfgang Hamer (CRC 1266 - Kiel University)
Co-authors: Dr. Daniel Knitter Priv.-Doz. Dr. Oliver Nakoinz Prof. Dr. rer. nat. Rainer Duttmann

The variability of rainfall – visible not least in the droughts of summer 2018 – is a threat for all societies, especially in the Mediterranean and sub-tropical climate region, where sufficient precipitation is limited to winter season and evapotranspiration is high. To which degree does this variability of rainfall, in combination with the socio-economic characteristics of a society, influence the resilience patterns of an area? We investigate this questions using the situation in the Argolis in the first millennium BCE as a case study, where geochronological research indicates, that precipitation amounts dropped up to 20 %. We examine the spatio-temporal climatic and environmental dynamics and integrate these in a fuzzy model of available resources, with a special focus on water availability. The latter is of particular importance, as the investigated area benefits not only from precipitation in the direct catchment area but also from more distant precipitation, whose waters are transported in the Argolis by means of extended groundwater aquifers. Based on empirical data and the fuzzy model of resource potential, land use is quantified. Different scenarios are used to estimate potential influences on supply patterns. This allows us to make assumptions about the inter-relationship and dependence of a society on environmental and socio-economic dynamics and offers insights into the resilience patterns of the area.

Water management for bathing facilities: its effects in the landscape and cityscape of Catina and Syracuse (1st BC – 4th AD)
Paola Santospagnulo (Freie Universität Berlin - Institute of Classical Archaeology)

Bathing buildings depended on water and represented one of the main places where Romans daily came into contact with it. In a sense, this type of building was the actual link between the natural element and the anthropized contexts, but also the symbol of man’s ability to bend the nature to his needs. In detail, during the Roman period, the presence of volcanic thermalism in Campania (Plégeaean Fileds) favoured a twofold consequence: first, the creation of engineering solutions intended to exploit steam and hot water; second, the attempt to recreate these conditions in other contexts, such as in the urban space, led Romans to develop new techniques of water management and water supply. Accordingly, from the last centuries of the Republican period onwards, all cities of the Empire were provided with public baths, which became essential features both of urban and rural areas. This paper centres on the role played by water in the transformations of the rural and urban landscape over time, by focusing on the bathing culture of eastern Sicily, specifically, the provinces of Catania (Catina) and Syracuse (Syracusae) between 1st and 4th centuries AD. The analysis will proceed, firstly, by examining the different geological structure distinguishing the two provinces (the lava stratifications around the volcano Etna and the limestone plateau of the Hyblean Mountains), its consequences on the water canalization ways (channels carved into the rocks, aqueducts, etc.) and the subsequent use and/or abandonment in the following periods. With special regard to the urban environment, evidence of public baths coming from the two main Roman colonies will be compared: Catina (‘Termi dell’Indirizzo’; ‘Termo della Rotonda’) and Syracuse (Termo Corso Gelone). By scrutinizing the original environmental features of these places (presence of hills, rivers, etc.), their topographic articulation and infrastructures, the paper will try to answer some questions concerning the position of the buildings in the cityscape: which were the reasons lying behind the site choice? Were the already structured urban zoning or the accessibility to the water resource implied? As to the extra-urban environment, different dynamics were involved. In fact, on the one hand, the existence of natural thermal springs influenced itineraries since Prehistory, (e.g. the baths of ‘Santa Venera al Pozzo’), on the other hand, during the Roman period the presence of important routes led to the creation of staging areas furnished with bathing facilities for travellers. In particular, it is interesting to note that among the baths analysed (Noto – Passo di Miele; Calatabino – Imperio; Fiumefreddo – Torrerossa), those linked to extra-urban roads were characterized by a direct connection to a stream. It is likely, therefore, that these buildings received water directly from these small rivers and streams.
Evaluating the influence of climate on the Late Bronze Age collapse in the eastern Mediterranean
Lydia Bowler (University of Reading)
Co-authors: Tamar Hodos (Department of Archaeology and Anthropology, University of Bristol, UK), Hai Cheng (Institute of Global Environmental Change, Xi’an jiaotong University, Xi’an, China; Department of Earth Sciences, University of Minnesota, Minneapolis, Minnesota, USA), Lawrence Edwards (Department of Earth Sciences, University of Minnesota, Minneapolis, Minnesota, USA), Okan Tüysüz (Eurasia Institute of Earth Sciences, Istanbul Technical University, Istanbul, Turkey), Dominik Fleitmann (Department of Archaeology and Centre for Past Climate Change, University of Reading, Reading, UK)

During the 13th and 12th centuries BC a prosperous and globalized Late Bronze Age (LBA) world system came to an abrupt end in the eastern Mediterranean following destruction that swept across the region. Following the twelfth century BC, new cultural forms and societies emerged, heralding the transition to the Iron Age in the eastern Mediterranean and specifically the so-called “Greek Dark Ages” across the Aegean. The causes of this widespread socioeconomic transformation, often referred to as the LBA “collapse”, have been debated for decades and remain contentious. This PhD project addresses this debate by examining whether climate may have acted as a contributing factor for the LBA collapse and the Greek Dark Ages. The main objectives of the project are to (i) present new high-resolution multi-proxy data for the eastern Mediterranean (ii) provide a big picture view of palaeoclimatic conditions across the eastern Mediterranean from 3.5 - 2.5 kyr BP (iii) integrate new palaeoenvironmental data with the existing archaeology to provide a more holistic explanatory framework. To achieve these objectives this study will develop precisely-dated and highly resolved stalagmite-based records from a number of cave sites across the eastern Mediterranean and Middle East in order to address strong regional climatic variability. Preliminary study has already provided a few records across the region, facilitating precursory understanding of climatic conditions. Stalagmites are used in this project as they are proven to be a critical recorder of palaeoclimate with numerous advantages over other climatic archives. For example, stalagmites can provide annually-resolved records of effective rainfall through the analysis of stable isotopes, trace elements and annual growth layers (e.g. Flohr et al. 2017). Prior studies have suggested that oxygen and carbon isotopes as well as trace element concentrations (e.g. magnesium, uranium, phosphorus) are excellent proxies of precipitation and effective moisture. For example, Magnesium (Mg) is a useful proxy for effective rainfall due to the sensitivity of Mg to groundwater residence time while it has also been demonstrated that speleothem Mg provides a potential means of reconstructing past occurrence and severity of dry periods at high resolution (Flohr et al. 2017). The use of stalagmites also permits high temporal resolution (a monthly to annual resolution can be achieved) as well as providing precise and robust chronologies from U-Th dating with low chronological uncertainties (between ±15 to ±35 yrs). This is of significance as many of the existing climate records across this region are of low resolution with high chronological uncertainties. This work also holds relevance to the current hydrological situation in the eastern Mediterranean, as well as the Middle and Near East, as it can inform us about the resilience and vulnerability of past societies to severe and persistent droughts and thereby contributes to a better understanding of current and future responses to anticipated water scarcity. This is important as the Mediterranean is recognized by the IPCC as one of the world’s global hot spots of climatic change, witnessing increasing frequency of drought events. As a result, the issue of water is and will remain a core concern in the sustainability challenge of the region as well as possessing implications for global food security due to likely increased agricultural stress.

Water availability and hydrological soil properties around the ancient settlement of Stymphalos (Greece)
Ingmar Unkel (Kiel University)
Co-authors: Thomas Birndorfer, Hans-Rudolf Bork, Svetlana Khannueva-Wendt

The impact of climate events or changes in the environment on the development of ancient societies are often discussed in a very general or simplified way. It is often neglected that in some regions people and the environment they are living in, are more sensitive to changes in hydrology, while in other regions changes in temperature play a greater role. For understanding the critical hydrological thresholds of food and energy supply for a society in the context of land-use and land-cover, it is not sufficient to investigate changes in precipitation patterns alone, but also the characteristics of the geological and pedological regime in the respective region has to be taken into account. We here present preliminary archaeohydrological investigations from the Lake Stymphalos catchment in Greece testing and complementing palaeoenvironmental and palaeoclimatic reconstructions from lake sediment cores and archaeological excavations by analysing the fertility and hydrological properties of the different soils in the catchment around Lake Stymphalos, and differentiate according to site characteristics (e.g. topography, climate, bedrock and initial substrate, land use history). As there is hardly any pedological information available from the region, these first analyses shall answer questions like: Which soil types are characteristic of the study area? Are there any differences in pedogenesis, e.g. due to the geological structure of the basin or due to different land use patterns? Is the human impact (footprint) visible in the soils of the study area? Can we identify changes in land use patterns and human activity in the past, especially concerning forest clearing, agriculture, and hydrology?
POSTER SESSION: Groundwater use at the Heraion of Samos in Antiquity – Technology and Adaptation
Anna Androvitsanea (Palacky University Olomouc, Czech Republic)

The water supply of the ancient extra-urban Sanctuary of Hera at the Greek island of Samos is currently studied by an interdisciplinary team. Simultaneously to an inventory and review of the archaeological evidence of wells and other water supply structures at the site, a thorough study of the hydrology of the catchment and aquifer system has been carried out. The combination of both disciplinary studies and the synopsis of archaeological and hydrological data provides new insights into the scientific understanding and the technology needed to develop and maintain water supplies. Changes in types and location of wells and other hydrological infrastructure shed light on adaptations to possible environmental and societal changes. The Samian Heraion is situated in an alluvial coastal plain in the Southeast of the island. The site is linked to the Imbrasos river, which drains a basin of approximately 27 square kilometers. The geology is defined by travertine, marble, schist and alluvium formations, while all carbonatic strata are strongly karstified. The basin forms a complex system of surface run off and groundwater flow. Both components are strongly interconnected. The study proposes an approach of analysing invariant system characteristics with modern hydrological methods such as numerical surface and groundwater modelling. The surface and groundwater hydrology of these fixed basin properties is modelled as a function of climate and land cover, derived from palaeoclimatological studies. Numerically calculated groundwater levels under different climate and land use scenarios, ranging from multi-year to centennial droughts or extreme floods, can then be compared to the depth and levels of excavated wells and water supply infrastructure. Results indicate that the Sanctuary is characterised by very beneficial hydrological conditions: It is located at the confluence of several hydrological basins, characterized by high groundwater recharge and seasonal runoff production. In addition, the archaeological site is situated directly on top of springs stemming from a deep groundwater flow system. The groundwater model emphasises the exceptional stability of the system towards climate change and its very slow response. Still, results of the numerical model and archaeological evidence suggest, that the site has been affected by a decline in groundwater levels requiring adaptations of the water supply technology.

POSTER SESSION: Palaeoenvironmental and archaehydrological data from Lake Vouliagmeni (Greece): a sneak preview
Ferry Schipers (TU Berlin)*1
Co-authors: Alexandros Emmanouilidis1, Pavlos Avramidis1, Thomas Neumann2,

POSTER SESSION: Wooden well from Uničov (CZ) – archive for water management and palaeo-environment in the first farmers’ society
Ivana Vostrovska (Palacky University Olomouc, Czech Republic)

Transition to the Neolithic way of life has taken place in eastern Central Europe about 6000 years ago. The sedentary way of life was related to plant cultivation and livestock breeding, consequently people lived in larger groups and built up permanent settlement areas. By the time the first farmers settled down, they needed permanent water sources in close neighbourhood. One of the Neolithic phenomena is wooden well, which was an additional and new aspect of human redesigning domestic
and public spaces. The active digging of wells reaching the underground water table reflects an innovative approach to water provisioning in sedentary communities. It was a testimony to the hydrological knowledge, technological capacities, environment and landscape of the first farmers. In this research we aim to explore firstly the water management in the first farmers’ society. Secondly, we look into ecological history and strategy in exploitation of surrounding landscape, which is related to the water among others. The study site is situated in the central east of the Czech Republic. Excavation at Uničov-U kravina has uncovered Linearbandkeramik settlement area with 10 longhouses, hundreds of pits, remains of an oven and a wooden well, which is the most unique feature. To achieve our goals, we want to combine archaeological and environmental methods. Wooden well construction has been studied by dendrochronology, archaeobotany and trasology. A chest-like well lining was dated to ca. 5278–5104 BC. Construction was formed by four oak corner posts, each with two longitudinal grooves, in which oak boards were inserted horizontally. The boards formed the wall of the well lining and simultaneously ensured its cross reinforcement. The surfaces of the boards showed tool marks typical for stone adzes. Sedimentary infill of well has been investigated in detailed by geoarchaeology, archaeobotany, osteology and entomology. Sedimentary environment of the deposits inside the well has been determined to explore water management and usage of well itself. The homogenized silt grade material at the bottom is associated with everyday water pumping. Following layer with coarser material and undecomposed organics presents partly damages by well usage and it also documents water pollution. In subsequent period muddy environment overgrown by roots points to that groundwater level decreased. Further silt grade layer supports cleaning of the well and follow-up usage. Decline of the well was documented in the final layer. Our reconstruction of a landscape and its changes over time is based by several environmental proxies. These results confirm the dominance of oak in the forest around the settlement area, which evidenced mesophilic oak forests. Hazel populations reached their Holocene maximum in this period. The settlement area itself was a markedly warm and dry forest-free zone with shrubs, in some parts surrounded by a mixed deciduous forest influenced by humans. We can reconstruct the site environment like a farming village in a mosaic forested and forest-free landscape with xeroteric pasture and the river around. The palaeoecological reconstruction of course has only a local interpretation capability, but the general ecological relation between biological proxies or even species can give much more contribution to our knowledge of past environment of the first farmers.
### SESSION 13

**16:30** Hunting native reindeer, while domesticating imported ones – Some thoughts on the development of the Sami pastoralism  
*Jostein Bergstøl, Museum of Cultural History, University of Oslo*

**16:50** Look back on the afternoon

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**08:30** Look on the present day  
Oliver Grimm, Ulrich Schmölcke

**08:50** Imagining hunting landscape in contemporary Germany: correspondences between animals’ movements signatures and hunting practices  
*Dr. Thorsten Gieser (Institute for Cultural Studies, Koblenz University)*

**09:20** Seal exploitation in Šventoji subneolithic sites (SE Baltic) during 3900-3000 cal BC  
*Giedrė Piličiauskienė (Department of Archaeology, Vilnius University, Lithuania)*

**09:40** Centrality of seals: Ålandic clay paw rite on the edge of Occam’s razor  
*Kristin Ilves (Helsinki University)*

**10:30** Environment and human subsistence on the western coast of Sweden during the Mesolithic and Neolithic  
*Leif Jonsson (LJ – Osteology)*

**10:50** Hunting mentality in agrarian environments. Wild animal skins in Iron Age and medieval graves in eastern Fennoscandia  
*Tuija Kirkinen (University of Helsinki, dept. of Cultures)*

**11:10** Carved bird pendants of forest hunter-gatherer-fishers (East European Plain, 3,500-2,700 BC) – the edible totems  
*Ekaterina Kashina (State Historical Museum, Moscow)*

**11:30** A preboreal relation with elks – the ritual elk deposits from Lundby Mose  
*Kristoffer Buck Pedersen (Museum Southeast Denmark)*

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**11:50** Discussion

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**13:30** European bison hunting and butchering at Vilnius Lower Castle during the 13th- 17th century  
*Giedrė Piličiauskienė (Department of Archaeology, Vilnius University, Lithuania)*

**13:50** The aurochs (Bos primigenius) in prehistoric Switzerland: humans and wild cattle in a diversity of landscapes  
*Lizzie Wright (University of Basel)*

**14:30** Human-deer spiritual connection: offering places of Northern Eurasia from Neolithic to modern times  
*Natalia Mykhaïlova (National Academy of Sciences Ukraine)*
## ABSTRACTS

**Human, beast and landscape. A diachronic study of hunting and human-animal-relationships in Northern Europe and in the Baltic Sea area**

*Keynote speaker: P. Rowley-Conwy (Durham University), T. Gieser ( Koblenz University)*  
*Session organizers: U. Schmölcke*, O. Grimm  
*corresponding chair, ulrich.schmoelcke@schloss-gottorf.de*

This session will provide a diachronic consideration of human, animal, and landscape interplay with an emphasis upon Northern Europe and the Baltic Sea area. Focusing on, amongst other aspects, periods of change it follows a multi-perspective approach. The considered time frame covers the late Palaeolithic up to the Middle Ages, and the central topic is hunting and, more broadly, human-animal-relationship, against the background of human’s dependency on landscape and climate. Thus, in particular for the period of hunters and gatherers, hunting techniques, strategies, and motivations are as relevant as the union formed between human and dog, as are the indications for the veneration of hunted animal species. For the Neolithic and later periods, hunting for the protection of acres and flocks will have to be considered alongside the hunt for the acquisition of raw materials, as opposed to, for example, trophy hunting and ‘princely hunt’. For the session, papers from various disciplines in the Natural Sciences and Humanities are welcome.

Thus, the session will bundle different aspects connected with hunting, and the overall diachronic view, given by one of the keynote speakers for parts of Northern Europe, and will imply the chance to trace red threads and changes. Furthermore, the focused analysis on certain periods and regions will enable us to see specific hunting patterns and more individual solutions, related to the landscape. Questions, central for the session, are as follows: to which extent were intensity and purpose of hunting linked to situations also times of general changes in the human-environmental interaction or interplay (example: wolf and bear extirpations in Christian societies)? What about the dynamics of human-animal-relationship, from dogs to other true mates of humans (example: late Paleolithic dog burial from Bonn-Oberkassel), in relation to domestic animals (example: Neolithic cattle graves) and wild beasts (example: bear symbolism)? What about the reconstruction of hunting episodes at particular sites, what about the earliest indications for the veneration of hunted animal species and, finally, what about the beginning of trophy hunting and the development of ‘princely hunt’?

### From Late Glacial hunting to Early Neolithic animal husbandry: a perspective from Britain and southern Scandinavia

*Keynote lecture: Peter Rowley-Conwy (Durham University)*

In this contribution I will emphasise the dynamic and changing nature of Late Palaeolithic and Mesolithic hunting: this was not just a static period that gave way to animal husbandry. I will consider three areas. 1. In the Late Palaeolithic and Early Mesolithic there are several sites with individual skeletons of aurochs and elk, both comprising both butchered animals and those that escaped from the hunters. These large animals would have been difficult and sometimes very dangerous to hunt, and I will consider the hunting methods probably employed for both species. 2. By the Earlier Mesolithic the landscape and vegetation had settled down, and settlement and hunting practices became more regular: we know a good deal about the hunting of land mammals. The sea shore is however hardly visible in this period due to sea level being lower. Recent discoveries in Sweden suggest that marine mammal hunting and fishing may however have been of considerable importance at this time. The flooding of the North Sea was also a major factor in this period. 3. Domestic animals appear as part of the Neolithic package c. 4000 cal BC. This change is coming to appear much more abrupt. The nature of the change, and any interactions between last hunters and first farmers, will be discussed in the light of recent evidence.

### The hunter’s path. Some remarks on the role and meaning of osseous hunting equipment in the Final Palaeolithic and Mesolithic

*Justyna Orlowska (Institute of Archaeology, Nicolaus Copernicus University in Torun)*  
*Co-author: Grzegorz Osipowicz Institute of Archaeology, Nicolaus Copernicus University in Torun*

Hunting equipment made of osseous materials of the Late Glacial and early Holocene huntergatherers is most commonly represented in archaeological record with various types of points, harpoon heads and fish hooks. Studies on these types of prehistoric weapons have a longstanding tradition and are important way of discovering information about the societies that existed in those days. The main objective of our study is to present results of extensive traceological analyses concerning Late Glacial and early Holocene bone and antler artefacts usually associated with hunting from Polish Lowland. Examined prehistoric material for most consist of so-called stray finds and represent various forms of harpoon heads, points and fish hook. During the traceological analysis of the included artefacts a wide spectrum of technological traces was identified that allowed to reconstruct chaîne opératoire of their production process. It allowed also to make some suggestions concerning probable function of the prehistoric specimens.
Moreover, traceological analysis enabled to the identification on selected finds specific traces that were possibly not purely practical, but served a symbolic purpose. These information were a starting point for discussion about non-utilitarian behaviors associated with these kind of artefacts and their symbolic meaning for people that used them. For the purpose of the project we gathered also morphological, technological and functional data about similar finds from Europe and discussed them with our results.

Human-bear interactions in Lateglacial and Holocene Britain
Hannah O'Regan (University of Nottingham)
The brown bear (Ursus arctos) is Europe’s largest terrestrial carnivore, and it has played an important symbolic role in cultures throughout its geographic range from Europe to North America. How can we begin to determine what role bears played in these societies? Were they predators, competitors, companions or prey? Using Britain as an example, this paper will examine human-bear relationships from the Lateglacial to early modern periods. Although bear remains are known from all periods, there are big differences in how they are incorporated into the archaeological record. For example, two Lateglacial bear tooth pendants were found in Kendrick’s cave, North Wales, and skull fragments and a cervical vertebra are known from the Mesolithic wetland environment of Star Carr. These finds contrast with the Bronze Age and Iron Age record, when bear remains are only found with human cremation burials, and again in the early medieval period when considerable numbers of phalanges are also found in cremations. This paper will examine what these differences might mean in terms of human-bear interactions, and will also consider when the bear became extinct in Britain and what impact this might have had on how bears were subsequently perceived and treated.

Animals and the human social landscape in medieval Icelandic sources
Harriet Evans (University of York)
In Finnboga saga (ch.11), a bear who is causing trouble among the communities of Halogaland is outlawed by the assembled farmers, before being hunted and killed by the hero of the saga. In this episode, the bear will only fight with Finnbogi once the man has removed all his armour and his sword, and the saga depicts the bear having the desire for the fight to take place on equal terms. In addition, the need to outlaw a bear before hunting it suggests that this wild animal is perceived as part of the community who must be excluded for its actions before it can be dispatched. This is the only instance of such an animal outlawry in the Sagas of Icelanders, and it takes place in Norway. In contrast, the laws of medieval Iceland known as Grágás suggest that certain animals, including bulls, pigs, horses and dogs walk the border between legal inclusion and exclusion, and can be legally outlawed for certain actions. However, these are all domestic animals, and in the Icelandic settings of many of the Sagas of Icelanders, depictions of wild animals are rare; these texts demonstrate instead that the line between the categories of human and domestic animal was capable of being breached. This presentation will explore the depiction of these animals as both objects and agents in the legal texts of early Iceland, and how both Viking age funerary contexts and later medieval narratives offer us interpretations of animal-human relations that seem to engage with conceptualisations of animals as persons capable of interacting with both human legal codes and the social landscape of medieval Iceland.

Reindeer Migration Routes and Distribution in the late Glacial in Lithuanian Territory
Linas Daugnora (Institute of Baltic Sea Region History and Archaeology, Klaipeda University)
Co-author: Algirdas Girininkas
During the Late Glacial in the territory of East Baltic region after retreate of the glaciers, the main hunting object was reindeer (Rangifer tarandus L.). Baltic region specimens would considerably help in the reconstruction of the origin and migration routes of the extant wild reindeer populations in northern Europe. In 20 localities of the territory of Lithuania and radiocarbon dates from antlers of reindeer between 12085 and 10 435 yr BP were collected. The majority of radiocarbon dating results show that reindeers colonized the eastern Baltic region quite rapidly and possibly all at once – 13400-12300 yr BP. The results of cosmogenic dating of boulders indicate that the ice sheet which covered a large East Baltic area melted at almost the same time – about 13500-13000 yr BP. Along with the reindeer population, the first inhabitants – the reindeer hunters must have appeared who produced different tools and weapons from the reindeer skeletal parts. On both sides of the Nemunas and other rivers shools, most sites and finding-places of the Late Palaeolithic period occurred (Fig. 8). They were left by communities of Hamburg-, Federmesser-, Bromme-, Ahrensburg- and Swidwerian cultures. Analogous campsites of the Late Palaeolithic period in Lithuania were at the Neris-, Ula-, Šešupė rivers and other water basins where reindeer crossed waters through wades and shools. The earliest reindeer antler of the Older Dryas period was found in Debelkišiai (Anykščiai district). However, among the radiocarbon-dated Upper Palaeolithic artefacts, the earliest are a Lyngby axes, discovered in Nemunėlio Radvililiškis (Parupė ) (Biržai district), Kalmiškiai (Jurbarkas district), Snaukštai (Klaipėda district) in 2014-2015, which provides new data on the Eastern Baltic area population.
sessions and the economic activities at the end of the ice age. The traceological, isotopic and zoo-archaeological analysis of the artefacts and reindeer skeletal parts, as well as the palynological and archaeological studies of the find spots, proved that the dated back to c. 14000-10000 BC and was to be assigned to the Older Dryas – Younger Dryas period. As witnessed by the radiocarbon date, the artefact perfectly fitted in the general context of the Upper Palaeolithic in Northern Europe and, on the basis of the radiocarbon dating, it ought to be considered one of the earliest items not only in the Eastern Baltic Region, but all over Northern Europe.

**Significance of caribou and reindeer fur for arctic hunters**
Kerstin Pasda (Institut für Ur- und Frühgeschichte, FAU Erlangen-Nürnberg)

The arctic climate requires an effective protection against the coldness. The significance of caribou fur in the past became obvious in interviews with Greenlandic hunters. However, caribou fur was the warmest accessible fur in Greenland. Some interviewees suggested that the fur was for a time even more substantial than the meat. At least since the Thule period until the beginning of the 20th century the fur played a major role in Greenland. Historical and archaeological sources in the 18th century about mass hunting and lists of fur trade indicate, that this mass hunting was mainly aimed at getting caribou fur. The evidence of the hunt taking place with the specific aim of obtaining the fur is difficult to render osteoarchaeologically. However, there may be indications of reindeer being hunted for their fur in European Palaeolithic sites, as in the Ahrensburgian site of Stellmoor.

**Hunting native reindeer, while domesticating imported ones - some thoughts on the de-velopment of the Sami pastoralism**

Associate Professor Jostein Bergstøl, Museum of Cultural History, University of Oslo (Norway)

Studies of the genetics of prehistoric reindeer during the last two decades have shown that the reindeer had two different immigration routes into Scandinavia after the Ice Age. In addition to that, the researchers have seen traces of another genetic marker in the domesticated reindeer, from around 1500 AD. New published research have now shown that this type may be traced to the Yamal region in Northern Russia. This insight opens for new perspectives on the start and development of the Sami pastoralism.

Excavations and surveys have revealed different types of mass trapping systems from the Iron Age and Middle Ages in Southern Norway. The later, funnel shaped traps have striking similarities to the driving fences in modern reindeer herding. In this paper, I will discuss the possibilities of influences from wild reindeer trapping in Norway on the development of the Sami pastoralism.

**Imagining hunting landscapes in contemporary Germany: correspondences between animals’ movement signatures and hunting practices**

Keynote lecture: Dr. Thorsten Gieser (Institute for Cultural Studies, Koblenz University)

“People are known and recognized by the trails they leave behind them...Animals, likewise, are distinguished by characteristic patterns of activity or movement signatures, and to perceive an animal is to witness this activity going on...” (Ingold 2011:72)

In this brief lecture, I will sketch a contemporary hunting landscape in Germany by tracing the material trails of hunters and game animals. Drawing inspiration from what hunters call Pirschzeichen (animal movement signatures) I follow the often miniscule ways in which animals shape the land and its vegetation and become known to hunters. In a second step I link these animal movement signatures to hunters’ landscaping practices (pathways, architecture, lines of fire, feeding sites, etc.). In analogy to the heuristic model of the ‘operational chain’, which reconstructs successive steps in the production and use of material artefacts, I suggest that the material remains of hunting practices in the landscape can be linked up and integrated into a larger hunting landscape by considering their correspondences to the Pirschzeichen.

**Seal exploitation in Šventoji subneolithic sites (SE Baltic) during 3900-3000 cal BC**

Giedré Pilicauskienė (Department of Archaeology, Vilnius University, Lithuania)
Co-authors: Grzegorz Osipowicz, Institute of Archaeology, Nicolaus Copernicus University, Torun, Poland; Gytis Pilicauskas, Archaeology Department, Lithuanian Institute of History, Lithuania; Ulrich Schmölcke, Centre for Baltic and Scandinavian Archaeology, Schleswig, Germany

Šventoji sites are of supra-regional importance due to brilliant preservation conditions and the degree of research done there during the last decade. Some of ca. 60 Stone Age sites are contemporaneous and represent highly elaborated settlement systems with dwelling areas on the eastern bank of the ancient lagoonal lake and...
fishing stations on western part of the lagoon. Bone collagen stable isotope analysis combined with zooarchaeological data demonstrate seals being of high importance to coastal Subneolithic people. First seal bone analysis (NISP=2132) made in 2016 show already significant differences in seal species, skeletal part distribution and animal age among sites that generated preliminary ideas about the differences in Šventoji sites chronology, function and seasonality. However, analysis of the complete zooarchaeological assemblages from studied sites and additional detailed microscopic analysis of seal bone fractures were necessary for final conclusions. In 2018, microscopic analysis of seal bones fractures, technological and use wear analysis of seal tibia scrapers were completed and they demonstrate new evidences concerning the technology of seal hunting, butchering and even possible rituals in Šventoji sites. Furthermore, we obtained new and very significant data concerning the sites seasonality. In this presentation we'll demonstrate our final conception about seal hunting and exploitation in Šventoji Subneolithic sites.

Centrality of Seals: Ålandic clay paw rite on the edge of Occam’s razor
Kristin Ilves (Helsinki University)
There are just over 110 small claw paws recovered in the Late Iron Age (550-1050 AD) burials on the Åland Islands of the Baltic Sea. These paws, which have only been found in burials, were made in connection with the cremation burial ritual that was typical for this period. They are of low-fired clay with little or no tempering material. The execution of modelling is rough. Clay paws are oblong in shape, broadening towards one end, and generally, with four to five short digits at the wider end. They measure between 4 and 14 cm in length and have a rounded to oval cross-section. Often, one side of the paw is slightly concave and the opposite side slightly convex. Despite an evident uniformity of the idea, there is a notable variation in the design. Identified as bearers of symbolic meaning, clay paws have been variously associated with bear or beaver. Both these species, however, were absent in the natural environment of Åland during the period of the rite. Therefore, the symbolic significance of the either animal has been interpreted to have been carried to Åland by immigrant groups to accommodate the absence of the relevant animal in the ecology. Reasons for either one of these species becoming important for the Late Iron Age society on Åland are mainly sought outside the archipelago and/or in the mythological narratives of surrounding areas. Following the principle of Occam’s razor, I suggest that clay paws should be identified with seals – living animals present in the environment and significantly important in both diet and economy of the Late Iron Age Åland. By suggesting the paw symbol being metonymic of a seal, also, the dichotomy between symbolic and functional is broken concerning this animal becoming a totem. The clay paw rite is a distinctly Ålandic innovation. It emerged in the Late Iron Age, in connection with a rapid and large-scale colonization of the archipelago. The colonization process has been recently explained in the framework of global climate catastrophe following the large volcanic events in the middle of the 6th century AD that in many agriculturally dependent areas in the Northern Hemisphere led to famine, resulting in mass starvation, disease, and death. In contrast to the many neighboring areas with a widespread decline of settlements and concentration in to fewer villages, on the Åland Islands, settlements become visible in drastic manner. There is an agreement that in the middle of the 6th century Åland saw the greatest increase in human population and activity that cannot be understood as an endogenetic demographic process. I argue that maritime resources, seals in particular, served as a driving force for a colonization of Åland from neighboring areas in order to tackle the effects of the climatic catastrophe. The emergence of the clay paw rite is linked to this process.

Environment and human subsistence on western coast of Sweden during the Mesolithic and Neolithic
Leif Jonsson (Lj - Osteology)
The earliest immigrants to the area were heavily dependent on marine resources. It is also likely that they were migratory spending the warmer part of the year on the coast and the colder part on the continent in the south. When local, stationary populations of deer, aurochs and wild boar had become established hunter gatherers could also form more or less sedentary groups. Marine resources remained the prime source of food throughout the Mesolithic. The introduction of agriculture was done by immigrating groups from the south but marine resources remained important to varying degree. In middle neolithic times the marine environment goes through great changes with abundance of fish and marine mammals, especially harp seal and southern fish species. During this period a new group of people settle at the Coasts of Southern Scandinavia, the Pitted Ware Culture. This group were mainly hunter-Fishers but also had some domesticates. Their relation to earlier farmers is not well understood. Later the PW culture dissapear and are succeed by farmers but their economy is poorly known.

Hunting mentality in agrarian environments. Wild animal skins in the Iron Age and medieval graves in eastern Fennoscandia
Tuula Kirkinnen (University of Helsinki, dept. of Cultures)
Co-author: Kristiina Mannermaa, Dept. of Cultures, University of Helsinki, Finland, Osteological Research Laboratory, University of Stockholm
In this paper, we discuss the role of big game hunting among the Late Iron Age and
medieval (AD 800–1500) farming populations in eastern Fennoscandia. In Finland, the importance of hunting and fur trade as supplementary economies have been considered an outgrowth of area’s location at the northernmost limits of the cultivation zone in Europe. The study area is situated on the paleartic zone, having characteristics of Continental fauna (pine marten [Martes martes]) as well as Siberian species (European elk [Alces alces], wild forest reindeer [Rangifer tarandus fennicus]) and marine mammals (ringed seal [Pusa hispida], grey seal [Halichoerus grypus]). The transition to productive livelihoods in the southern Finland took thousands of years, and in the northern and eastern parts of Finland hunting retained its central role up to the Modern Age. Our study indicates that from cultural and mental point of view the change was even slower than previously suggested. We base this argument on the animal hair and skin material collected from Finnish and East-Karelian inhumation burials, in which the wrapping of the deceased in European elk and (wild forest) reindeer skins indicates the longevity of a hunting mentality long after having adapted to farming. Our first argument rests on the tradition of wrapping in hunting cultures. The earliest evidence of wrapping bodies in Northern Eurasia derives from the Mesolithic Stone Age, after which animal skins were repeatedly used for wrapping the deceased. As a second argument, we suggest that the act of wrapping had its origins in hunting rituals, in which the wearing of a skin helped the hunter to become an animal. Rane Willerslev (2007) has interpreted that this ritual was practiced especially in big-game hunting, which demanded close contact with the game animal. In burials, the act of wrapping controlled the liminal stage of death and facilitated the transformation from a human being to an animal-ancestor. This is in line with the Finno-Ugrian worldview in which animals such as brown bear (Ursus arctos) and reindeer were ex-humans, fore-fathers, or relatives. We suggest that wrapping of bodies in wild animal skins during the Iron Age has a direct continuity to the prehistoric hunter-gatherers, and represents a several thousand-years long, unbroken tradition. For interpreting our results, we estimate the interaction between food supply and ritual treatment of bones and skins, and, on the other hand, past cervid population history in the accumulation of archaeological data. The results are based on a somewhat heterogeneous and fragmented body of source material, but they clearly underline the importance of hunting and wild animals in the Late Iron Age and Early Medieval world in northern Europe.

**Carved bird pendants of forest hunter-gatherer-fishers (East European Plain, 3500–2700 BC) – the edible totems**

_Ekaterina Kashina (State Historical Museum, Moscow)_

Bone bird figurines used as personal adornments disseminated during the period between 4000–2300 BC in the territory of the current Baltic states, Republic of Belarus and the center of East European Plain, at the interfluve of Volga and Oka Rivers. The excavation of several sites seems to show year-round habitation, due to the presence of large semi-subterranean dwellings in locations where fish was very abundant. Additionally, these communities’ spiritual life is reflected in mobile art, mostly small sculpture pendants, depicting humans and animals made of bone, flint, and amber. This focus is on carved bird pendants: morphology, technology, functional use, and symbolism. There are two kinds of pendants: the full-figure bird representation and the partial one. All full-figure sculptures represent bird silhouettes and lack any details except drilled holes for fastening, but partial sculptures (bird head and neck/rod) usually have drilled eyes and carved mouth line, and also a perforated hole or carved incisions for fastening. In the Baltic region only full figure pendants are known, while both kinds are common in the central part of East European Plain. In terms of species, waterfowl (small ducks, swan and geese), merganser, marshland (crane, heron, sand-piper) and woodland species (capercaillie, partridge, grouse) are present. The species with the highest representation is the capercaillie (Tetrao urogallus, 40 of circa 100 pieces), which is of great interest for the discussion of pendants’ functional use and symbolism. The total absence of raptor birds is also remarkable, which drove me to compare species representation in both pendants and bird bones. According to research into the faunal remains, performed at three sites of the Oka River basin, it can be said that the bird species represented in pendants were pretty much the same as those which were hunted. Ducks (especially Anas platyrhynchos) is the most represented (near 50%). Their wing bones (antebrachium) were used for making awls, humeri for making awls/tools for sinew-thread treating, and feathered carpometacarpus could have been used for decoration. The capercaillie usually comes second among bird bone remains (near 10%). The significant number of finds allows us to suggest that each community member obtained the bird pendant and wore it in everyday life. According to my recent studies, bone, amber, and flint zoomorphic pendants could represent a totem ancestor of a community/kin. The presence of various bird species images buried in one dwelling may be the evidence of different clan members communal living. The abundance of duck and capercaillie bones in faunal collections means that obviously no nutritional taboo existed regarding all bird totems. The capercaillie pendants is the most represented and disseminated pendant in the Volga–Oka interfluve, which suggests that they reflect the possible existence of a large number of kin. The choice of this particular totem animal could have been driven by the similarity between animal behavior and that of humans. It seems that capercaillie fitted quite well for this purpose, considering these birds’ abilities to stay at the same place during winter season (sedentism), to hide in snow caves (semi-subterranean dwellings), to consume berries, to dance, sing and fight during the mating period, and so on.
A preboreal relation with Elks - the ritual elk deposits from Lundby Mose
Kristoffer Buck Pedersen (Museum Southeast Denmark)

The early preboreal in southern Scandinavia is an enigmatic period. As the environment was recovering from the severe cold of younger dryas, people were re-colonizing the barren landscape. But the earliest traces of people in the preboreal are not settlement sites, but bones from elks deposited in small kettleholes. At Lundby Mose bones from at least 13 elks were deposited in 6 different concentrations. The Elks were deposited at - at least - four separate events. The earliest elk-deposits were made in the very early part of the preboreal (L1, L2 & L3). The deposits consisted only of elk-bones, and they are interpreted as an expression of a ritual human-animal relationship, a communication between the hunter and the souls of the elks. A large concentration of bones from elks (L5), and other animals, is dated to a later part of the preboreal. Its composition and characteristic is more reminiscent of settlement waste as we know it from the subsequent Boreal period. Together with similar finds from Skottemarke and Favrbo, and some newly interpreted sites of same age, it is proposed that Lundby mose is part of a special ritual horizon. This could be seen as the newcomers attempt to colonize the new landscape with souls - a ritual game management - to secure a good stock of game for the future.

European bison hunting and butchering at Vilnius Lower Castle during the 13th-17th c.
Giedré Pilčiauskienė (Department of Archaeology, Vilnius University, Lithuania)
Co-authors: Povilas Blaževičius, National Museum – Palace of the Grand Dukes of Lithuania

Vilnius Lower castle and the Palace of the Grand Dukes of Lithuania (13th-17th c.) are objects of an extraordinary importance for Lithuanian state history. Dwellers of various social stratus – kings, dukes, bishops, knights, officers, soldiers, as well as craftsmen and servants lived in the territory of the castle through the centuries. Since the middle of the 20th c. an area of about 18,000 m2 was excavated there. Dozens of latrines, sewers and water-supply pipelines were examined, more than half of million archaeological artefacts were collected and ca. 70,000 animal bones fragments were analysed. Hunting was very important in the life of the residents of Vilnius Lower castle. Therefore, remains of wild game consist even 11-28 % of the zooarchaeological assemblages. European bison was the second most hunted animal during the all historical stages of the castle, despite permission of the king was needed for bison hunting. Almost 2000 bisons bones fragments were found in Vilnius Lower castle, most of them were dated to the end of 14th-15th c. Synthesis of zooarcheological and historical data allow us to take a look at royal hunting, consumption and value of this animal during the 13th-17th c. Moreover, in this presentation we also would like to demonstrate unique material of one waste pit, dated to the end of 14th – beginning of 15th c., where remains of at least 29 bisons were found. Zooarchaeological data and historical sources concerning the royal bison hunting, butchering and meat conservation allow us to reconstruct this one bison hunting and butchering episode.

The aurochs (Bos primigenius) in prehistoric Switzerland: humans and wild cattle in a diversity of landscapes
Lizzie Wright (University of Basel)
Co-author: Marguerita Schafer

The area now occupied by current day Switzerland has an incredibly rich prehistoric archaeological record, due in part to the fantastic preservation conditions at waterlogged sites by many of its lakes. These lakeside settlements - dated mostly to the Neolithic period - have produced very well preserved organic remains, including many large assemblages of animal bones. During the Neolithic period domestic cattle, pigs and sheep/goat provided an important part of the economy, but a number of wild animals were hunted to supplement this. Although red deer is the most commonly found wild animal aurochs remains are also found frequently, and in much higher concentrations than during the Mesolithic period. There are, however, fluctuations in the intensity of hunting across time and in different landscapes. This paper will present the current evidence for aurochs remains in Switzerland. We will bring together data from multiple sites in different geographical regions and across time, and will consider the role of different landscapes in the exploitation of these animals.

Human-Deer spiritual connection: offering places of Northern Eurasia from Neolithic to Modern time
Nataliia Mykhailova (Institute of Archaeology of National Academy of Sciences of Ukraine Senior Researcher Department)

Cult of the Deer, which was formed in Upper Paleolithic, has become dominant in mythsritual complex of the people of Europe and North Asia in Mesolithic and Neolithic time and was preserved in the world outlook in Bronze and Iron Ages. The main components of the cult were myths and rites of fertility and hunting success, which included the sacrifice of a deer. Sacred places were the material component of the cult. Numerous archaeological evidences of the Neolithic deer sacrifices were found in Northern Europe and Siberia. As usual, they were connected with the outstanding places of landscape, deer calving places, ways of deer migrations, hunting grounds. Deer cult ceremonies were held near the rock art depictions frequently. More
than a hundred offering places, connected with the rock depictions, are known in Fennoscandia and Northern Russia. The stylistic diversity of images and the presence of cultural layers of different eras testify to their prolonged functioning, sometimes before historical or even contemporary times. Most researchers are tracing a clear connection of images with water, which plays the role of boundary between worlds in the spiritual culture of indigenous peoples. Through comparing of the archaeological and ethnographical materials with the synchronic and diachronic aspects we can assume, that deer/elk offering places were perceived as dwellings of the spirits mediators between people and Great Mother, which had the form of the female elk in ancient times. Thousands of her images were reflected in rock and mobile art of Northern Europe and Siberia in Neolithic time. The inventory of the offering places included the attributes of ritual offering: deer/elk sculls, antlers and bones, weapons – sacred deer slaughtering tools; flints for making sacral fire, bowls for the sacred meal; and gifts to the Great Mother: deer figurines, jewels, coins and so on. The tradition of the deer offerings was kept in Bronze and Iron ages. There were great offering places with the sculls of the elk, bear and other animals in Northern Russia, which were common to several neighboring settlements. The surrounding area was considered sacred. Some sacral places were functioned till modern time.

**SESSION 15**

**The implications of the study of the past for the anthropology of health**

**Friday March 15th, Room 207**

Maria Carolina Avila Testa

**WED 15:30 POSTER SESSION** Cesspits as source of reconstruction of health conditions in medieval towns – a case study of Kiel

Tent

Anna Wierzgon (GSHDL, Kiel; Institute of Pre- and Protohistoric Archaeology, Kiel University)

**FRI 08:30** Health and sanitation as a public responsibility in medieval Trondheim

R 207

Sean Denham (Museum of Archaeology, University of Stavanger)

08:50 Archaeological perspectives on past and present perceptions of the plague

Doris Gutsmedl-Schuemann (Freie Universitaet Berlin, Institute of Prehistoric Archaeology)

09:10 Who were the first inhabitants of medieval Kiel? - A contribution of archaeobotanical investigations from medieval cesspits and contemporary studies in medicinal anthropology focusing on developing countries to the knowledge of health and hygiene of the population of the Old Town of Kiel between the 13th and 15th century

Anna Wierzgon (GSHDL, Kiel; Institute of Pre- and Protohistoric Archaeology, Kiel)

09:30 Historicism and ahistoricism in Medical Anthropology

Keynote lecture: Josep Comelles (Medical Anthropology Research Center (Universitat Rovira i Virgili))

10:30 Rain water and health in the Roman ancient time

Yasmina Benferhat (University of Lorraine, Campus Nancy)
10:50 When medical anthropology meets Linguistics. Language, context and disease analysis in guarani manuscripts of colonial Paraguay (18th Century)
Leonardo Cerro (CONICET)

11:10 Historical and anthropological notes of an Andean diagnostic medical practice and healing
Rocio Rebata (UNMSM; UPC)

11:30 The medicine of the priest Taddeo de Wiesent in South America, the method, its scopes and current uses
Maria Carolina Avila Testa (GSHDL, Kiel University)

11:50 Discussion

13:30 Health and social rank of the Corded Ware population from Żerniki Górne, Poland, dated to 2600-2300 BC
Rafal Skrzyniecki (University of Adam Mickiewicz in Poznan)

13:50 Discussion

15 ABSTRACTS

The implications of the study of the past for the anthropology of health

Keynote speaker: J. Comelles, Universitat Rovira i Virgili, Spain

Session organizers: C. Avila Testa*
*corresponding chair, caroatest[at]gmail.com

Societies have lived through centuries of migration, disaster, and change, exchanging knowledge that has taken root in other societies and shaped syncretisms today. In parallel, various historical, ecological, and industrial events have altered lives and societies, specifically through their impact on the health of the population. These processes have had widespread cultural, environmental, and other consequences, in some cases disadvantaging the health of the population, or generating new epidemics, or the appearance of new diseases and health problems. Despite a significant body of work on historical studies of health, the study of health and medicine in the past are rarely thought in tandem with medical anthropological work today. This panel focuses on the dialogue between anthropology, history, and health, and welcomes papers that contribute to thinking about how historical approaches to health can be brought to bear on the theoretical or practical concerns of contemporary medical anthropology, and vice versa. Potential questions include: How can studies from archaeology and history contribute to the study of contemporary disease developments or patterns? Likewise, what concepts, theories, and interventions have emerged within the field of medical anthropology that might contribute to the study of the past? How are environmental processes and ruptures part of health concerns not only of the past, but also of the present? What critical intersections can be identified between the fields of health, environment, and the past that might open up productive lines of research for the future?

POSTER SESSION: Cesspits as source of reconstruction of health conditions in medieval towns – a case study of Kiel
Anna Wierzgon (GSHDL, Kiel; Institute of Pre- and Protohistoric Archaeology, Kiel University)
Co-author: Yasmin Dannath, GS HDL (Botanical Platform), Kiel

The investigations applying methods of forensic medicine on skeletal remains from ancient times traditionally provide information about health conditions, deficiencies and other physical problems of past populations. However, it is not always possible to find parts of human skeleton in the archaeological investigations. In such case an important information about health in the past provide archaeobotany. This paper
focuses on possibilities of gaining information of health conditions from medieval cesspits in Kiel using archaeobotany, with proxy comparison from pollen and macro-remains analysis. This case study is based on four medieval cesspits in Kiel dated between the 13th and 15th century. The cesspits provide plenty of information about environmental, nutritional, hygienic and sanitary conditions in the medieval town, which can affect human health. First, the detected botanical species inform about plant foods, as they are direct evidence of not digested plant remains or kitchen waste. These macro-remains enable to reconstruct the medieval diet of inhabitants and have a potential to detect the malnutrition or lack of certain food substances in daily nutrition. For this purpose, an approach to quantifying nutritional plants by investigating proportions of calories and possibly daily caloric intake in medieval Kiel was applied. In addition, some plant species provide information about waste, moisture, high nitrogen content in soils, which informs about potential health risks. It presents a broad picture of hygienic and living conditions in the town. The pollen analysis carried out in the soil samples from the cesspits of Kiel detected a high rate of intestinal helminth eggs of Trichuris trichura and Ascaris. The research questions to be answered here are: What does the presence of these parasite eggs indicate a disease affected Kiel inhabitants? What diseases can cause these specific parasites? The additional information provides historical sources. From Kiel there are known some documents providing information about diseases, beginning in the foundation phase of the town in the 13th century. Is it possible to use historical sources to answer these questions?

**Health and sanitation as a public responsibility in medieval Trondheim**

*Sean Denham (Museum of Archaeology, University of Stavanger)*

One of the first steps in developing a public health policy is the recognition of the link between health and sanitation. A second step is the realization that as populations and population densities increase, sanitation infrastructure and sanitary practices are most effectively organized at the communal/administrative level. This talk will present the Medieval Urban Health- From Individual to Public Responsibility, AD 1000-1600 (MedHeal600), an ongoing research project which seeks to identify this process in the well-preserved urban medieval layers in Trondheim, Norway. MedHeal600 takes a three-prong approach, looking at the bioarchaeological, archaeological and historical records. The bioarchaeological aspect acknowledges that health is inextricably linked to both environmental conditions and access to adequate nutrition. This particular work packet, therefore, involves not only more direct methods of evaluating health levels (palaeopathology, mortality patterns, pathogen aDNA), but also methods of providing an environmental and nutritional context (stable isotopic analysis, palaeobotany, zooarchaeology) within which health levels can be viewed. The archaeological aspect focuses on the changes in infrastructure over time, particularly fresh water supply and waste disposal systems. The historical research looks at both the legislative and social aspects of health and sanitation over the course of the medieval period. How were health and sanitation perceived by the medieval population? When and how did preventive measures against infectious disease become a communal rather than a private effort, and how has this affected the historical development of Norwegian public health policies? What effective measures could an urbanizing population in a relatively low resource environment take to promote health and, more importantly, what lessons might this provide for modern analogous situations? In MedHeal600, it is the interplay of the bioarchaeological, archaeological and historical records which help to illuminate the development of the concept of health and sanitation as a public responsibility, as well as the steps taken to act upon that responsibility.

**Archaeological perspectives on past and present perceptions of the plague**

*Doris Gutsmiedl-Schuemann (Freie Universitaet Berlin, Institute of Prehistoric Archaeology)*

Diseases have both a biological as well as a social dimension. To address their biological dimension, research from disciplines as modern medicine, physical anthropology as well as paleogenetic, which became more and more important over past years, are needed. To address their social component, it is needed to examine such aspects as popular perception and response as well as the effects that the disease had through disciplines like archaeology, history or cultural anthropology. To get the best view on diseases in the past and how people dealt with them, interdisciplinary research and exchange is crucial. Furthermore, modern perceptions of how a disease should be handled, have to be made explicit, to avoid unreflected transformations of modern views to the past. In this paper, I would like to discuss the different dimensions of diseases and how different disciplines perceive and interpret them at the example of the plague. The plague, caused by the bacterium yersinia pestis, is on the one hand a disease, that is still present today and causes several dozens to hundred of deaths worldwide every year, but it is also a disease that was researched at least since the 1830ies. First, research on the plague was conducted by historians of medicine and mainly from written evidence they had from the past. From written evidence, two main plague events were identified in the past: First the so called Justinianic Plague in late antique and early middle ages, and second the so called Black Death at the end of the middle ages. But this first research was also conducted in a special historical and
Who were the first inhabitants of medieval Kiel? - A contribution of archaeobotanical investigations from medieval cesspits and contemporary studies in medical anthropology focusing on developing countries to the knowledge of health and hygiene of the population of the Old Town of Kiel between the 13th and 15th century.

Anna Wierzgon (GS HDL, Kiel; Institute of Pre- and Protohistoric Archaeology, Kiel)
Co-author: Yasmin Dannath, GS HDL (Botanical Platform)

The archaeobotanical studies on medieval cesspits from the Schlossstraße in the Old Town of Kiel reveal numerous information regarding daily life in the Middle Ages. Seeds, fruits and pollen are a tangible evidence of nutrition and agriculture in the old times. Furthermore, based on the micro- and macro-remains from the soil samples, health conditions in the medieval Kiel can be reconstructed. The investigation of seeds and fruits from cesspits provide information about quantity and calorie content of consumed plant food and meal preparation. Also, hygienic conditions and social status of inhabitants of medieval Kiel can be obtained from plant remains. In addition, the palynological analysis of cesspits revealed human intestinal helminths. A summary of this information built a fundament on studies about health conditions in the medieval Kiel. The present paper goes one step further and compares the results of archaeobotanical remains from medieval cesspits with results obtained from studies on stool samples of people in developing countries to gain information about health conditions in the foundation phase of Kiel. Despite spatial and temporal differences, we can observe in the both population groups environmental and socio-economic similarities. In the both investigated groups an urban development is still in progress. Furthermore, the medieval inhabitants of Kiel and contemporary inhabitants of developing countries use cesspits, often together with neighbours. In addition, the palynological analyses of soil samples from cesspits in Kiel dated between 13th and 15th century has revealed numerous parasite eggs. The same intestinal helminth species were present in the stool samples collected during the medical studies in several developing countries. The results from the anthropological studies and archaeobotanical analyses were compared to gain more information about the medieval cesspit users. The attempt of the investigations is to answer the questions concerning health, hygiene, socio-economic conditions and individual behaviour habits of inhabitants of medieval Schlossstraße. The research questions to be answered are: How many people were infected? How old were the cesspits users? What social groups are mainly carriers of these parasites? What are the risk factors in the developing countries to be infected by the parasites and how can we relate it to the medieval cesspits? Moreover, the investigations give additional information about the environment in medieval Kiel such as drink water quality, hygiene of finger nails, wearing shoes, eating of raw or under cooked vegetables as well as about agricultural management, such as pouring the contents of cesspits into gardens and fields, and potential contamination of useful plants with faecal material in the farm. The example of medieval Kiel shows that multidisciplinary studies of archaeobotany and contemporary medicinal anthropology open new possibilities to investigate health, sanitary patterns and environment in the past times.
one was the historical-geographical-ethnographic conception sustained in Germany in the XVIII-XIX century by a series of authors who highlighted the need of also applying a historical perspective to the ethnographic view. This line had a continuity at hand of critical “salubristas” like Maxime Kuscinski Godard, anthropologists of Marxist orientation, as well as Ernesto de Martino and Tullio Seppilli in the Italy in the fifties, and with the development in Latin America of a critical medical anthropology that precedes, chronologically, the development of Anglo-Saxon critical medical anthropology in the eighties. All these developments are the result of the limits posed by an ethnographic view that has been, and will be, an indispensable tool in the different stages of the medicalization process. A fundamental tool insofar as the ethnographic dimension of medical practice has been key in articulating the mechanisms of persuasion, later critical in education aimed at facilitating the embodiment by the population of a medicalizing discourse.

Rain water and health in the Roman ancient time
Yasmina Benferhat (University of Lorraine, Campus Nancy)
I would like to submit a project of talk on rain and health in the Roman World (ancient world might be too vague, it is about Greece and Rome). The corpus would be the Hippocratic treatises (especially Aer.; Epid.; Morb.; Humor.) and Pliny’s HN. The idea would be to search on the connections between rain and health: what is the quality of rain water for healthy and ill people? Does the rain water can bring diseases and which ones? There are two different aspects to be taken in account: the rain as vector of diseases (or not), so meteorology, and the rain water which can be kept and drunk later, but in which conditions, and it is more a question of archeology. My paper would be a first attempt to see what kind of results we can expect, which would be a first base to keep on searching on this matter.

When medical anthropology meets Linguistics. Language, context and disease analysis in guarani manuscripts of colonial Paraguay (18th Century)
Leonardo Cerno (CONICET)
This presentation is about the use of linguistic methodology for the study of social practices, particularly for the research on medical practices in colonial South America. In this context, some indigenous languages became writing systems, were standardized and latterly used in dictionaries and texts which in turn contributed to normalize name of native plants, diseases and therapies. Bilingual and monolingual codex have circulated in colonial Paraguay, involving translations of Pedro de Montenegro’s ‘Materia Medica’, the most influent medical treatise written in the Jesuit reductions and used for Indian population’s diseases. We focus on the guarani anonymous manuscript Pohã Nanã (‘Herbal Medicines’, 1725) comparing different versions and relating language variables with the historical and social context. Where were used these texts and by whom? Why were they written in guarani? Which communicative functions have they fulfill? What can they tell about native knowledge and cultural processes involved in therapies and health practices in colonial Paraguay and its region? To what extent are they different of Montenegro’s ‘Materia Medica’? Some findings and methods in the field of historical linguistics can contribute in giving answers to these questions.

Historical and anthropological notes of an Andean medical practice of diagnosis and healing
Rocio Rebata (UNMSM; UPC)
The explanation of the causes of diseases and their treatments in the Andean medical system have been historically considered as “archaic beliefs”, “popular superstitions”, and even as “irrationalities”. Today this position reveals a limited understanding of the value of the intercultural conception of health in the Andean context. The healing with the guinea pig (limpiacun cuy), also known as caypada, jubeo or soba, is framed in this context. Although there are no precise references about their origin, it is possible to find evidence of their pre-Hispanic background in chronicles and colonial documentation of the sixteenth and seventeenth centuries, particularly during the Extirpation of idolatries in Peru. This Andean medical practice of diagnosing and healing diseases has remained alive in the Andes at the present —with changes in its meaning and practice— within the cultural framework of popular Catholicism. This scenario is transformed and complemented with the advance of the institutionalization of Western Biomedicine and with the expansion of the Pentecostal Christian churches. The purpose of this paper is to present a study about the historical evolution of the healing with the guinea pig, and to report on progress and preliminary results of qualitative fieldwork about its current practices in the Northern Peru. The main objective is to contribute to an intercultural dialogue of knowledges.

The medicine of the priest Taddeo de Wiesent in South America, the method, its scopes and current uses
Maria Carolina Avila Testa (GSHDL, Kiel University)
The intersection between history and current developments in medical folklore led us to know the itineraries as curators of some Capuchin missionaries in South America. We will develop in this opportunity, a tour about the diffusion of medical prescriptions, the relationship with humoral medicine and the current uses for the cure of illnesses among Peruvian immigrants. We find recipes of doctors, curators and priests of the Capuchin order who developed the so-called modern hydrotherapy (Sebastian Kneipp) and Naturism. Some of them were missionaries, doctors and others developed as laymen, this is the case of “Father” Tadeo de Wiesent in Chile and Colombia, although his work reached other Latin American countries. Tadeo built a hospital (and other works) to treat those suffering from arthritis, and he also attended consultations in the current style of the healing cures with the method of hydrotherapy. Then his disciples would continue to develop this medicine based mainly on water baths and would call it natural medicine, among the most popular were Manuel Lezaeta Acharán and Carlos Kozel, who continued to use 16th century biomedicine (modern medicine) in the 19th century until today. The priest Taddeo de Wiesent was a popular curator, who cured a large number of people in Chile and Colombia, his method and works continued to develop in several places in Latin America. He developed social actions of great importance to local ethnic and cultural societies, despite resistance and confrontations with certain local power groups. We also asked ourselves: How is the diffusionism of this medicine present in home medicine and in beliefs about the natural etiologies of the disease?

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**Health and social rank of the Corded Ware population from Żerniki Górne, Poland, dated to 2600-2300 BC**

*Rafał Skryniecki (University of Adam Mickiewicz in Poznan)*  
*Co-authors: Marta Krenz-Niedbała, Sylwia Łukasik, Wenesa Woźniak*

Site 1 in Żerniki Górne, Małopolskie voivodeship, Poland, is mainly known for its large necropolis of the Cracow-Sandomierz group of the Corded Ware Culture, dated roughly to the second half of the 3rd millennium BC. It consists of 63 human graves, mostly of niche construction. Access to the necropolis was not ageor sex-restricted, although differences in treating the deceased with regard to their biological sex were clearly emphasized. Men and women were buried according to different rules – the former usually on their right side with head towards S, the latter on their left side, heads towards N. Nevertheless, some deviations from this pattern are also present. Moreover, large number of graves contained sets of standardized grave goods. Some of them, e.g. weapons and large bone tools, were deposited exclusively in objects containing male individuals lying on their right side. Variations in number and quality of funeral equipment, along with the presence of sex-determined burial ritual, are often interpreted in terms of social divisions. Therefore, the aim of the present study was to assess the health status of the human Neolithic population from Żerniki Górne as well as to check whether the relative position in the social rank system influenced health of the examined individuals. In total, the analyses involved 52 adolescent and adult individuals excavated at Żerniki Górne, including 31 females, 17 males and 4 individuals of undetermined sex. The most numerous age-at-death category were young adults (N=26), followed by middle adults (N=18), and adolescents N=4), while old adults were not recorded in the examined sample, and four individuals could not have been categorized given the lack of diagnostic skeletal elements. The basic characteristics of the biological profile were determined through the standard methods applied in physical anthropology. Sex assessment was made according to dimorphic features of the skull and pelvis. Age-at-death was evaluated on the basis of age-related changes in the pubic symphysis, dental wear, and, as a complementary method, cranial suture closure. The health status was assessed through the analysis of: enamel hypoplasia (EH), cribra orbitalia (CO) and porotic hyperostosis (PH), Harris lines (HL) and caries. Additionally, body height calculations, as well as paleopathological and taphonomic analyses were made. The social status of particular individuals was determined on the basis of the funerary equipment, among others, copper jewellery and weapons. Then each individual was categorized into one of the two arbitrary social ranks - lower and higher, according to their “wealth”. The general frequencies of individuals displaying particular skeletal indicators were as following: enamel hypoplasia 50.0%, cribra orbitalia 18.2%, porotic hyperostosis 0%, Harris lines 69.2%, and caries 35.7%. Average body height of males was 164 cm, and females 155 cm. The position in the social hierarchy did not reflect in the health status of the examined individuals, but was related to body height – higher-rank males and females were on average taller than their lower-rank counterparts, which suggests better overall living conditions for the individuals of higher social status. Generally, low number of health-related observations for the sample divided into social rank categories could have influenced the results obtained for health status.
**Trends, phases, events – temporal scales in archaeological and palaeoenvironmental data**

**Tuesday March 12th, Room 106**

Session organizers: Ingo Feeseer, Walter Dörfler, Nils Mueller-Scheeßel, Johannes Müller

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**08:30** Scales, Frequencies and semantics. On the meaning and comparison of proxies in (environmental) archaeology

*Keynote lecture: Niels Bleicher (Underwaterarchaeology / DendroLab City Of Zurich)*

- **09:00** A Revised Chronology of the Mesolithic in Southeast Norway
  *Gaute Reitan (Museum of Cultural History, University of Oslo)*

- **09:20** How can changes be traced? Multi-scalar studies of the built environment in prehistoric Southern Turkmenistan
  *Ilia Heit (Freie Universität Berlin, Institut für Vorderasiatische Archäologie)*

- **09:40** Prehistoric landscapes of north Mayo, western Ireland: an overview from a palaeoecological perspective
  *Michael O’Connell (University of Ireland Galway)*

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**11:30** Bronze Age Archaeological and Radiocarbon Chronologies of the Southern Urals (Russia/Kazakhstan) – Results and Problems

*Finn Schreiber (Free University Berlin)*

**11:50** Discussion

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**13:30** Archaeological chronologies as sensor of the different pace of cultural change

*Keynote lecture: Frank Siegmund*

- **14:00** Land use, social transformations and woodland in Central Europe – past, present and future of the research
  *Jan Kolar (Institute of Botany, Czech Academy of Sciences, Brno, Czech Republic)*

- **14:20** Late Holocene land-use history in coastal areas: palynological case study from south-eastern Sweden
  *Olena Vinogradova (Södertörn University, Stockholm Sweden)*

- **14:40** Dating the Balts. At the Crossroads of GIS, Statistics and 14C.
  *Roman Shiroukhov (Centre for Baltic and Scandinavian Archaeology (ZBSA), Schleswig)*

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**15:30** Österild – 2500 year record of human–environment interaction

*Morten Fischer Mortensen (National Museum of Denmark)*

**15:50** Temporal scales of succession and regeneration in natural and in disturbed landscapes

*Walter Dörfler (Institute of Pre- and Protohistoric Archaeology, Kiel University)*

**16:10** Boom and bust cycles during the Slavic period in NE-Germany

*Martin Theuerkauf (Institute of Botany and Landscape Ecology, Greifswald University)*

**16:30** Discussion
Archaeological as well as palaeoenvironmental transformations can be observed on different time scales. Hereby, it is generally possible to identify rapid and longer lasting changes as well as periods of rather stable conditions. In order to distinguish such processes “trends”, “phases”, and “events” are commonly described. This relates also to the question of continuity vs. discontinuous transition processes. Whereas trends could be regarded as a continuous transition, phases can be interpreted to reflect a transition by replacement of one state by another. The definition of such processes and their absolute time scale, however, very much depends on chronological constraints. Archaeological as well as palaeoenvironmental data have a specific uncertainty regarding the dating and the time span they represent. Therefore, considering and defining temporal scales is essential for data comparison and reconstructing or modelling processes in prehistory, and to estimate the probabilities of causal dependencies.

For example, if we are interested in reconstructing human-environmental interaction we have to consider that events of a certain scale in one sphere do not necessarily result in changes on a similar time scale in the other sphere. On the one hand, a short-term event can trigger a longer lasting change. On the other hand, a longer lasting trend can result in a sudden change, if a certain threshold is reached. Burial archaeology for example can focus on a single event, i.e. an individual burial, or a longer phase, i.e. the age and occupancy of a cemetery as well as on greater trends, such as general changes in burial behavior. On each of these temporal scales social structures are recorded and transformation can be studied. These scales also imply the timing from events to processes to structures, even if social processes cannot necessarily be read with a purely ‘linear’ notion of time.

Therefore, this session aims at discussing the following questions:

- How can temporal scales of one archive be methodologically sound and translated to that of another?
- Does the temporal range of a transformation represent its duration or rather dating uncertainties?
- Do our explanatory models depend on the definition of temporal scales of transformations?
And how do our pre-conceptions about the velocity and duration of processes influence our interpretation of transformations?

We invite contributions from archaeology and natural sciences with a transdisciplinary research focus. The papers should focus on examples from different disciplines regarding the identification and description of different temporal scales in their data and their (potential) consequences for interpretation.

Scales, Frequencies and semantics. On the meaning and comparison of proxies in (environmental) archaeology

Keynote lecture: Niels Bleicher (Underwaterarchaeology / DendroLab City Of Zurich)

Many studies on the human environment or the influence of humans on it are based on time series and often on the comparison of such. Obvious examples of such time series are annual ring and pollen data, but ultimately diachronic data on settlement intensity, find density or even the rate of change of typological elements are nothing more than time series.

For the handling of time series there are well defined methods in other disciplines. These show that variability in time series often occurs in different frequency bands and that the significance of variability differs in these different frequencies. It therefore makes a difference to the interpretation of many data whether they are viewed on a large or small scale. There is also the problem when comparing time series that causal relationships can only be inferred under certain circumstances.

In this presentation, examples for shifts of meaning with scale changes within time series are presented and related problems with the comparison of time series are brought up for discussion.

A Revised Chronology of the Mesolithic in Southeast Norway

Gaute Reitan (Museum of Cultural History, University of Oslo)

Since the turn of the millennium, more than 400 Stone Age sites have been excavated in Southeast Norway by the Museum of Cultural History, University of Oslo. What implications does this tremendous amount of recently obtained data have for the understanding of the period in question, not least in terms of trends and breaks in the archaeological material? In a study published in 1975 the Mesolithic of Southeast Norway was divided into four subsequent phases. This was the first chronology outlined for Southeast Norway, which was based on local finds, local shoreline-displacement curves and typological patterns expressed in the native archaeological record, but no radiocarbon dates were directly included. Nevertheless, this four-phased division is still the established reference for the Mesolithic in Southeast Norway, albeit slightly adjusted after later excavations: the Early Mesolithic (9500–8300 BC), the Middle Mesolithic (8300–6350 BC), whereas the Late Mesolithic is divided into two sub-phases (6350–4650 BC and 4650–3800 BC, respectively). This chronology is closely linked to Holocene vegetational and climatic data, even in popular scientific publications, as relatively few radiocarbon dates from archaeologically excavated contexts have been available. Consequently, certain transitional sequences have only been partly explored. This situation has now drastically altered. The multitude of excavations, most notably along the coast, has provided a rich data material and hundreds of radiocarbon dates which shed light on the chronological and technological long-term trajectory in the region.

Besides, as a result of the continuous postglacial land uplift, shore-bound settlement sites from the whole Mesolithic period are situated on dry land around the Oslo Fjord. Therefore the development of local shoreline displacement curves by geologists as integrated parts of several large-scale excavation projects. The distribution of nearly all known settlement sites, i.e. located adjacent to the contemporary sea, witness to a subsistence strategy heavily based on marine resources. Consequently, a well-dated and well-mapped sea level history provides a highly reliable tool for dating shore-bound Stone Age sites. The recently unearthed settlement site assemblages have turned out to be difficult, at least in part, to fit into the established chronological scheme first suggested more than 40 years ago. Hence, it is argued that the present Mesolithic chronology of Southeast Norway is due for a revision. Based on technological shifts and fluctuations in lead artefacts, along with new local shoreline displacement curves and a large number of radiocarbon date results, a new chronological outline is suggested in this paper. In this chronology the Early-, Middle- and Late Mesolithic are each divided into two sub-phases: EM 1 (9500–8600 BC), EM 2 (8600–8200 BC), MM 1 (8200–7000 BC), MM 2 (7000–5600 BC), LM 1 (5600–4500 BC) and LM 2 (4500–3900 BC). This chronology identifies certain breaks so abrupt that they open for new questions about i.a. potential immigration. Although the present study is mainly based on excavated material from the Oslo Fjord area, and with radiocarbon date results being data of a kind which are directly comparable across time and space, the conclusions are arguably relevant to the bordering areas of Western Sweden, likely also Denmark in terms of contact networks.

How can changes be traced? Multi-scalar studies of the built environment in prehistoric Southern Turkmenistan

Ilia Heit (Freie Universität Berlin, Institut für Vorderasiatische Archäologie)

Recent decades of archaeological research have seen a variety of theoretical discussions of concepts of time. Besides a greater focus on the emic perspective – on time experienced through social practices of past people – considerable effort has been made to understand time.
spent on differentiation among temporal processes in terms of their speed and range when looking at material change over time. This multiscale consideration of time in archaeology has deep reaching roots in the works of Braudel and his notion of history as a composite of varying temporal rhythms – longue durée, moyenne durée or conjoncture and événement. It provided an epistemological potential for archaeological histories as a composite of varying temporal rhythms – longue durée, moyenne durée or conjoncture and événement. It provided an epistemological potential for archaeo-

logical inquiries into change and its temporal dimensions and created opportunities for the integration of small-scale research questions into an area in which scholars have traditionally operated with diachronic comparisons in a long-term perspective. However, how can these theories be implemented on a practical level? The archaeo-

logical evidence from the Neolithic-Aeneolithic tell of Monjukli Depe in Southern Turkmenistan offers a possibility to take a closer look at processes of change at multiple levels, with a focus on built space. The small prehistoric village settlement yielded multiple layers of substantial mudbrick architecture which give insight into building and dwelling practices of past inhabitants. Its excellent preservation allows us on the one hand to trace the phenomena on a small scale of single events or repeated actions that were potentially perceived by past inhabitants and consisted of constructing, using, modifying or abandoning living space. On the other hand the multilayered evidence of superimposed mudbrick architecture at Monjukli Depe gives a possibility to look at middle-term processes, which involved changes in living environment occurring during the whole period of site occupation. The question here is which techniques and ideas of organizing living space were transmitted over generations by the site’s inhabitants and how they changed during this time. The long-term processes encompass changes in spatial organization that took place over longer periods of time and therefore lie beyond human experience but can be grasped analytically. Extensive Soviet excavations on numerous Neolithic and Aeneolithic sites in the region provide a good basis for a diachronic analysis of longterm change in domestic architecture and spatial organisation on settlements that span the 6th through 3rd millennia BCE. The talk will present methods and results of a multi-scalar approach to architectural evidence from Monjukli Depe and prehistoric Southern Turkmenistan based on small-scale stratigraphic analysis, Bayesian radiocarbon modelling and micro-scale diachronic observations of architectural forms and settlement layouts.

Prehistoric landscapes of north Mayo, western Ireland: an overview from a palaeoecological perspective
Michael O’Connell (University of Ireland Galway)
Co-author: Karen Molloy

County Mayo in mid-western Ireland has a wide variety of landscape and a rich archaeological heritage that includes considerable field evidence for human activity in all the major cultural periods. It is particularly noted for the high concentration of megaliths of court-tomb type, datable to the early Neolithic, in the northern part of the county (de Valera and O Nuallain 1964. Survey of the Megalithic Tombs of Ireland. Vol. II. County Mayo). Here too, stone-wall, pre-bog, field systems have been recorded, the most extensive (>1000 ha) and regular system being Céide Fields. Recently, the uniqueness of Céide Fields and nearby similar field-wall systems, e.g. at Belderrig and Rathlacan, has been accorded international recognition in the form of the Carlo Scarpa Prize for Gardens awarded by the Benetton Foundation (March 2018; Boschiero et al. 2018. The Céide Fields, Ireland. Publisher: Fondazione Benetton). In this presentation, an overview of the palaeoecological evidence — including radiocarbon dating and dendrochronology of pine, and several pollen profiles — for woodland dynamics, farming history, climate change and landscape development at a regional level will be presented.

On house generations, C14-dates and house orientation: Putting together pieces for an integrated LBK chronology
Nils Mueller-Scheßel (Institute of Pre- and Protohistoric Archaeology, Kiel University)
Co-author: Tine Karck, stud. phil.

For the time being, LBK chronology is a mess, and this is true in relative as well as absolute chronological terms. Only for the Rhineland and adjacent regions was it possible to define a fine-grained supra-local relative chronological system, which is solely dependent on ceramic decoration („house generations“). However, even this system has recently underwent serious criticism (Fridrich 2016). In terms of absolute dates, the available dendrological ones cannot be brought in conformity with the radiocarbon dates, and those not with the relative chronology. Even more so, the relevance of radiocarbon samples for dating LBK events have been thoroughly questioned (Strien 2017). To remedy this situation somehow, we bring in house orientation as a new independent measure of time. Taking large scale excavations like Erkelenz-Kückhoven or Ulm-Eggingen as starting point, we can show that across the LBK world there is a significant correlation between the orientation of houses and the respective settlement phases. On settlement level, this allows new phasings based on house orientation that can be compared both to the ceramic development and absolute dates derived from C14- samples. We thus hope to get to a better understanding of trends, phases and events within the development of the LBK.

Can archaeologists obtain generational precision on a calibration plateau?
Thanks to Bayesian deposition (age-depth) models, it is increasingly possible to construct precise chronologies for palaeoenvironmental proxies, even in periods where the radiocarbon calibration curve is relatively flat, leading to calibrated date ranges for single samples spanning several centuries. By combining the exact sequence of sample deposition with potential variation in the sedimentation rate, deposition models can give absolute dates for environmental changes with multi-decadal precision. Archaeologists rarely have the detailed prior information required to not only place radiocarbon samples in exact date order, but also to constrain potential differences in their dates. They therefore tend to aggregate data from assemblages on calibration plateaus (obscuring any changes occurring within these periods), or to subdivide these periods arbitrarily, and risk creating misleading synchronisations between archaeological and palaeoenvironmental proxies. The Late Neolithic gallery grave at Niedertiefenbach, Hessen, Germany, offers a rare example of where archaeologists can do much better. Individual calibrated dates of human remains from this grave tend to span the entire late-4th millennium calibration plateau (c.3350-3100/3000 cal BC), but by using Bayesian chronological modelling to combine the calibrated dates with stratigraphic relationships, age-at-death estimates, and kinship information revealed by aDNA, we are able to restrict the overall period of burial to 3-5 generations, and to provide even narrower absolute date ranges for genetic markers found in a limited number of individuals. Thus it is possible to compare archaeogenetic results directly to the environmental record.

Synchronicity and asynchronicity in pollen signals: high resolution pollen analysis and radio carbon based time models for the Neolithic period in the Lake Constance area

Jutta Lechterbeck (Arkeologisk Museum, Universitet i Stavanger)

For the Western Lake Constance region a number of high resolution pollen analyses have been carried out in the last decades, each of which is dated by at least ten radiocarbon dates. Moreover, a non-glacial varve chronology exists for Lake Steisslingen. The time-depth model for each profile was constructed with the time-depth model tool from Oxcal. All profiles from the Lake Constance area show a very similar vegetation development in the Neolithic displaying a number of alternating Fagus and Corylus/Betula peaks. The independent chronology for each profile reveals that despite of the visual similarity those peaks are not synchronous. On the contrary – it can be shown that the actual vegetation changes occurred in a very small-scaled pattern in the landscape, reflecting the spatial shifting of land use. Also the immigration of Fagus does not occur synchronous in all profiles. On the whole the example of the Western Lake Constance area shows that biostratigraphical correlation can be very much misleading even in the case of obviously very similar developments in a small area.

Bronze Age Archaeological and Radiocarbon Chronologies of the Southern Urals (Russia/Kazakhstan) – Results and Problems

Finn Schreiber (Free University Berlin)

Bronze Age chronology of the Southern Urals (Russia/Kazakhstan) is characterized by a several different cultures with just vague insights into their chronological relation regarding both, the connection between the cultures and the absolute chronology. A new ceramic chronology based on multivariate analyses of burial finds in the Southern Urals area now provides a framework for dating finds of the late Bronze age (1800-1400 BC). The results can be summarized in a phase model with three successive chronological stages with major changes visible in ceramics and burial customs. Comparative analyses show similar chronological features for sites in the Trans-Ural steppe and forest steppe areas. This indicates comparable cultural characteristics in different parts of the Southern Urals. A series of new radiocarbon dates (AMS) was established to provide an absolute dating for this ceramic chronology. However, comparison of all available dates shows very different results for the steppe and forest steppe areas. Possible reasons for this could be found in the archaeological record and biases in the radiocarbon dates as well. The paper will focus on possibilities and problems, both of developing and correlating of typological chronological and Bayesian radiocarbon modelling in the Southern Urals Bronze Age and present the current state of research and potential future goals.

Archaeological chronologies as sensor of the different pace of cultural change

Keynote lecture: Frank Siegmund

Well established traditional archaeological chronologies reflect the pace of change in the material culture and social behaviour of past societies. More change allows more detailed chronologies, and vice versa. Thus, we can take our chronologies as a detector of the very different pace of change in the past. A systematic collection of central European chronologies shows, that the duration of the single phases of archaeological
chronologies doesn’t follow a general pattern in the sense of “the older the longer, the younger the shorter”. Instead, shorter and longer phases can be observed in every era. In early historical situations, which thanks to written sources can be cross-referenced to a certain extent, the duration of the phases corresponds well with historical events and developments. Archaeological chronologies can therefore be used as a comparative diachronic and intercultural tool to assess cultural changes as well as to assess the force of traditions and innovations.

A major cause of the variation in the duration is seen in the way culture is transmitted to young people: short phases are mainly linked to cultural transfers between peers; long phases result principally from the transfer of culture from parents to children; long phases from the transfer from grandparents to grandchildren. The introduction of major technological innovation like agriculture and animal husbandry, the “secondary products evolution”, the beginning of the Bronze Age, or the beginning of the Iron Age is accompanied by relatively long phases, i.e. periods with fewer changes in the material culture.

Land use, social transformations and woodland in Central Europe – past, present and future of the research
Jan Kolar (Institute of Botany, Czech Academy of Sciences, Brno, Czech Republic)
Co-authors: Vojtech Abraham; Martin Macek, Peter Tkáč

Prehistoric land use changed according the several factors such as subsistence strategies, population dynamics, technological innovations or transformations of social structures associated with land ownership rules. These phenomena did not occur or transform in large areas of Central Europe at the same time and they were influenced by specific modes of human mobility, environmental conditions, availability of natural sources etc. Taking the transition from hunting and gathering to farming and herding as an example, we know that the change was somewhere sudden, somewhere it took several hundreds of years until the communities became fully agropastoral. What was the impact of such a rapid or gradual change on the land use? Can we register the velocity of the social transitions in the palaeoarchives? Are we able to effectively compare palaeoarchives and archaeological datasets and knowledge? In the previous project (http://longwood.cz/) archaeological evidence on human presence from the eastern part of Czech Republic from the period between 10,000 BCE and 1,250 CE served as a data input for a spatio-temporal modelling of the intensity of human activity. So far, our modelling approach represented an effective tool for overcoming spatial and temporal uncertainties of the archaeological dataset and for producing of the quantified human activity model, which is easily comparable with palaeoenvironmental proxies. In the upcoming research project, which starts in 2019, we will use the fact that Czech Republic is currently fully covered by archaeological databases of sites and finds and we will create a quantified model of land use based solely on the archaeological evidence. This will be easily comparable with quantified vegetation models. Nevertheless the incorporation of non-quantifiable knowledge on the prehistoric societies such as technological innovations, social structure or ways of communications is still a challenge which needs to be discussed.

Late Holocene land-use history in coastal areas: palynological case study from south-eastern Sweden
Olena Vinogradova (Södertörn University, Stockholm Sweden)
Co-authors: Johan Rönby1, Veronica Palm1, Joakim Holmlund3, Marie-José Gaillard- Lemdahl1, Elinor Andrén1, Thomas Andrén1
1 Södertörn University, Stockholm Sweden
2 Linnaeus University in Kalmar, Sweden
3 Malmö All, Sweden

Introduction of agriculture in Sweden is dated to ca. 6 ka BP. Earlier studies indicate that fertile coastal areas generally have the longest and most continuous history of crop cultivation (e.g. Berglund et al. 1991). However, this conclusion was never tested systematically along the costs of Sweden. Moreover, the effect of long-term land-use in coastal areas on e.g. the Baltic Sea is still debated (Conley et al. 2011). In this context, paleorecords from lake sediments and marine deposits have the potential to provide useful information on the impact of early agriculture on the Baltic Sea environment. In this study, we focus on environmental transformations of the south-eastern coastal zone of Sweden during the last 3 ka BP. This area has a long agrarian and human occupation history, but so far detailed land-use reconstructions are scarce. The general trend of land-use intensification from the establishment of permanent fields ca. 3 ka BP was interrupted by decrease during the Migration Period (ca. 1,5 ka BP) and the Medieval crisis caused by plague outbreaks (ca. 700-500 yr BP) (Myrdal and Morell 2011). Our case study is based on pollen and microcharcoal data from Lake Lillsjön (N 57°55.934', E 16°23.342', 16 m.a.s.l; surface area 0.16 km2) located in the hemiboreal zone of south-eastern Sweden. The area is rich in archaeological findings that evidence human activity from the Mesolithic time onwards. The pollen data from such a small lake provide information on the local land-use and vegetation. The type of land use is reconstructed based on the modern analogue approach and the “indicator-species approach”. We use the synthesis of human-impact pollen indicators of Gaillard (2013). The underlying assumption is that pollen types represent plant species that are indicative of specific soil, nutrient and climatic conditions, as well as types of anthropogenic activity. Our first results show the occurrence of pollen types indicative of various kinds of pastures and meadows, ruderal communities and cultivated land (Cerealia
type pollen). The reconstructed land-use changes are then compared with the archaeological record of the area.

Literature

Dating the Balts. At the Crossroads of GIS, Statistics and 14C.
Roman Shiroukhov (Centre for Baltic and Scandinavian Archaeology (ZBSA), Schleswig)
Iron age chronology of the East Baltic region is more intuitive, than relative, based mainly on typological dating of sequences of cemeteries artefacts. The Western Balts late iron age cemeteries data gives an opportunity to establish a new combination of dating methods for this area, applying typology, GIS, R-statistics and 14C. The situation of the Balts region in the 10-13th century is rather peculiar, as it was by this time “an island of prehistory”, surrounded by „the continent of history“. The double-sided periphery between the Old Rus’ and Scandinavia. The historical perspective of the absolute time of dates, events and written sources is juxtaposed here to the relative time of pre-history (mythology) and processes decoded in archaeological remains. The goal of the project is to develop an example of georeferenced statistically modelled radiocarbon-dated time-scale. Initially the data of 9 Prussian, Curonian and Scialvian cremation cemeteries (about 800 graves) is used. Every cemetery is represented here as the set of “events” or “time capsules” – sealed deposits, created for some reason, at a certain place, and in a short passage of time. The relative-dating part of the study is dedicated to the correlation between the date of cremation and the dating of the types of artefacts. Mainly the metalwork based chronological schemes are used. The date of a certain grave represents a correlation of possible dates of production of type + use of type + deposition of type. The next stage of research is GIS analyse of typological data. GIS, as the tool of georeferenced past visualisation, places the typological data on multi-layered time-maps. The horizontal “time maps”, with a chronological and semantic layers, are created for every cemetery. So, already in the GIS-analyse of 3 smallest cemeteries: Alejka-3 (Prussians), Bandužiai (Curonians) and Viešvilė (Scialvians), it is visible, that the two first are dated both later on the georeferenced- typological scale, then the third one. Than Alejka-3 is slightly later than Bandužiai, having only few chronological analogies to Viešvilė. Already at this scale we can divide them to the 3 relative dating periods. Typological georeferenced data is statistically analysed with R. Gradation- typological method is used for determination of the direction of typological series, and verification of expansion and randomness of typological series in time. Correspondence analysis is needed to correlate the possible date of the use of artefacts with the date of the construction of the deposit. GIS and statistically-verified relative chronology is connected to the AMS 14C absolute dates of the samples from the same graves. During the 2018 24 samples from 7 cemeteries were successfully dated. The most stable dating material for radiocarbon dating turned out to be burnt human bones, textile and horn (drinking horn mount fragments), and unburnt horse bones, leather, wood and charcoal on a lesser scale. The most of gained 14C samples correspond to the preliminary relative dating of the cemeteries. This is the first case of the successful complex dating for this data. At the end of the project author hopes to elaborate absolute chronology system for the period in a local scale. Which could connect the archaeological pattern of local processes with the set of external historical sources events.

Österild – 2500 year record of human–environment interaction
Morten Fischer Mortensen (National Museum of Denmark)
Environmental changes in the past are, for obvious reasons, expected to have had an impact on human life but it is often difficult to establish a solid link between any changes in the climate/environment with human responses in palaeoenvironmental studies, as they operate on different time scales. However at the small-scale site of Österild in Northern Jutland, Denmark a very distinct human-environment interaction was revealed during a rescue excavation in 2012. Here a field system dating to the early pre-roman Iron Age was overgrown by peat due to rising ground water. Later during the Little Ice Age the area was covered by aeolian sands and today the area is covered by woodland. This study which combines archaeology with pollen and macro-fossil analyses shows how people adapted to the environmental changes during a 2500 year time period.

Temporal scales of succession and regeneration in natural and in disturbed landscapes
Walter Dörfler (Institute of Pre- and Protohistoric Archaeology, Kiel University)
Succession is a process that describes the steps from a disturbed landscape into a more natural environment. Abandonment of settlements and arable fields initiate a succession that typically can be divided in several steps. In woodlands we can identify an initial phase, primary and secondary forest and the terminal phase that finally results in climax vegetation. It depends on growing conditions, inter species compe-
Succession after the last glaciation in Compared to different records of woodland regeneration after abandonment of inhabited space in prehistory. What are the driving forces for this process, how fast is it and how do people intervene due to multiple utilisation of woodland?

**Boom and bust cycles during the Slavic period in NE-Germany**

*Martin Theuerkauf (Institute of Botany and Landscape Ecology, Greifswald University)*

Slavic people populated parts of eastern Germany after 600 CE. Archaeology separates various cultural stages, recognizable for example in the ceramics. Beyond that, new high resolution pollen records from central and eastern Mecklenburg-Vorpommern also show pronounced variations in land-use indicators during the Slavic settlement period, with peaks around ~700 and ~1000 CE, followed by again low values around ~800 and ~1100 CE. Apparently, Slavic populations flourished and subsequently sharply declined twice, with the peaks in population lasting only 50-100 years. No such variations in land use indicators are observed further west (western Mecklenburg-Vorpommern and Lower Saxony) and further east (Poland), suggesting that the observed fluctuations are a regionally limited phenomenon. The presentation first aims to delineate the region, in which the fluctuations are observed, using pollen records from across NE-Germany. Secondly, synchronicity of the fluctuations is tested. Thirdly, pollen based reconstructions are used to quantify the changes in forest cover versus open land during the boom and bust cycles, and to find spatial patterns in the fluctuations. Finally, additional proxies, including archaeological, historical and climate data, are used to develop a theory about the causes and mechanisms of the phenomenon.

**POSTER SESSION: Geoarchaeological analyses at Tiryns (Peloponnese, Greece)**

*Thomas Birndorfer (Institute for Ecosystem Research, Kiel University)*

Excavations in September 2017 in the Lower Town at Tiryns revealed fluvial deposits dating between the Late Helladic IIIA1 (1.400 BC) and the Late Helladic IIIB2 (1.200 BC) period. According to the current state of research, the related river traversed the alluvial plain and passed the Upper Citadel of Tiryns in the north. Previous geoarchaeological investigations in the Argolid, performed by E. Zanger 1993, described several meters of floodplain deposits burying the Lower Town of Tiryns. Zanger argued that these deposits originate from a single catastrophic flash-flood event, which served as a trigger for the people of the Late Bronze Age to erect the dam of Kofini with a large artificial channel to redirect the river to the south of Tiryns. Nevertheless, there is archaeological evidence pointing at building development in this period. This contradiction makes it necessary to investigate the area of the Lower Town of Tiryns under geoarchaeological aspects. The objective of this study is to reconstruct fluvial-morphological dynamics, runoff characteristics as well as sedimentation- and erosion processes in the Lower Town of Tiryns. The investigated profile, the exact chronological limitation by ceramic fragments under the first fluvial deposits and the first building development above the youngest river gravels, which covers 150 to 200 years of river history, is unique for such semi-arid areas. Therefore, the investigated archive represents a very valuable event stratigraphy, which helps us to reconstruct the paleoenvironment conditions in the Late Bronze Age. Furthermore, the project tries to answer the following questions: How was the undeveloped area of the Lower Town used and how was the floodplain area prepared for the building development? Concerning the cultural-historical context, the investigations should provide detailed information about the extent of the flooding events caused by the river, which was directly linked to the impact on the settlement system of the Lower Town.

**POSTER SESSION: Steppes of southern Ukraine in Boreal and Early Atlantic period: archaeological and paleoenvironmental data on the common timescale**

*Dmytro Kiosak (Odessa I.I. Mechnikov National University)*

Co-authors: Nadia Kotova, Willy Tinner, Sandra Bruegger

Two stratified archaeological sites (Kamyana Mohyla 1 and Melnychna Krucha) were systematically excavated and C14 dated in order to produce the refined chronological framework for societal change of hunter-gatherers groups up to the secure arrival of farming and herding in the region. Archaeological record is confronted to the paleoclimatic data, both available through the published descriptions and obtained via small scale on-site analyses. Some suggestions about the timing and character of human/environment interactions are put forward.

**POSTER SESSION: Were there changes in agricultural practices that coincided with changes in material culture at Middle Neolithic Oldenburg settlements in N Germany?**

*Dragana Filipovic (Institute of Pre- and Protohistory, Kiel University)*

Co-authors: Jan Piet Brozio (Institute for Pre- and Protohistory, Kiel University), Johannes Müller (Institute for Pre- and Protohistory, Kiel University), Wiebke Kirleis (Institute for Pre- and Protohistory, Kiel University)
The Middle Neolithic (3300-2800 BC) in northern Germany and southern Scandinavia portrayed as the time of full establishment of agrarian economy, increased importance of livestock (mainly cattle), emergence of new settlement clusters near water reservoirs as well as inland, construction of numerous megalithic tombs, and technological innovations in pottery and tool production. The period is associated with later phases of the development of the Funnel Beaker cultural phenomenon, to which earliest farming in the region was credited. One of the densely populated regions of the time was the Oldenburger Graben, a peninsula in northeast Holstein characterised by undulating Young Drift landscape, several small river systems, and the ‘ditch’ (Graben) – a narrow, low-lying zone cutting across the peninsula in NW-SE direction and representing remnants of a former fjord. In the west part of the ditch, excavations were conducted at several sites and analyses performed of seed/fruit, charcoal and pollen, animal and human bone, and inorganic materials. They showed that the area was continuously occupied for almost a millennium by communities who lived in structures made of daub and wood, practiced crop and animal husbandry, plant and shell gathering and hunting, and made tools and pottery. A palaeoenvironmental model for the wider region, which was devised from several high-resolution pollen archives in eastern Holstein, suggests alternating phases of landscape opening vs. forest recovery during the period of occupation of the Oldenburg sites. These shifts may reflect varied and/or changing methods of land use, principally those applied in agriculture. Additionally, some changes through time in the settlement size and structure, as well as in the artefact assemblages (e.g. pottery shape and decoration) were observed at some of the Oldenburg settlements. There may have also been shifts in the crop production and plant use. This paper combines previous and recently produced archaeobotanical information for the Middle Neolithic occupation of Oldenburger Graben in order to identify potential changes in the plant production and use that may have coincided with new developments in some other aspects of life in this region. In this paper, we highlight the suitability of the available Oldenburg archaeobotanical record for tracking changes/phases/events in plant-based subsistence strategies during the Middle Neolithic in the region.

POSTER SESSION: Trends, phases and events in palaeoenvironmental records from Northern Germany

Ingo Feeser (Institute of Pre- and Protohistoric Archaeology, Kiel University)
Co-Author: Stefand Dreibrodt (Institute for Pre- and Protohistoric Archaeology, Kiel University)

Palynological and geoarchaeological data from Northern Germany reveal distinct synchronous changes of human environmental impact on different temporal scales. On a long-term, multimillennial scale a general increasing trend is detectable. On a multi-centennial scale phases of rather stable human impact seem to be interrupted by short-term, multi-decadal, lulls of human activity. Comparing these patterns with archaeological and palaeoclimate data point to possible correlations on different temporal scales. Hereby main cultural changes seem to coincide with palaeoenvironmental changes on a multi-centennial scale. With respect to climate change, however, no general uniform relationship is obvious, but the correlation of climate and human impact patterns seem to change in the course of time. Interpreting such correlating patterns in context of human-environment interaction raises the question of causal relationships. In this context it is necessary to think about different models of potential temporal connectivity of the involved processes/developments. Environmental stress for example can influence human activity in several ways, be it as trigger, driver or catalyst. Whereas a trigger can be considered as a short-term influence or relationship, respectively, a driver can be defined as a direct relationship on longer time scales and generally identifiable by a significant correlation. A catalyst can be described as an indirect relationship, which generally raises the susceptibility for internal or external disturbances on varying time scales. This paper aims at discussing the presented palaeoenvironmental data in context of such considerations.

POSTER SESSION: A high-precision absolute chronology for Ribe, the oldest town in Scandinavia

Bente Philippsen, Søren Sindbæk, Claus Feveile, Jesper Olsen

Ribe is known as one of the oldest towns in Scandinavia. From the early 8th century on, it was an emporium, a marketplace and node in a maritime trade network. A new research excavation was accomplished in the context of the Northern Emporium project in order to gain insights about the emergence and apparent decline of the trading port, as well as about the permanency and density of settlement. The Northern Emporium project is an archaeological research project funded by the Carlsberg Foundation (Semper Ardens Fellowship). The project is affiliated to the Centre of Urban Network Evolutions (UrbNet) at Aarhus University and carried out in close collaboration with the Museum of Southwest Jutland. Two plots with settlement and workshop layers as well as parts of the adjacent street were excavated with high-definition methods and detailed digital recording. The aim of this study is to provide a radiocarbon chronology for Ribe that matches the degree of detail of the excavation, where the length of the phases in the age model reflects the actual duration of the activities, rather than the dating uncertainty. To achieve this, we are currently performing high-precision radiocarbon dating of annual tree ring samples to construct a new calibration curve for the period AD 650-900. We will present preliminary results of this effort and of radiocarbon dates made on
bone, wood and charcoal samples from the Ribe excavation. We will exemplify how the calibrated age ranges are changed when the annual calibration curve is used instead of IntCal13, which is based on decadal samples. The detailed stratigraphy of the excavation is used to construct an age model for the development of Ribe’s marketplace.

This will be of importance not only for understanding the study region, but also for the chronology of the Viking age in general. Many Viking Age artefact types are dated based on their stratigraphical position in the Ribe sequence. The older layers, containing preserved timber, are well-dated by dendrochronology. However, not all of the phases in Ribe have been dated by absolute dating methods yet. The latest dendro-date from this part of the site is AD 741, but activities at the site continue more than 100 years after that date. The calendar ages of some important typological reference points for Viking Age chronology are thus only estimated by relative methods, e.g., the duration of phases derived from the thickness of the layers. Therefore, a precise radiocarbon chronology of the entire occupation history of Ribe has the potential to consolidate or shift the dating of important artefact types. As Ribe was embedded in global networks of transcontinental trade, reflected by finds such as Early Islamic trade commodities, our results have the potential to resonate in the wider research field of urban networks.

17 Determinism in archaeology: What is it and why does it matter?
Friday March 15th, Room 105
Session organizers: A. Ribeiro, V. Arponen

FRI 08:30 Landscapes as the Context of Semiosis
08:30 Keynote lecture: John C. Barrett (University of Sheffield)
R 105
09:00 Understanding Determinism in Archaeology
VPJ Arponen (CRC 1266, Kiel University)
09:30 From Hobbes, Rousseau, and Mauss to the determination of prehistoric actors
Arne Windler (Deutsches Bergbau-Museum Bochum)
10:30 Determinism and the other: Archaeological and historical narratives as theft
Guy Middleton (Charles University)
11:00 Easy and wrong. Social and political functions of determinism
Thomas Meier (Heidelberg University)
11:30 Constraint and freedom: comments on the “theoretical gap” in archaeology
Artur Ribeiro (Graduate School “Human Development in Landscapes”, Kiel University)
12:00 Types’, ‘Groups’ and ‘Cultures’: How the European legacy of categorization haunts Archaeology
Martin Furholt (University of Oslo, Institute for Archaeology, Conservation and History)
13:30 Discussion
Determinism in archaeology: What is it and why does it matter?

Keynote speakers: J. Barrett (Sheffield University, Department of Archaeology)
Session organizers: A. Ribeiro, V. Arponen*
*corresponding chair, varponen[at]gshdl.uni-kiel.de

Elizabeth Arkush and Travis Stanton have described archaeological research as operating primarily under two modes: either archaeology is the study of processes, which is recognized as involving some form of determinism, or it is the study of human agency, which is generally understood as non-deterministic research (Arkush 2011, Stanton 2004). But, is this necessarily an accurate representation of archaeological research and determinism?

With the rise of new scientific techniques (e.g. isotope analysis, aDNA), the study of Big Data, and the application of new and better scientific models (Kristiansen 2014), as well as a desire to return to a processual way of doing archaeology (Kintigh et al. 2014), the issue of determinism is topical again. In light of this situation, this session aims at demystifying determinism by trying to understand what it is and why it matters.

Some of the questions that can be considered in the session include:

• Why are certain ways of conducting empirical research deemed deterministic or non-deterministic?
• Where in resides the core of the idea of environmental determinism, a topic of heated debates in archaeology since the 1960s?
• Do agency focused studies actually counter determinism?
• What is cultural determinism as opposed to environmental determinism?

We welcome papers from archaeologists and paleoenvironmental scientists alike and hope to see empirically but also theoretically mature and ambitious contributions. The session is jointly organized with Arbeitsgemeinschaft Theorien in der Archäologie (AG TidA).

Literature

Landscapes as the Context of Semiosis

Keynote lecture: John C. Barrett (University of Sheffield)

In the study of the history of life (and this is what I take archaeology to be) determinism is only ever likely to explain why things died or why life, under certain circumstances, was not possible. This is because all forms of life exhibit certain boundary requirements that might, or might not, be satisfied by various environmental conditions. When those boundary requirements are no longer satisfied, for whatever reason, then we can say that this failure determined the death of that form of life. If, on the other hand, our concern is to understand the diversity through which various forms of life have developed, then we will not be able to identify what determined that diversity, although we may be able to trace some of the conditions under which that diversity became possible. The reason for this is that forms of life develop, from fertilized cell to maturity, by growth in their embodied forms, in their physical abilities, and in the ability of some to replicate successfully. All these complex biological practices are achieved by means of a process of semiosis. It is by this means that forms of life learn of their various environments (including the available sources of sustenance and security), learn of their place within those environments and of their relations with others, and by these same processes, others are able to recognize them. The conditions from which those lives originated, and the conditions towards which those lives appear to be directed, do not determine this path of development. This development is contingent upon the moments in which a form of life is able to interpret the signs amongst which it is attempting to develop and to act upon that interpretation.

Understanding Determinism in Archaeology

VPJ Arponen (SFB 1266, Kiel University)

Archaeology is a discipline between the natural and human sciences. As a data collection based science, archaeology has a fundamental interest in natural scientifically produced and analyzed data. Archaeological interpretation, however, also builds upon human scientific theories of social and cultural dynamics. The question of environmental determinism in archaeology appears to us against that heterogeneous disciplinary background. This contribution aims at understanding how the charge of environmental determinism arises from that background as well as where the substance of the debate lies.

From Hobbes, Rousseau, and Mauss to the determination of prehistoric actors

Arne Windler (Deutsches Bergbau-Museum Bochum)

Only a few books had a comparable impact on the archaeological research as Marcel
Mauss’ (1990 [1923/24]) eminent ‘Essai sur le don’. But since its publication, the connection between donor and receiver of a gift as well as the question of why gifts are returned are recurring topics. The discussion about reciprocity can be condensed into a non-individualistic, normative and an egoistic, utilitarian notion – the modern dichotomy of altruism and egoism is omnipresent (Adloff 2016). The former is represented by Karl Polanyi (1978 [1944]), and his idea of pre-modern embedded societies in contrast to modern capitalistic economies. Another protagonist of the normative concept is Alvin Gouldner (1984), who represents the opinion that reciprocity is a universal, internalised norm, which unites the exchange partners. The latter notion is connected to Peter Blau (1967) and his idea, that social exchange is characterised “by voluntary actions of individuals that are motivated by the returns they are expected to bring” (Blau 1967, 90). While the concept of individualism is associated with Thomas Hobbes’ (1651 [2011]) ‘Leviathan’ and Adam Smith’s (1981 [1776]) ‘free hand’, the normative approach can be traced back to Jean-Jacques Rousseau (2010 [1755]; see Adloff 2016). This dichotomy is deeply embedded in Western thinking and can be identified in the archaeological literature on pre-modern economies: most interpretations of prehistoric exchange refer selectively to the non-individualistic views and/or apply the individualistic approach without any reflection. At the same time, the authors stress that an application of the selfish approach is only possible for modern societies. As a consequence, archaeologist tend to determine prehistoric actors as altruistic and cooperative, while modern (capitalistic) actors shall be egoistic and uncooperative. However, it remains questionable when this ‘analytical cut’ (Hansen 1995) should have taken place. The aim of the talk is to clarify the origin and effects of this dichotomy within archaeological thinking and pleads for a more reflective way to determine prehistoric actors.

**Literature**

**Determinism and the other: Archaeological and historical narratives as theft**

*Guy Middleton (Charles University)*

Determinism can be defined as a theory or doctrine that acts of the will, occurrences in nature, or social or psychological phenomena are causally determined by preceding events or natural laws (Merriam-Webster). It appears in several guises in archaeology and history, in both popular and scholarly work. Deterministic theories, especially geographic and environmental, have been used to explain social and material change and the different developmental trajectories of given groups and societies, including the formation and collapse of civilisations and societies. Arguably, however, such ‘explanations’ oversimplify complex historical and social processes and rob past individuals, groups, and societies of agency. This reflects and reinforces an ‘othering’ of past peoples and, in this sense, determinism can be regarded as a form of colonial history that needs to be questioned.

**Easy and wrong. Social and political functions of determinism**

*Thomas Meier (Heidelberg University)*

Most archaeological debates on determinism (or what is thought to be determinism) are focussing on specific parameters (e.g. resources, precipitation, temperature etc). To my knowledge the systematic functions of determinism are, however, poorly reflected and discussed. Usually they come as an unreflected by-product, but seem to be happily received. A deterministic approach greatly reduces complexity of a given system (Komplexitätsreduktion sensu Niklas Luhmann). Non-deterministic approaches usually struggle with a multitude of factors in highly complex interactions, which needs a lot of efforts and resources to understand and identify the driving mechanisms of a system/network/process. In contrast a deterministic perspective introduces the dominant factor as an a priori and allows an early focus on only one or a small number of explanatory factors. This conceptual procedure highly enhances the effectiveness of research, the comprehensiveness of the results and the possibility to apply such results. If we understand determinism as such a measure to reduce complexity, it fulfills important functions in an academic world, which increasingly falls short of resources and is accused of being useless not the least because of its high complexity. Mostly deterministic factors are identified in the non-human sphere. They counter human agency be it on an individual or societal level turning humans (among others) and societies into victims of the “circumstances”. In consequence they offer easy excuses and deprive humans of their responsibility for the world they are living in, while they seem to explain the impossibility of structural changes. Determinism offers a narrative of conservatism and irresponsibility and serves corresponding political agendas.

**Constraint and freedom: comments on the “theoretical gap” in archaeology**

*Artur Ribeiro (Graduate School “Human Development in Landscapes”, Kiel University)*

Many archaeologists have pointed out the existence of a “theoretical gap” in archaeology (Cochrane and Gardner 2011; Kristiansen 2004; Hodder 2001). On one side of...
the gap is the study of processes, with particular focus on the reconstruction of past environments, and how humans react to these processes and to the environment. On the other side of the gap is the study of agency, which prioritizes human decision-making in understanding how past societies developed. Most researchers describe this theoretical gap as detrimental to the development of archaeology, but it is not clear why this is so. The aim of this paper is to question the underlying assumptions that have led to the theoretical gap. First, there is the assumption that archaeology should be a methodologically monist enterprise, that is to say, a discipline that should not diverge into different methodologies, which can then lead to multiple “theoretical gaps”; second, there is the assumption that these different methodologies are mutually exclusive, for example, if a methodology identifies “constraints” on human action, it cannot be compatible with a methodology that identifies “freedom” of human action; and third, there is the assumption that “constraint” and “freedom” have the same meaning as the metaphysical notions of “determinism” and “contingency”. Overall, the paper will provide a brief survey of these assumptions, how they have affected archaeological research in the last decades, and some steps on how to move on without them.

Literature

‘Types’, ‘Groups’ and ‘Cultures’: How the European legacy of categorization haunts Archaeology
Martin Furholt (University of Oslo, Institute for Archaeology, Conservation and History)
There is no lack of critical engagement with problems arising from epistemologically problematic practices of categorization in European Archaeology. Yet at the same time, there is a widespread, if not dominant reliance on such kinds of categories that are the results of precisely these problematic practices. This reaches from implicit reliance on Eurocentric ideas about social group composition, mobility, ethnicity and relations of power connected to prehistoric societies, to the monothetic classification of archaeological materials, from the level of ‘archaeological cultures, down to the level of artefact types. The disjunct between critical reflection and the archaeological practice has recently become apparent in the debates unfolding in the context of aDNA research and the new migration debates in European archaeology. They highlight first of all the need for a better integration between theoretical debates and our practical work, but second of all they make clear that the issue of categorization – most visibly when it relates to ethnicity and migration – is a contentious topic which goes far beyond the realm of archaeological academic research.

18 Transformations in geophysical and geoarchaeological methods
Tuesday March 12th and Wednesday March 13th, Room 208
Session organizers: N. Pickartz, W. Rabbel, D. Wilken, S. Dreibrodtr

TUE 08:30 Towards a geoarchaeological implementation of geophysical prospection: a perspective
R 208
Keynote lecture: Philippe De Smedt (Ghent University)

09:00 Integrating non-invasive and geoarchaeological methods to reveal the stratigraphy and functional aspects of the Middle Bronze Age fortified settlement
Jakub Niebiesczanski (Institute of Archaeology and Ethnology, Polish Academy of Science)

09:20 Improving geophysical data processing and interpretation through information gained from excavations
Ercan Erkul (Institute of Geosciences, Kiel University)

09:40 Discussion

10:30 Transforming near-surface geophysical archaeological prospection: from square metres to square kilometres – from postholes to landscape archaeology
Immo Trinks (Ludwig Boltzmann Institute for Archaeological Prospection and Virtual Archaeology)

10:50 Locating a Bronze Age Mining community: a minimally invasive combined geophysical, geoarchaeological, and geochemical approach
Roderick B. Salisbury (Department of Prehistoric and Historical Archaeology, University of Vienna)

11:10 From Susceptibility Measurements to Magnetic Inversions
Natalie Pickartz (CRC 1266, Kiel University),
11:30 Evaluating Magnetic Depth Estimation Techniques for Archaeogeophysics  
Jeremy G. Menzer (Environmental Dynamics PhD Program, University of Arkansas, USA)

11:50 Discussion

13:30 A multi-dimensional approach for detecting archaeological sites in the Zitava valley, Slovakia using ground and satellite based remote sensing  
David Matzig (Institute of Pre- and Protohistoric Archaeology, Kiel University)

13:50 Combining LiDAR and old peat coring data in creation of georeferenced topographical model of an overgrown prehistoric bay  
Juuso Kosinken (Freelance archaeologist – Mikroliti Ltd.)

14:10 Using Colluvial Deposits and Archaeological Expertise to Decipher Bronze Age Land Use Practices at Three Landscapes in SW-Germany – Preliminary Results  
Sascha Scherer (University of Tübingen, Germany)

14:30 Exploring the Archives Stored in Mediterranean Transformed Landscapes  
Arian Goren (University of Tübingen, Germany)

15:30 The Impact of Geoarchaeological Studies in Paleolithic Survey; Case Study: A Middle Paleolithic Site in the Northern parts of Susiana Plain, Khuzestan, Iran  
Saeid Bahramiyan (Laboratoire Archéorient; Maison de l’Orient et de la Méditerranée, Jean Pouilloux, l’université Lumière Lyon, France)

15:50 Class-based rounding – The use of a new approach to manage large sedimentological and geochemical data sets gained for multi-proxy approach  
Dirk Nowacki (Goethe University Frankfurt, Main/Institute of Physical Geography)

16:10 Discussion

**WED 08:30 Direct push sensing in wetland geoarchaeology**  
*Keynote lecture: Christoph Zielhofer*

09:00 Constrained Electrical Resistivity Tomography using Direct-Push Electrical Conductivity logs and vibracore data  
Tina Wunderlich (Christian-Albrechts-University Kiel, Institute for Geosciences, Department of Geophysics)

09:20 Innovative application of downhole ERT for geoarchaeological research  
Erica Corradini (Institute of Geoscientific Dept Geophysics, Kiel University)

09:40 Discussion

10:30 Tracing tsunami signatures of the AD 551 and AD 1303 tsunamis at the Gulf of Kyparissia (Peloponnese) using Direct Push in situ sensing techniques  
Hanna Hadler (Institute of Geography, Johannes Gutenberg - Universität Mainz)

10:50 A minimal-invasive multi-methodical approach for site investigation with direct push sensing on different spatial scales  
Johannes Völlmer (Institute of Geography, Leipzig University)

11:10 Using Geophysics in Archaeological Rockshelters: Lessons from South Africa and Australia  
Ian Moffat (University of Cambridge and Flinders University)

11:30 Discussion

13:30 Direct push sensing and geoarchaeological sounding at Neolithic Pestenacker settlement (Lech catchment, SW Germany)  
Anne Köhler

13:50 3D-Modelling of Charlemagne’s summit canal – merging remote sensing and geoarchaeological data  
Johannes Völlmer

14:10 Discussion
**SESSION 18**

**ABSTRACTS**

Transformations in geophysical and geoarchaeological methods

*Keynote speakers: Ph. De Smedt (Ghent University); Ch. Zielhofer (Universität Leipzig)*

Session organizers: N. Pickartz*, W. Rabbel, D. Wilken, S. Dreibrodt

*n*corresponding chair, natalie.pickartz(at)ifg.uni-kiel.de

In archaeological and paleoenvironmental research, geophysical and geoarchaeological data provide otherwise inaccessible quantitative information on subsurface anthropogenic structure and soils. To fully develop the information potential of this data, it is necessary to combine methods of data acquisition and interpretation from different disciplines – basically geophysics, geology, and archaeology, thus giving rise to a new class of methodical approaches and scientific working tools. In this context the term “transformations” used in the session title has a twofold meaning: First, “transformations” is understood in a methodical sense. It indicates the first aim of the session, which is to present and discuss new ways for transferring data and interpretational results of one discipline into something meaningful for the other disciplines. This will create synergy and increase the accuracy in the interpretation of physical and geological field data with respect to the remains of material culture and environmental development. An application example are large settlement places, the remains of which can be probed only at random by drilling and excavation, and which can be surveyed and analyzed as a whole only by areal non-destructive geophysical measurements. The target parameters may be mass determinations, the shape and size distributions of buried house remains, or reconstructions of prehistoric fluxes of soil and transport energy. The methodology required for deriving quantitative results combines elements of physical and material on-site sampling, physical and sedimentological soil analysis, the determination of transfer functions relating archaeological and soil properties and their physical parameters, the development of 3D numerical models of the subsurface structure from geophysical data using transfer functions, 3D geophysical imaging and inversion, statistical assessment of the results, and so on.

The second meaning of the term “transformations” in the session title is a reference to the research subject of the Collaborative Research Center 1266. It indicates the second session goal, which is to present and discuss example studies using combined approaches such as outlined above, for analysing settlements as a whole and deriving indications of change in the remains of material cultures or soils in space and time. The session is directed especially to scientists who are working in, or are simply interested in, the developing field of combined quantitative analysis of geophysical, geoarchaeological, and archaeological data.

Towards a geoarchaeological implementation of geophysical prospection: a perspective

*Keynote lecture: Philippe De Smedt (Ghent University)*

*Co-authors: with Jeroen Verhegge and Lieven Verdonck*

The archaeological application of geophysical prospection is surging, and along with the wider use of such techniques, geophysical equipment types are advancing and diversifying rapidly. However, regardless of recent advances, a bias exists in the way geophysical prospecting is integrated into the archaeological workflow, as emphasis remains (often strictly) on finding contrasts between archaeological features and the surrounding subsurface matrix. This ‘anthropocentric’ implementation of geophysics is in part rooted in the cultural research perspective that drives archaeology, but is exacerbated by use of specific methodological strategies, such as gradiometers, that favour discriminating discrete soil disturbances over characterising and understanding natural background variation. Furthermore, the integration of geophysical prospection into archaeological programmes often remains fragmentary, as it is still frequently characterised by a strong distinction between the process of creating geophysical datasets, and their subsequent integration into further archaeological interpretation. Hereby, the lack of feedback on the fundamental relationship between investigated archaeology and the obtained geophysical measurements is commonplace. To exploit the full potential of geophysical prospecting, we advocate a more geoarchaeological implementation of the method; taking into account the underlying physical properties, both natural and anthropogenic soil variations and taphonomic processes that are determinant in the detection of archaeological remains. In addition, by putting stronger emphasis on the natural subsurface variation, regardless of the archaeological questionnaire, the potential of geophysics in revealing palaeoenvironmental information can be tapped into more easily. As the integration of geophysical methods into developer-led archaeology increases, implementing exhaustive geophysical strategies that go beyond detecting archaeological features becomes a necessity. Here, the importance of a thorough understanding of the geophysical expression of archaeological structures within varying geological conditions cannot be overstated. Such information not only allows for a better founded interpretation of survey data, but equally enables assessing the geophysical discrimination potential (and lack thereof) of specific structures under varying geological conditions. In this paper, we discuss key issues that need to be addressed to overcome bias and limitations of the current application of geophysics in archaeology. Through an overview of existing methods and case studies, we show how frameworks to tap into the geoarchaeological potential of geophysics are already available, but remain little explored. We argue that integrating such approaches into the archaeo-geophysical workflow in a more standardised fashion will not only provide a broader interpretive basis for archaeological research, but facilitate the integration and communication of geophysics in archaeology.
Integrating non-invasive and geoarchaeological methods to reveal the stratigraphy and functional aspects of the Middle Bronze Age fortified settlement

Jakub Niebieszczański (Institute of Archaeology and Ethnology, Polish Academy of Science)
Co-Authors: Iwona Hildebrandt-Radke, Akos Peto, Gabor Serlegi, Joanna Galas, Mateusz Jaeger, Gabriella Kulcsar, Nicole Taylor, Janusz Czebreszuk, Gabor Markus

Archaeological investigations of the vast, multi-layered or tell-like settlements by means of conventional excavation methods are always connected with extremely long time as well as high financial costs. A good alternative to obtain the basic archaeological data concerning such sites, are the non-invasive methods, such as geophysics (magnetometry, ERT or georadars). However, in order to provide a more detailed insight into the stratigraphy, or to at least draw a background for more sophisticated archaeological explanations (function or utility in spatial aspect) it is essential to use a cross-combination of methods, which fortunately is becoming a standard in present days. Such multidisciplinary methodology, comprising of geophysics, corings, small-scale excavations and laboratory verification of samples, was used by our team in Central Hungary, on a complex multi-layered and fortified settlement of Kakucs-Turjan. In effect of spatial analysis of the non-invasive results and through the sedimentological and geochemical analyzes, as well as corings and precise trench planigraphy, we have revealed the spatial organization and division of the discussed settlement and the functional aspect of particular parts of the site. Following paper focuses on both, the usage of magnetometric survey data and its processing in the ArcGIS software as a first step of the non-invasive research as well as the subsequent verification procedures like corings and sampling of sediments for further laboratory analyzes. The latter were oriented towards the reconstruction of the sedimentary environments of the cultural layers. Thus, we have recognized the actual nature of the magnetic anomalies and were able to extrapolate these results on the overall geophysical picture, providing archaeological explanations concerning the internal organization of the fortified settlement and its main defensive components, such as ditches. Following presentation aims to not only view the results of the research, but also to discuss the methodology proposed by our team in terms of non-invasive prospection planning as well as its verification. This methodical package comprise the GIS supported spatial analysis, which was conducted to choose the most suitable anomalies on the magnetic map in order to perform the verification procedures. Moreover, the geoarchaeological methods were a combination of various fieldworks activities, which are going to be discussed in this presentation as well. Therefore, the main aim of this talk is to discuss different methodical approaches, which were used in order to reveal the stratigraphy and functional division of the multilayered and fortified Bronze Age settlement.

Improving geophysical data processing and interpretation through information gained from excavations

Ercan Erkul1 (Institute of Geosciences, University of Kiel)
Co-Authors: Tina Wunderlich1, Harald Stümpel1, Wolfgang Rabbel2, Philipp Niewöhner2
1 Institute of Geosciences, Kiel University
2 German Archaeological Institute Berlin

The ancient city of Milet is situated in the Southwest of Turkey, about 10km away from the Mediterranean Sea. Since 1993 more than 130 ha have been geophysically investigated using geomagnetics. At places of special interest additional measurements using geoelectrics and electromagnetic induction have been performed. These methods measure the electrical resistivity of the subsurface that can give additional information about building materials, for example. One of the discoveries through geomagnetic measurements is a Byzantine basilica located to the North of Kalabak Tepe. Its walls are visible on the geomagnetic map as anomalies indicating lower magnetization. Additional geoelectrical measurements have been conducted on several profiles revealing places of higher resistivity that are due to building stones. But the rectangular structure in the southern part of the geomagnetic map could not be explained by these results only. Thus several small excavations were carried out that confirmed the existence of the walls visible in geomagnetics. With the aid of these findings the geophysical data could be newly interpreted.

For the first inversion of the apparent resistivity values standard parameters were used giving a relatively smooth image of the subsurface. Due to the findings of archaeological excavations the geoelectrical data processing was revised and a robust inversion approach was used instead. This results in a relatively blocky appearance of the anomalies resembling well the shape of the walls.

The floor plan of a Byzantine basilica or cemetery church found with the help of geomagnetics was further clarified by geoelectrical measurements. Especially small excavations gave additional information about the sharp-edged shape of the subsurface structures that could be used to improve the inversion of geoelectrical profiles. Because resistivity anomalies were better limited, the interpretation became clearer. With the improved data processing it was possible to distinguish between different filling materials and thus temporal building phases. A square complex south of the basilica was built first, followed by the cemetery church about 100 years later.

Transforming near-surface geophysical archaeological prospection: from square metres to square kilometres – from postholes to landscape archaeology
Over the past decade, near-surface geophysical archaeological prospecting methods have evolved from manually operated survey solutions for the investigation of limited archaeological sites to highly efficient motorized multichannel sensor arrays permitting the non-destructive investigation of the buried remains of entire settlements, including corresponding cemeteries, infrastructure and the assumed empty space in-between. After pioneering work conducted since the early 2000s by Stümpel, Rabbel and Erkul at Kiel University (Erkul et al. 2003), the 2010 in Vienna established Ludwig Boltzmann Institute for Archaeological Prospection and Virtual Archaeology is attempting to push the boundaries further towards increased spatial imaging and ever-greater coverage rates (Trinks 2012). In the framework of so-called archaeological prospect case studies, the methodology, involving remote sensing in form of aerial archaeology, airborne laser scanning, hyperspectral scanning, and near-surface geophysical prospecting methods with a focus on magnetometry, high-resolution ground-penetrating radar (GPR) and electromagnetic induction measurements has been advanced, tested, and applied at unprecedented scale at different archaeological sites in northern and central Europe. The generated comprehensive archaeological prospecting datasets covering large parts of archaeological landscapes are analyzed archaeologically through integrative interpretive mapping. The prospecting data offers insights into buried archaeological remains as well as any other naturally occurring geological and anthropogenic structures in the ground that exhibit sufficient physical contrast. In particular, extensive high-resolution ground-penetrating radar (GPR) measurements can be well suited to provide information on paleoenvironmental conditions, mapping sediments, bedrock, filled gullies or waterways, erosion and deposition horizons. In the case of superimposed anomalies of different character or orientation, the three-dimensional and anomalous physical and pedological properties that do – or fail to cause geophysical detectable anomalies. Academic teaching, professional training and a continued dialogue between the community of archaeological prospection practitioners and the users of the prospecting results and interpretations are necessary for the common goal to gain wider acceptance as well as for the protection of our declining cultural heritage. Erkul E., Rabbel W., Stümpel H. (2003). Development of a mobile multi-sensor system: first results. Archéologie Polona 41, 159-160. Trinks, I., Neubauer, W., & Doneus, M. (2012). Prospecting archaeological landscapes. In M. Ioannides et al.: Proceedings Progress in Cultural Heritage Preservation. EuroMed 2012. Springer, 21-29.

Locating a Bronze Age Mining community: a minimally invasive combined geophysical, geoarchaeological, and geochemical approach

Roderick B. Salisbury (Department of Prehistoric and Historical Archaeology, University of Vienna)

Co-authors: PD Dr. Peter Trebsche (Zentrum für Museale Sammlungswissenschaften, Donau- Universität Krems, peter.trebsche@donau-uni.ac.at); Michael Konrad (BA, Zentrum für Museale Sammlungswissenschaften, Donau-Universität Krems, michael.konrad@ donauuni.ac.at); Dr. DJ Ingrid Schlögel (Central Institute for Meteorology and Geodynamics, Applied Geophysics, Vienna, ingrid.schloegel@zamg.ac.at); Ass. Prof. Dr. Adrian Flores-Orozco (Geophysics Research Division, Department of Geodesy and Geoinformation, TU-Wien, adrian.flores-orozco@geo.tuwien.ac.at); Lukas Aigner (BA, Geophysics Research Division, TU- Wien); Mag. Günther Weixelberger (Geologie Weixelberger GmbH, Austria, office@weixelberger.at)

Locating a prehistoric mine is difficult if there are no visible features in the surface morphology (e.g. sunken shafts) or if there are no historic records. We faced this problem when investigating the Late Bronze Age mining settlement of Frigglistz-Gasteil, which is located at the easternmost fringe of the Alps in Lower Austria. The site was occupied during the late Urnfield Period (ca 1050 to 900 BC). It reached a maximum extent of about 3 hectares, making it the largest known prehistoric mining settlement in Lower Austria. The site has yielded only indirect evidence of copper ore extraction, in the form of huge piles of mining debris and some miners’ tools (antler picks and hammers) recovered during systematic excavations from 2010 to 2014. Application of several prospection techniques, including terrain walking, aerial photography, LiDAR terrain modeling, geomagnetic surveys, and percussion drillings, has failed to delineate traces of copper mines. Therefore, in a current project funded by the Austrian Science Fund (FWF), a combination of different geophysical, geoarchaeological and geochemical techniques were applied in 2017 and 2018 to investigate the stratigraphy of the mining dumps, evaluate a potential miner’s residential area, and locate the underground works and the copper vein (in case there is any copper ore
Geophysical methods employed included Induced Polarization (IP) imaging and ground penetrating radar (GPR). The IP method is an extension of electrical resistivity tomography (ERT), and provides information of the electrical conductivity and capacitive properties of the subsurface. Electrical resistivity imaging enabled us to delineate the extension of the main geological units, as well as the position and geometry of the dump materials. Additionally, imaging of the polarization effect revealed significant anomalies related to subsurface areas with high volumetric content of metallic minerals. The seismic refraction and tomography results allowed us to distinguish the overburden (dump material) from the bedrock and aided in the interpretation of the IP imaging results. GPR images provided detailed information about structures in the near surface improving the interpretation of the IP images. After preliminary analyses of the geophysical results, we conducted two core drillings, which reached the underlying bedrock at 32 m and 37 m depth. The archaeological and geological interpretation of the two cores provided the key to the interpretation of the geophysical measurements. Another useful method to locate different activities on the extraordinarily well preserved occupation surfaces were multi-element geochemical analyses. A preliminary analysis of available soil phosphates and pH was followed by ICP-OES multi-element chemistry. Results detected invisible activities on the excavated surfaces, which we interpret in terms of activity patterns associated with domestic activities of the miners, as well as copper extraction and production activities. The transformation of different prospection data – as addressed by the session title – into one overall interpretation involved both the translation of data between disciplines and the transitions of different prospection data – as addressed by the session title – into one overall interpretation involved both the translation of data between disciplines and the transitions between multiple analytical scales. The latter in respect to the expected results: first level – geology, second level – ore veins, third level – anthropogenic dumps and mining shafts/galleries, fourth level – activity areas inside the mining settlement.

From Susceptibility Measurements to Magnetic Inversions

Natalie Pickartz (Kiel University/CRC 1266)
Co-authors: Wolfgang Rabbel, Dennis Wilken, Knut Rossmann, Robert Hofmann, Martin Furholt, Nils Müller-Scheeßel, Stefan Dreibrodt

Magnetic prospection has become a standard geophysical method in archaeological prospection due to its advantages. Motorized data acquisition speed is high and a variety of different archaeological structures can be mapped in various geological backgrounds. The general layout of a site can be mapped well. Yet, because of the inherent ambiguity it is challenging to determine the geometry (shape and depth) as well as the magnetization of the archaeological features. Constraints to magnetic inversion can be obtained from other geophysical prospection methods, in-situ measurements in excavations or boreholes, laboratory measurements of soil samples and generalization of excavation results. From our work at different prehistoric settlement sites in eastern Europe we are presenting a comparison of different procedures measuring the magnetic susceptibility in the field and in the laboratory, forward calculations of high resolution susceptibility measurements in boreholes and in-situ as well as inversion results. We are especially focusing on the consistency of the measured susceptibilities as well as the pros and cons of the different measurement procedures. With forward calculations it is determined whether remanent magnetization is present or not. For the inversion we are focusing on their challenges and limits aiming to estimate the magnetized volume. The laboratory measurements have the advantage of standardized sample treatment, yet the homogenization of the samples changes especially the density which needs to be corrected. In contrast, field measurements are less affected by sample ‘alteration’ and data acquisition is faster. This advantage should be used to perform repetitive measurements.

Evaluating Magnetic Depth Estimation Techniques for Archaeo-geophysics

Jeremy G. Menzer (Environmental Dynamics PhD Program, University of Arkansas USA)

Magnetometry is possibly the most widely used archaeo-geophysical technique in the world, however, a major drawback is the lack of depth information to anomalous source bodies. In fact, many novice archaeo-geophysical users are under the impression that magnetometry does not or cannot provide depth information. Yet, depth estimation is an active area of research and is commonly used in geologic studies. Previous evaluation of depth estimation techniques on modeled data provided promising results, therefore, this study evaluates real-world data collected at a controlled archaeological test site and multiple pre-historic Native American sites in Arkansas and Tennessee, USA. The study focuses on simple depth estimation techniques including half-width rules and multi-height measurements, but, more complex methods are also considered (e.g. Euler Deconvolution and center estimation techniques including half-width rules and multi-height measurements). Additionally, the potential benefits of deriving depth information to magnetic sources is discussed in the context of quantitative versus qualitative interpretation techniques in archaeo-geophysics.

A multi-dimensional approach for detecting archaeological sites in the Zitava valley, Slovakia using ground and satellite based remote sensing

David Matzig (Institute of Pre- and Protohistoric Archaeology, Kiel University)
Co-authors: Stefan Dreibrodt, Nils Müller-Scheeßel, Erica Corradini, Diane Panning,
Natalie Pickartz, Dennis Wilken, Wolfgang Rabbel

With the advancement of digitisation and the free and easy availability of satellite-data and open source computer applications over the last few years, the archaeological evaluation of satellite images no longer has to be limited to purely visual methods (cf. CORONA). Instead, they can encompass analyses over longer time series, which allow patterns beyond the visible spectrum to be recognized in the data. The application of multi-spectral satellite images for a semi-automatic detection of subsurface archaeological sites using Sentinel-2, Landsat and ground-based magnetic data, is based on the premise that buried remains are likely to alter the soil-characteristics in comparison to the surrounding soil. Thus differences in the surface vegetation can be detected, using vegetation-indices, derived from multi-spectral satellite images. Especially under extreme weather conditions, the plants growing above archaeological features should be less susceptible to drought stress, as the features themselves can store more water than the sterile surrounding soil. A process-oriented workflow was developed using data generated in southwest Slovakia by several subprojects of the CRC 1266 „Scales of Transformation“. It combines publicly available multi-spectral satellite data and the open source script-based programming-language R for maximal reproducibility and zero additional cost, with the results of in-field magnetic measurements to improve precision in site recognition. Thus, it should be easily possible to apply this approach also to other archaeological key areas. Funding by the GSHDL is thankfully acknowledged.

Combining LiDAR and old peat coring data in creation of georeferenced topographical model of an overgrown prehistoric bay
Juuso Kosinken (Freelance archaeologist – Mikroliiti Ltd.)

Combining LiDAR and old peat coring data in creation of georeferenced topographical model of an overgrown prehistoric bay Basic topographical maps still provide most important geographical tool for finding unknown prehistoric sites in Finnish environments. Nevertheless, normal maps don’t include any topographical information about prehistoric dryland areas lying under contemporary peat layers of wetlands. Therefore, topography of sub peat landscape must be reconstructed through three dimensional modelling. Wetlands provide deposits of remarkable preservation of organic archaeological materials. However, Finnish wetlands also form a dimension of research still poorly understood. The studied bog, Rajalamminsuo, lies next to a lake of the Ancient Saimaa water system which has a dramatic shoreline displacement history. Due to the shoreline displacement, the studied bog has most likely been dryland area during the Mesolithic and an open water bay during later prehistoric times. Bogs surroundings yield dwelling places and other sites of prehistoric activity spanning from times of Typical Comb Ceramic to Early Metal Age ca. 3900 cal. BC – 200 cal. AD. In modelling of Rajalamminsuo bog, 1984 geological peat investigation data was exploited together with LiDAR point cloud to create interpolation representing bogs basal mineral soil of glaciofluviel sand. The modelling method has a benefit of utilizing formerly acquired data provided by Geological Survey of Finland and National Land Survey of Finland. Hence, creation of the reconstruction doesn’t require any field work. Accuracy of the ETRS-TM35FIN georeferenced model was tested with manual peat corings and GPR. Results of the study gave essential knowledge about challenges of the modelling method which are important to understand when applying it as such and when developing it further.

Using Colluvial Deposits and Archaeological Expertise to Decipher Bronze Age Land Use Practices at Three Landscapes in SW-Germany – Preliminary Results
Sascha Scherer1,2
Co-authors: B. Höpfer2,3, M. Fuchs4, E. Kandeler5, E. Lehndorff, C. Poll5, T. Scholten1,3, T. Knoop1, P. Kühn1,3
1 Department of Geosciences, Chair of Soil Science and Geomorphology, Eberhard Karls University Tübingen, Germany
2 Institute of Pre- and Protohistory and Medieval Archaeology, Eberhard Karls University Tübingen, Germany
3 SFB 1070 ResourceCultures, Eberhard Karls University Tübingen, Germany
4 Department of Geography, Justus-Liebig-University Giessen, Germany
5 Faculty of Agricultural Sciences, Soil Biology, University of Hohenheim, Germany
6 Institute of Crop Science and Resource Conservation (INRES), Soil Sciences and Soil Ecology, Bonn University, Germany

Our project aims to decipher Bronze Age land use practices following an interdisciplinary approach by combining archaeopedological and archaeological analyses at three landscapes in SW-Germany (Hegau, Western Allgäu, Baar). Based on relative comparison of physical-geographical conditions, we assess the Hegau as favourable and both Western Allgäu and Baar as unfavourable for prehistoric subsistence. Additionally, we want to develop and use a dynamic and relative comprehension of favourability and unfavourability in regard of shifting material and immaterial requirements through time (JAMES ET AL., 2019, IN PREP). Archaeological studies include actual excavations and GIS-analysis of known sites. The mapping of settlement structures (post holes, fire places, middens) and findings (shards, silex, bones and ores) gives insights into local land use chronologies, i.e. the size and duration of settlements. Literature work helps to transform site-specific information into the level of settlement networks and regional dimension. The archaeopedological approach comprises the analysis of multi-layered colluvial deposits and settlement structures by the application of a broad methodology. We interpret colluvial deposits as the correlative sediments of human-induced soil erosion (HENKNER ET AL., 2017, HENKNER ET AL., 2018) and as archives for the decipement...
of time-specific land use practices. Their mapping within (onsite) and in the vicinity of (offsite) excavated settlements should provide indications of spatial land use patterns. The chronostratigraphy of colluvial deposits is investigated by a triple-dating approach including AMS-14C radiocarbon dating, optical stimulated luminescence (OSL) and typological classification of archaeological finds. High-resolution sampling in 5 cm increments for diagnostic colluvial layers will provide a sufficient data density within the temporal scale. Phases of pedogenesis and soil erosion are differentiated by basic soil parameters as calcium carbonate, pH-value, soil organic matter, pedogenetic oxides, grain sizes and micromorphological indices as soil microstructure or small-scale soil formation processes. Land use practices like metal or ore processing may be identified by heavy metal analyses (Ni, Pb, Zn, Hg, As). Varying amounts of phosphorus indicate direct human-environment interactions that are further differentiated by geobiochemical markers. The investigation of steroids like sterols, stanoles and stanones and of bile acids helps to decipher prehistoric domestication and manure management. Deposition of faecal material – by foraging cattle or fertilizing farmer – may be identified by C-, N- and P-cycling of soil enzymes (e.g. urease activity). The analysis of black carbon indicates fire management strategies, whereas fire temperature is differentiated by calculating the ratio of B6CA to B5CA. Anthracological research (on- and offsite) helps to decipher the usage of wooden material as lumber or fuel. Finally, the investigation of bogs in the vicinity of our settlements should provide pollen spectra that give insights in crop diversity and paleoenvironmental conditions. With the project in its second year, the presentation gives an overview about research concepts and objectives. Completion of field analysis provides first interpretations and upcoming perspectives of the project’s laboratory phase. Finally, first data sets of heavy metal and steroid analysis as well as enzymatic activity can be discussed.

Literature

Exploring the Archives Stored in Mediterranean Transformed Landscapes
Arian Goren (University of Tübingen)
Co-authors: D. Langgut, I.Rellini, M. Maerker, N. Ben-Melech, V. Hochschild, Y. Gadot

After successfully dating terraces in-fills in the outskirts of Jerusalem using OSL dating (Davidovich et al. 2012, Gadot et al. 2016; Porat et al. 2017), the importance of applying several methods to re-examine the emergence of complex agricultural landscapes has proven indispensable. Furthermore, manipulating measured OSL signals has shown that anthropogenic soils can carry the memory of previous sediment re-deposition cycles. The next reasonable step is to acknowledge the immense potential of terraces, as imposing features in Mediterranean landscapes, to store valuable information on active transformation of landscapes taken by humans. In this regard, terraces are a unique archive of human-landscape interaction, and hence their content can and should be explored by an array of methods, addressing the three dimensions of these features. Following previous work, unraveling the information stored in in-fills of agricultural terraces in the outskirts of Jerusalem intends to expand in order to shed light on understanding the evolution of terraced landscapes. In addition to OSL dating, the study of macro and micro botanical remains, stereo imagery classification, modeling surface and subsurface runoff, as well as exploring the potential of micro-morphology in distinguishing the formation of anthropogenic soils are implemented in an interdisciplinary effort to tell the story of these unique landscapes. Providing such detailed reconstruction, never conducted before at this scale, enables to compile a conceptual toolkit for future application in the study of transformed landscapes throughout the Mediterranean.

The Impact of Geoarchaeological Studies in Paleolithic Survey; Case Study: A Middle Paleolithic Site in the Northern parts of Susiana Plain, Khuzestan, Iran
Saeid Bohramiyan (Laboratoire Archéorient; Maison de l’Orient et de la Méditerranée, Jean Pouilloux, l’université Lumière Lyon, France)

Because of the varied landscape and suitable environmental conditions, the Iranian Plateau has had a high potential for attracting human populations from the past to the present. In terms of geographical location, Iran is located between West and East Asia. It connects southwest Asia to the central and eastern parts of Asia, and could always be used as one of the migration routes of Pleistocene humans. In contrast to some scattered Paleolithic information revealed during the first Paleolithic studies in Iran, which were more focused on caves and rock shelters in Zagros and Alborz Mountains, in the last two decades, the studies conducted along with the presence of proficient researchers and the commencement of interdisciplinary and professional researches such as geoarchaeology on the activities of Pleistocene humans in the mountainous regions of Zagros and Alborz, piedmont regions, plains, edge of deserts and the coastlines, have shed some new and interesting information and have reinforced the above thesis of Iran as the connecting bridge. Nonetheless, some of these areas have not received good acknowledgement and have remained rather unknown in a
way that there is limited information about the Paleolithic periods from these areas among which Khuzestan province in the Southwest of Iran, especially, its northern and northeastern areas (northern highlands of Susiana plain), could be counted as a conspicuous example that despite limited Paleolithic surveys in recent few years, the obtained evidence from these surveys are of utmost significance. The Site of Khervali is one of the very few discovered Paleolithic sites in recent years which is located in the west of Zagros Mountain in the northern piedmonts of Susa Township, close to the western bank of Karkheh River. The aforementioned site was discovered focusing on the study of the geographical characteristics of the area. The importance of the site is in its geographical landscape. The site lies directly on the Bakhtyari conglomerate formation, and its surface is covered with a hight amount of round pieces of sandstone in different sizes and also an abundance of chert. In terms of geological point of view, it seems that the high elevation of this area, compared to its surrounding plain, has preserved it from the sedimentation process in Khuzestan plain and sedimentary deposits of the Holocene period. The site was surveyed systematically in 2012. Due to the vastness of the site and distribution of the Artefacts, a sampling of the entire site was impossible, for this reason, just four parts of the site which have preserved from the sedimentation process and sedimentary deposits were selected for sampling of Artefacts from which 330 Artefacts were collected in total. Techno-typological analysis of the artefacts shows that the Khervali is presumably a middle Paleolithic site with the use of the flake removal technique, along with Levallois elements, different types of the scraper and considerable ease of accessibility to the local raw materials available in the Bakhtyari conglomerate formation in the study area.

Class-based rounding – The use of a new approach to manage large sedimentological and geochemical data sets gained for multi-proxy approach
Dirk Nowacki (Goethe University Frankfurt/Main/Institute of Physical Geography)

By implementing new methods in geoscientific questions the amount of gained data is steadily rising and data handling gets more and more difficult. This holds especially true in geoarchaeological and palaeoenvironmental studies applying multi-proxy approaches which are based on geochemical and sedimentological data. These allow comprehensive statements on the depositional condition, for example, limnic, lagoonal, and marine environments, which may lead to conclusions about palaeoecology, palaeovegetation, paleoecolimate, and human influence. Beside the environmental interpretation of the data records the quality of the data themselves plays an important role. Differences in the composition of the sampled material, the chemical properties, e.g. the concentration of certain elements, and the accuracy of the applied analyses may cause questions about the quality and the reliability of the proxies used. The strength of the presented class-based rounding approach is the inclusion of the accuracy of the measurement method and the resilience of the results of analyses in the multi-proxy approach. The class-based rounding allows to reduce the background scattering of the measured values. In the present paper the application of class-based rounding will exemplarily be presented on limnic sediments of the Danube-River system in Romania.

Direct push sensing in wetland geoarchaeology
Keynote lecture: Christoph Zielhofer

Co-Authors: Johannes Völlmer1, Anne Köhler1, Johannes Schmidt1, Ulrike Werban2, Peter Dietrich4, Sven Linzen3, Lukas Werther3, Stefanie Berg3, Peter Ettel4
1 Chair of Physical Geography, Leipzig University, D-04103 Leipzig, Germany
2 Helmholtz Centre for Environmental Research UFZ, Department Monitoring and Exploration Technologies, D-04318 Leipzig, Germany
3 Leibniz Institute of Photonic Technology (IPHT), D-07745 Jena, Germany
4 Chair of Prehistory and Early History, Friedrich-Schiller University, D-07743 Jena, Germany
5 Bavarian State Department of Cultural Heritage BLfD, D-80539 Munich, Germany

In pre-historic and historic times floodplain edges and lake shorelines were preferential settlement areas. Buried archaeological features like pile-dwellings, weirs, hythes, or mills are fairly abundant in wetlands. These (geo)archaeological archives are highly valuable, since the high groundwater level ordinarily provides excellent preservation conditions for organic-rich proxy-parameters and artefacts. However, wetlands are characterised by difficult exploration conditions that require complicate and costly excavation techniques due to the impact of groundwater inflow and highly unstable trench edges. Alternatively used classical driving core techniques often suffer from high compaction rates of organic layers and thus show a bias in depth accuracies. Regarding these challenging issues we focus here on direct push sensing with special interest on two key sites in Bavaria: Neolithic houses at Pestenacker (UNESCO- World Heritage Site) and Charlemagne’s canal, the Fossa Carolina. Both locations represent prominent sites in wetlands, which are characterised by complex archaeological strata but also by a high diversity of fluvial, palustrine and lacustrine facies types. Direct push sensing represents a set of tools for performing subsurface records by pushing small-diameter, hollow steel rods with different probes into the ground. This technique is mostly applicable in unconsolidated sediments that are typically less than 30 m below the surface. Thus, continuous in situ measurements provide high-resolution vertical data logs up to a depth-accurate resolution in the cm-scale. In this presentation we will show the potential of direct push sensing in wetland (geo) archaeology. We focus on depth-accurate recording of buried archaeological structures and on the high-resolution detection of different facies types in wetlands. Within an
In a geoelectric prospection, the apparent electrical resistivity along a profile is measured and analysed in a tomographic inversion process. This leads to images of the subsurface in terms of specific electrical resistivity that are e.g. used for an identification of archaeological features or a stratigraphical characterisation of the subsurface. Nevertheless, the tomographic inversion process is ambiguous, i.e. different subsurface models can result in the same misfit and are thus equally “true”. Therefore it is highly recommended to use additional information from other methods to constrain the inversion. In our case, we use Direct-Push Electrical conductivity (DP EC) logs and vibracore data to constrain the ERT inversion in different ways: a) Applying improved starting models derived from the DP-EC logs: Normally a homogeneous starting model is used in the inversion. By using an improved starting model that is closer to reality, the inversion process can be lead into the right direction producing better subsurface models. b) Applying structural constraints from logs and vibracore data: Structural constraints such as interfaces from sediment cores or DP-EC logs are incorporated in the subsurface model. At these interfaces, the smoothing constraints of neighbouring model parts are removed and the resistivity values of these parts are allowed to vary abruptly from one cell to the other. c) Applying both structural and resistivity constraints: Resistivity and depth information from DP-EC logs are used to constrain the subsurface model in certain regions. The resolution of electrical resistivity tomography (ERT) is depending on electrode spacing, measurement configuration and resistivity distribution, but in general, it is coarser than the vertical resolution of DP-EC logs, which is 2 cm. A DP-EC log represents the true electrical resistivity distribution with depth, but only at a single point along a profile. To adapt the high vertical resolution of the DP-EC logs to the coarser ERT resolution blocking of the logs in required. These blocked logs can then be used to constrain the tomographic inversion with resistivity and structural constraints in so-called regions around the log locations, which is found to be the best constraining approach. This constraining with in-situ measured subsurface information yields improved subsurface electrical resistivity models with improved depth of interfaces and resistivity values.

Innovative application of downhole ERT for geoarchaeological research

Erica Corradini (Institute of Geoscience, Dept of Geophysics, Kiel University)
Co-authors: Thomas Günther**, Tina Wunderlich*, Ercan Erkul*, Dennis Wilken*, Wolfgang Rabbel*

Geophysical methods combined with sedimentological information principally have the capability to provide quantitative information for determining local stratigraphies, which can be interpreted as indicators of environmental changes. Among the geophysical methods typically applied in archaeo-geophysical prospecting, ground penetrating radar (GPR) shows the highest stratigraphic resolution, but it is limited in penetration depth depending on the electric resistivity of the subsurface. This drawback does not apply to Electrical Resistivity Tomography (ERT). However, if ERT is performed at the surface, it generally suffers from spatial resolution limits. Against this background we investigate up to which degree ERT results can be improved by constraining the tomographic computation through drilling results. We present a new application of resistivity measurement in boreholes in a way to better understand the resolution of the method that can be helpful for geochronological investigations. A borehole electrode array was constructed consisting of 16 electrodes with 10 cm spacing. This probe has been applied at the Mesolithic site of Duvensee along a transect with 10 corings every 5 m, crossing a former island in order to improve the understanding of the stratigraphy in that area. The probe is lowered into the boreholes to measure the resistivity in the vertical direction and can be used also for crosshole and borehole-to-surface measurements. The results of the test measurements were first individually inverted and afterwards combined with the measurements on the surface giving a good match and a detailed variation of the resistivity in the first 1.5 m. The electric measurements were then compared with GPR and drilling results to evaluate in how far the major facies can be traced into the area away from the boreholes.
Tracing tsunami signatures of the AD 551 and AD 1303 tsunamis at the Gulf of Kyparissia (Peloponnese) using Direct Push in situ sensing techniques

Hanna Hadler (Institute of Geography, Johannes Gutenberg - Universität Mainz)

Author and co-authors: Lea Obrocki, Hanna Hadler, Andreas Vött, Dennis Wilken, Peter Fischer, Timo Willershäuser, Benjamin Koster, Franziska Lang, Ioannis Papanikolaou, Wolfgang Rabbel, Klaus Reicherter

The western Peloponnese was repeatedly hit by major tsunami impacts during historical times as reported by historic accounts and recorded in earthquake and tsunami catalogues. Geological signatures of past tsunami impacts have also been found in many coastal geological archives. During the past years, abundant geomorphological and sedimentary evidence of repeated Holocene tsunami landfall was found between Cape Katakolo and the city of Kyparissia. Moreover, neotectonic studies revealed strong crust uplift along regional faults with amounts of uplift between 13 and 30 m since the mid-Holocene. This study focuses on the potential of direct push (DP) in situ sensing techniques to detect tsunami sediments along the Gulf of Kyparissia. Direct push measurements were conducted on the landward shores of the Kafiá Lagoon and the former Mouria Lagoon from which sedimentary and microfaunal evidence for tsunami landfall are already known. DP methods helped to decipher in situ high-resolution stratigraphic records of allochthonous sand sheets that are used to document different kinds of sedimentological and geomorphological characteristics of high-energy inundation, such as abrupt increases in grain size, integration of muddy rip-up clasts and fining upward sequences which are representative of different tsunami inundation pulses. This study’s investigations were completed by sediment coring as a base for local calibration of geophysical direct push parameters. Surface-based electrical resistivity tomography and seismic data with highly resolved vertical DP datasets and sediment core data were all coupled in order to improve the quality of the geophysical models. Details of this methodological approach, new in palaeotsunami research, are presented and discussed, especially with respect to the question how the obtained results may help to facilitate tracing tsunami signatures in the sedimentary record and deciphering geomorphological characteristics of past tsunami inundation. Using direct push techniques and based on sedimentary data, sedimentary signatures of two young tsunami impacts that hit the Kafiá Lagoon were detected. Radiocarbon age control allowed the identification of these tsunami layers as candidates for the AD 551 and AD 1303 earthquake and tsunami events. For these events, there is reliable historical data on major damage on infrastructure in western Greece and on the Peloponnese. At the former Mouria Lagoon, corroborating tsunami traces were found; however, in this case it is to decide whether these signatures were caused by the AD 551 or the AD 1303 event.

A minimal-invasive multi-methodical approach for site investigation with direct push sensing on different spatial scales

Johannes Völlmer1* (Institute of Geography, Leipzig University)

Co-authors: Johannes Schmidt1, Peter Dietrich2, Ulrike Werban2, Sven Linzen3, Stefanie Berg4, Lukas Werther4, Christoph Ziehlofer4

1 Institute of Geography, Leipzig University, Leipzig, Germany
2 Department Monitoring and Exploration Technologies, Helmholtz Centre for Environmental Research (UFZ), Leipzig, Germany
3 Leibniz Institute of Photonic Technology (IPHT), Jena, Germany
4 Bavarian State Department for Cultural Heritage (BLfD), Munich, Germany
5 Seminar of the Archaeology of Prehistory to the Early Middle Ages, Friedrich Schiller University, Jena, Germany + Centre of Applied Geosciences, Eberhard Karls University, Tübingen, Germany

Archaeological excavations on prehistoric and historic settlements and sites are often characterised by difficult underground properties like high groundwater tables and unstable trench edges. Alter-natively used vibra-corings are challenging due to inexact depth accuracy caused by high sediment compaction rates. Additionally, excavations and vibra-corings provide only a small insight of ex-tended sites. Here, we present direct push sensing as an alternative application for subsurface in-vestigation. Direct push sensing implies different tools for the exploration by pushing steel rods with different probes in the ground to get high-resolution insitu data. The combination of direct push sensing with SQUID magnetic survey in a spatial hierarchical way provides a new approach for the exploration of ground monuments from large to small spatial scales. According to our methodical approach, large-scale SQUID magnetic surveys provide a first detection of potential archaeological anomalies. Subsequent, high resolution direct push sensing delivers in-situ sediment colour and electrical conductivity to describe fillings, stratigraphy and geometry of two dimensional cross-sections on medium to micro scales. Finally, selected vibra-corings offer de-tailed sediment sampling and further laboratory analysis as ground truth. The approach was applied at the Early Medieval Fossa Carolina in S-Germany. The 3 km long Caro-lingian canal was built 793 AD to bridge the Central European watershed between Rhine- and Dan-ube-catchment and was supposed to provide a navigable connection between the North Sea and the Black Sea. The aim of our study is to investigate the depth, the geometry and the fillings of the canal at different sections to clarify its state of construction progress and subsequent potential navigability. Fur-ther, we want to explore potential surrounding structures that might be part of the Carolingian hydro-engineering concept. The results show three examples of explored Fossa Carolina structures. The canal trench was ana-lysed in the Northern Section and potential hydro-engineering structures for water supply were analysed in the Northern and North-Eastern Section. For each site, in-situ colour cross-sections with 12, 5 – 50 cm horizontal and 1 – 2 cm vertical resolution were compiled and coupled with per-cussion drillings. The results show a detailed cross-section of the Carolingian canal with high depth-accuracy. How-ever, the potential hydro-engineering structures cannot be associated to the canal...
Using Geophysics in Archaeological Rockshelters: Lessons from South Africa and Australia
Ian Moffat (University of Cambridge and Flinders University)

Geophysical methods are now routinely applied to many archaeological investigations however their use on Pleistocene aged sites remains unusual. In this presentation, I showcase results from ERT and GPR investigations of rockshelters in South Africa and Australia. Geophysical survey was used to map the geomorphology of the bedrock surface in these sites and to define the stratigraphic packages with reference to adjacent excavation units. Additional sediment analysis is being conducted in order to assist with constraining the physical properties of the subsurface. Geophysics was particularly useful for locating the deepest parts of the rockshelters and validating if the excavations finished on bedrock or roof fall blocks. The results suggests a much greater potential role for geophysical methods in Pleistocene archaeology.

POSTER SESSION: Using Geophysics in Archaeological Rockshelters: Lessons from South Africa and Australia
Co-authors: Johannes Völlmer, Stefanie Berg, Ulrike Werban, Christoph Zielhofer

The Fossa Carolina is the first hydro-engineering construction that bridges the Central European watershed in the Early Medieval. The canal was built in 792/793 AD on order of Charlemagne and should have connected the drainage systems of the Rhine-Main-catchment and the Danube catchment. At that time, navigable waterways played an important role for itinerant kingships, economic exchange and communication across powerful elites and religious institutions in Europe. Hence, this hydroengineering project was of high geostrategic relevance. Current studies show, that the canal was built as a summit canal with several ponds of different levels. The canal trenches were deepened into sandy to loamy valley fills between the Rhine-Main and Danube catchments. In this poster, we show for the first time, the integration of Airborne LiDAR and (geo) archaeological datasets with the aim to create a 3D-model of Charlemagne’s summit canal. We develop an approach for handling with geoarchaeological data of different resolution. The canal trench geometry is derived from three archaeological excavations and four high-resolution direct-push transects. Schmidt et al. (2018) produced a purged Digital Terrain Model (DTM), which they purged by removing all anthropogenic structures. This pre-modern DTM reflects the Carolingian topography deals in this study as basis for the modelling approach. By means of several core drillings we interpolate the ditch floor and the adjacent escarpments through the adjacent excavation units. Additional sediment analysis is being conducted in order to assist with constraining the physical properties of the subsurface. Geophysics was particularly useful for locating the deepest parts of the rockshelters and validating if the excavations finished on bedrock or roof fall blocks. The results suggests a much greater potential role for geophysical methods in Pleistocene archaeology.

POSTER SESSION: Direct push sensing and geoarchaeological sounding at Neolithic Pestenacker settlement (Lech catchment, SW Germany)
Anne Köhler (Leipzig University, Institute for Geography)

Co-authors: Johannes Völlmer, Stefanie Berg, Ulrike Werban, Christoph Zielhofer

Wetland margins are valuable geoarchaeological archives due to their preferential settlement conditions in prehistoric times. A high groundwater level usually provides excellent preservation conditions for paleoecological and geoarchaeological proxies as well as for archaeological artefacts. However, this advantage also impairs classical archaeological excavations as a result of the increased groundwater inflow. Alternative percussion drillings offer inaccurate depth data due to increased compaction rates in organic rich sediments. The rarely used direct push sensing technology in paleoenvironmental and geoarchaeological research offers the opportunity to overcome this problem. Different probes (soil colour, electrical conductivity, cone penetration testing) provide undisturbed and in-situ information with a high resolution in a time-effective manner. The Neolithic settlement of Pestenacker, near Landsberg am Lech in Upper Bavarian Alpine foothills (SW-Germany), represents an exceptionally well-preserved wooden house settlement in a wetland environment. It is located at the Verlorenen Bach floodplain edge and was dated to the year 3,495-3,476 BC according to dendro-chronological investigations. Its great archaeological and transregional importance led to the inclusion in the UNESCO list of World Heritage Sites in 2011 as part of the “Prehistoric Pile Dwellings around the Alps“.

“Prehistoric Pile Dwellings around the Alps”.
By using the direct push technology in combination with classical percussion drilling and sediment analysis, different questions on different scale levels are dealt with. The Poster shows the floodplain stratigraphy at high vertical resolution and the stratigraphic coupling with the Neolithic settlement layers.
construction depth of the entire Carolingian canal. Furthermore, we calculate the excavation volume of the most important hydro-engineering construction in Early Medieval Europe. As a result, we compute an excavated volume of c. 287,000 m³. The excavated volume is not equally distributed over the whole canal length. On the contrary c. 87% of the entire volume corresponds with just 45% of the canal length. The present remnants of the massive dams are smaller indicating only a volume of c. 120,000 m³. This difference reflects the erosion and overprint since the 8th century AD. According to current information to the construction time by dendrochronological and historical data, we finally calculate the number of workers (c. 1725 persons) that were needed for the earthwork construction.

19 Scales of Transformation in Prehistoric and Archaic Societies – CRC 1266

Wednesday March 13th, Room 106
Session organizers: J. Müller, W. Kirleis, K. Fuchs

08:30 Welcome by the Convener
J. Müller, W. Kirleis

08:35 Inequality as a driver of transformations
VPJ Arponen (CRC 1266, Kiel University)

08:50 Investigate transformations
Daniel Knitter (Department of Geography, Physical Geography, Kiel University)

09:05 Discussion: Theory and Modelling (Cluster A)

09:15 Pioneers of the north: Transitions and transformations in Northern Europe evidenced by high-resolution data sets
Sonja Grimm (Centre for Baltic and Scandinavian Archaeology (ZBSA))

09:30 Transformations of specialized foragers
Daniel Groß (Centre for Baltic and Scandinavian Archaeology (ZBSA))

09:45 Late Mesolithic and Neolithic transformations in the Northern Central European Plain
Jan Piet Brozio (Institute of Pre- and Protohistoric Archaeology, Kiel University)

10:30 Dating LBK houses by their orientation: the interpretative power of magnetic results as exemplified by recent research in the Upper Žitava valley (southwest Slovakia)
Nils Müller-Scheßel (Institute of Pre- and Protohistoric Archaeology, Kiel University)

10:45 Functions, development and regional variability of communal buildings in Cucuteni-Tripolye settlements
Robert Hofmann (Institute of Pre- and Protohistoric Archaeology, Kiel University)
**SESSION 19**

**11:00 New advances in archaeobotany at the Tripolye mega-site of Maidanetske (Ukraine) about plant cultivation and wild plant resources**
Marta Dal Corso (Institute of Pre- and Protohistoric Archaeology, Kiel University)

**11:15 Transformation in the contact zone 'Gulf of Corinth'**
Torben Keßler (Institute of Classics Archaeology, Kiel University)

**11:30 Human, landscape, architecture – Hellenistic building complexes in the context of human action and perception**
Asja Müller (Institute of Classics Archaeology, Kiel University)

**11:45 Discussion: Transformations of socio-economic formations (Cluster B-E)**

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**13:30 Climate and society between 6000 and 3000 BP in Southern Iberia. Preliminary synopsis from overarching and local investigations**
Martin Hinz (Institute of Archaeological Sciences, University of Bern)

**13:45 Analysis of lake sediments as tool for high-resolution reconstructions of human-13.45 environmental interactions-examples from the Mesolithic period in northern Germany**
Stefan Dreibrodt (Institute of Ecosystem Research, Kiel University)

**14:00 Palaeoenvironmental transformation on different spatial scales: from local to overregional patterns**
Ingo Feeser (Institute of Pre- and Protohistoric Archaeology, Kiel University)

**14:15 Dynamics of plant economies in ancient societies**
Dragana Filipovic (Institute of Pre- and Protohistoric Archaeology, Kiel University)

**14:30 Genomic analysis of a Middle Neolithic community in Germany reveals time estimate of 5,300 BCE for admixture between hunter-gatherers and farmers**
Alexander Immel (Institute of Clinical Molecular Biology, Kiel University)

**14:45 Discussion: Socio-environmental Components of Change (Cluster F)**

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**POSTER SESSION**

**15:30 The never-ending why – Theories on Neolithic monumentality**
Johanna Brinkmann (Institute of Pre- and Protohistoric Archaeology, Kiel University)

**15:35 In search for the Bølling-Oscillation — new palynological data on old questions at lake Bølling, Denmark**
Sascha Krüger (Centre for Baltic and Scandinavian Archaeology (ZBSA))

**15:40 Chronological models of Tripolye mega-sites development: testing with radiometric dates**
Liudmyla Shatilo (Institute of Pre- and Protohistoric Archaeology, Kiel University)

**15:45 Social transformations at the end of Neolithic Central Germany**
Clara Drummer (Institute of Pre- and Protohistoric Archaeology, Kiel University)

**15:50 Late Neolithic pottery production in the central German low mountains**
Marianne Talma (Institute of Pre- and Protohistoric Archaeology, Kiel University)

**15:55 Bronze Age transformations in Northern Germany**
Stefanie Schaefer Di-Maida (Institute of Pre- and Protohistoric Archaeology, Kiel University)

**16:00 Human and climatic landscape transformation in the Stymphalia polje, Greece**
Joana Seguin (Institute of Ecosystem Research, Kiel University)

**16:05 Human/paleoenvironmental interactions in Southern Greece during the Bronze age-Iron age transition: a biomarker perspective**
Jan Weber (Institute of Geosciences, Kiel University)

**16:10 Ex oriente lux? Ex oriente luxuria? Sociocultural transformation processes in the Early Iron Age Eastern Mediterranean**
Kim Annika Kittig (Institute of Classics Archaeology, Kiel University)
Scales of Transformation in Prehistoric and Archaic Societies – CRC 1266

J. Müller, W. Kirleis, K. Fuchs

What are the substantial transformations that describe human development from 15,000 years ago to the beginning of Common Era? How did the interaction between natural environment and human populations change over time? What role did humans play as cognitive actors trying to deal with changing environmental conditions? Which factors triggered the transformations that led to substantial societal and economic inequality characterizing the development from Paleolithic camp sites to Aegean polis? Looking at the period from 15,000 to 1 BCE, the Collaborative Research Centre 1266 (CRC 1266) takes a diachronic view in order to investigate the processes of transformation that led to the development from late Pleistocene hunter-gatherers to early state societies, thus covering a wide array of societal formations and environmental conditions across Europe. In order to identify the dimensions of transformation processes on different temporal, spatial and social scales, we explore past environmental and archaeological archives of high quality in different landscapes and use a combination of archaeological and palaeo-environmental methods.

This session is dedicated to the major results obtained within first years of the CRC 1266, presented by PostDocs and PhD candidate contributions from all 18 subprojects. Since 2016 the CRC researchers concentrate on specific topics dealing with intensive comparative work on archaeological case studies, diachronic work on parameters with broad theoretical discussions, targeted model development and with cutting-edge method development in dating and sub-surface prospection in order to enable true interdisciplinarity. We explicitly welcome audience that is interested in the CRC topics! The program will be announced by January 2019.
The inter-relationship of societies with their landscape is characterized by continuous dynamics. Different disciplines do actively contribute to investigations of these dynamics, identifying phases of transformation and stability. Various terminologies and concepts, heterogeneous data and methods, as well as interpretations characterize the research on societies and their landscapes. This aggravates the identification and comparison of transformation phases or events as specific forms of societal dynamics. The aim of this talk is to present different integrative modeling approaches that are flexible to be used in different contexts in order to support the required comprehensive perspectives and enable to draw conclusions about transformations. Since models are heuristics they can be used to exemplify various discipline-specific assumptions and foster communication. Integrative modeling is a practice, that is complementary to the classical, discipline-oriented approaches. To illustrate the potential of a model-supported integrative research approach, we present models of crisp and fuzzy logic for interaction analyses and land-use quantifications. The application of this approach is shown by means of selected field studies and their hypotheses from prehistoric and classical archaeology projects in Germany (C1) and the Eastern Mediterranean (E1). We conclude with some theoretical remarks (A1) and promote the “reflective turn box” as a heuristic device to integrative research that aims to foster discussions, reflection on terms, as well as closer interdisciplinary collaboration.

Pioneers of the North: Transitions and transformations in Northern Europe evidenced by high-resolution data sets (B1)

1 Centre for Baltic and Scandinavian Archaeology (ZBSA), Foundation Schleswig-Holsteinische Landesmuseen, Schloss Gottorf

In this project, we investigate the cultural and socio-economic transformations in mobile hunter-gatherer groups that were confronted with different and changing environmental conditions at the end of the last Ice Age. In particular, we use diverse case study regions to exemplify the socio-environmental interactions of pioneer populations and early inhabitants during the Final Palaeolithic colonisation processes in Northern Europe. Four major periods of change were originally identified based on the known archaeological and environmental data:

1. Human colonization of the south-western Baltic region at the onset of the Meiendorf interstadial,
2. Pioneers settling into this region during Meiendorf and the early Allerød interstadial,
3. Broader variation appears towards the end of the Allerød, and
4. Expansion and pioneering further northwards at the end of the Younger Dryas stadial.

Having established these four phases, the task was to discuss what the changes observed are in fact representing? Were these actual transformations of a group from a prior state (α phase) over a state of transformation (β phase) to an established new state (γ phase)? Or were these actually different pioneering movements with first group A, then B, then C etc.? To investigate this, we employed both material culture studies (e.g. dynamic technological analyses of material culture variability as well as variation in spatial organisation and site distribution) and scientific analysis of high-resolution palaeoenvironmental profiles. Since the start of the project, we have not just revisited several old assemblages and profiles but also found and investigated new ones. Thus, we integrate new and old data to build solid, local environmental chronologies to approach the questions about the character of the transformation. Based on our analyses and the numerous collaborations, we have manifestly improved our knowledge concerning all our case study regions, established an additional region in Denmark, and increased our understanding of transformations in the palaeoenvironmental and archaeological record of the south-western Baltic region. Our investigations thus far imply that (1) was perhaps the most substantial transformation of the human-environmental interactions with people arriving in this region, (2) may not have been a transformation at all but a replacement, (3) needs further research to be understood, and (4) occurred later than originally thought and might be highly dependent on the environmental interactions.

Transformations of specialized foragers (B2)

Daniel Groß*, Harald Lübke*, John Meadows*, Ulrich Schmölcke*, Sönke Hartz*
1 Centre for Baltic and Scandinavian Archaeology (ZBSA), Foundation Schleswig-Holsteinische Landesmuseen, Schloss Gottorf
2 Leibniz Laboratory for Radiometric Dating and Stable Isotope Research, Kiel University
3 Regional Archaeological Museum and Viking Museum within the Foundation of the Schleswig-Holstein State Museums at Schloss Gottorf, Kiel University

In this project, we investigate the cultural and socio-economic transformations in...
The beginning of the Holocene is marked by severe environmental changes on a global such as regional scale. Several archives from the Northern European Lowlands enable us good insights into these prehistoric processes and how humans were affected and reacting to these. While the societies under consideration were non-sedentary hunting and gathering economies, they were closely interacting with their environment. In this presentation we will present new results from the project “Transformations of specialized foragers” with emphasis on the Early Mesolithic. The regional focus is the south-eastern part of Schleswig-Holstein in northern Germany, which has been subject to intensified research during the last two years. In the interdisciplinary environment of the CRC 1266 “Scales of Transformation” we developed a workflow for reconstructing prehistoric settlement regions in cooperation with the subprojects. This comprises the interlinking of archaeological data, geophysical surveys and palaeo-environmental reconstructions. We will exemplify this by results from ancient Lake Dvunsee where we can see alterations in the settlement system in accordance with changes of the lake. Furthermore, light will be shed upon typo-chronological and economic transformations of Mesolithic societies. Our results contribute to refined understanding of Early Holocene hunter-gatherers but more importantly show significant changes of the subsistence systems during the course of the Mesolithic and give hints for changes in the social sphere. Finally, we will discuss general misconceptions about the homogeneity of Holocene hunter-gatherers in the region and present perspectives for further research.

**Late Mesolithic and Neolithic transformations on the Northern Central European Plain (C1)**

*Jan Piet Brozio, Sönke Hartz, Johannes Müller*

1 Institute of Pre- and Protohistoric Archaeology, Kiel University
2 Archaeological Museum Schloss Gottorf, Foundation Schleswig-Holsteinische Landesmuseen, Schloss Gottorf

This project focuses on marked socio-ecological transformations in social and environmental domains from the Late Mesolithic to the end of the Neolithic period on the Northern European Plain. To extract and compare patterns of transformation in selected test areas, archives of environmental developments and archaeological artefacts are combined with the results of new geophysical prospections and excavations. This new fieldwork concentrated on four sites which date to between the late Middle Neolithic and Young Neolithic – Oldenburg LA 225 and 232 in the former fjord region of the Western Oldenburger Graben, the inland Labenz LA 11 in the Dvunsee fen area, and Brodersby-Schönhagen LA 107 on the coast of the Baltic Sea. The combination of both the archival and new datasets for diachronic analyses revealed the variable impact of economic and social practices on the Neolithic societies through time. This paper presents both the major results of the ongoing field projects and larger chronological analysis, highlighting the main drivers of transformations and their effects on the Neolithic societies of the Northern European Plain.

**Dating LBK houses by their orientation: The interpretative power of magnetic results as exemplified by recent research in the Upper Žitava valley (southwest Slovakia) (C2, G1, G2)**

*Nils Müller-Scheeßel, Erica Corradini, John Meadows, Johannes Müller, Diana Panning, Natalie Pickart, Wolfgang Robbel, Helene Rose, Martin Furholt*

1 Institute of Pre- and Protohistoric Archaeology, Kiel University
2 Institute of Geosciences, Kiel University
3 Leibniz Laboratory for Radiometric Dating and Stable Isotope Research, Kiel University
4 Centre for Baltic and Scandinavian Archaeology (ZBSA), Foundation Schleswig-Holsteinische Landesmuseen, Schloss Gottorf
5 Department of Archaeology, Conservation and History, University of Oslo

Either by excavation or in the last decades increasingly by geophysical prospection (esp. magnetics) we have an ever growing body of settlement and house plans of the LBK (early Neolithic in Central Europe) at our hands. However, current discussions mostly focus on the question of the initial setup of individual settlements (house wards or rows). With the help of extensive recent research in southwest Slovakia in terms of excavations, surveys and geophysical prospection, we propose to go one step beyond this. By having dated more than one quarter of the houses of one of the three settlements of Vráble, we are able to explicate a link between the orientation of individual houses and their respective dating. Furthermore, we show that houses of similar orientation can be found at standard distances. Taking this evidence together, it is possible to devise a model of the settlement development which allows to make succinct statements about the succession of houses and their longevity as well as the population size of the village. We extend this model to other contemporaneous settlements in the area which are partly or completely covered by magnetic prospection to arrive at informed estimates on the settlement history and population density of an LBK micro-region, the Upper Žitava valley. In this way, we can sketch the transformations in terms of the settlement patterns and population distribution taking place during the Early Neolithic in this part of the LBK world. We will discuss the ways these transformations also changed social interaction and communication on the local and regional level. Finally, we provide an outlook on the possibilities of similar studies in other areas of the LBK territory.

**Functions, development and regional variability of communal buildings in Cucuteni-Tripolye settlements (D1)**
Emergence, decline and related aspects of huge population agglomerations in Tripolye megasites with partly thousands of houses are investigated in the sub-project D1 of the CRC1266 ‘Scales of Transformations’ together with colleagues from the National Ukrainian Academy of Science, the Borys Grinchenko Kyiv University and the German Archaeological Institute in Berlin and Frankfurt. High-resolution magnetic surveys in Cucuteni-Tripolye settlements led to the discovery of large, so far unknown building structures which are located at prominent positions within settlements. Because of their extraordinary size, positioning and special architectural characteristics these structures have been identified as public or communal buildings such as “temples” or assembly houses. Precise spatial and functional analysis of these structures in geomagnetics plans and new excavations allow a unique insight into the social organization of Tripolye communities and their transformation in a longer-term perspective. Within large settlements of the Cherkassy and Kirovograd regions two classes of such buildings can be distinguished: So called high-level ‘mega-structures’ likely fulfilled functions at the level of the whole community while low-level “ring”-street (and other) buildings have been used for integrative proposes of a parts of the commune. The latter category of buildings, normally shows more or less uniform distributions within settlements which likely reflect some kind of communal organisation in quarters or districts.

With the goal to understand the construction and functional aspects of such buildings, one low-level ring-street-building was excavated in Maidanetske in the frame of the CRC 1266. Detailed collection and analyses of available information such as find inventories and distribution, imprints of timbers on daub, the dense sampling for botanical, zoological, pedological, and geoarchaeological investigations provide solid arguments for the evaluation of functional aspects of this building in comparison to the ‘normal’ houses and the identification of activity zones.

In order to deepen the understanding of transformations in the social organisation of Tripolye communities, the category of communal buildings as a whole is evaluated in a diachronic perspective based on old and new plans of geomagnetic surveys. Starting from analysis of size, frequency and positioning of such facilities we are now able newly to discuss in diachronic perspective crucial aspects such as the development of use group sizes of such buildings and the role and development of central institutions in Tripolye societies.

New advances in archaeobotany at the Tripolye mega-site of Maidanetske (Ukraine) about plant cultivation and wild plant resources (D1, A2, F2)
Marta Dal Corso*, Wolfgang Hamer2, Robert Hofmann1, René Ohlrau3, Liudmyla Shatilo1, Daniel Knitter1, Stefan Dreibrodt1, Philipp Saggau2, Rainer Duttmann2, Ingo Feese3, Hannes Knapp1, Norbert Benecke1, Johannes Müller1, Wiebke Kirleis1)
1 Institute of Pre- and Protohistoric Archaeology, Kiel University
2 Department of Geography, Physical Geography, University of Kiel
3 Graduate School “Human Development in Landscapes”, University of Kiel
4 Institute of Ecosystem Research, University of Kiel
5 German Archaeological Institute, Berlin

Within the Project D1 of the CRC 1266 ‘Scales of Transformation’, Tripolye population agglomerations in central Ukraine have been investigated. For now, archaeobotanical research focused on the mega-site of Maidanetske. An updated overview is here presented concerning the analyses of botanical micro- and macro-remains at different scales, with focus on cultivars and natural resources. Cereal cultivation is attested by charred macro-remains, despite difficult preservation conditions. Phytolith analysis stressed proves of the high importance of cereal by-products as plant temper for house construction, hence of cereal processing in the site. Together with attestation of stockbreeding, likewise a stable community lived at the site. Furthermore, the analyses of plant remains shed light on the natural resources in use. charcoal fragments attested the use of ash as preferred tree for fuel and construction, followed by oak and elm. These trees compose both, the mixed broadleaved woodland of the hardwood belt along river valleys and the mixed broadleaved woodland in areas less influenced by hydrographic fluctuations, suggesting that the area around the site was covered with forest at the time of settlement. However, some attestation of grassland vegetation is given by feathergrass awns, charred and recovered on-site. These remains indicate either the use of grassland spots with steppe vegetation in the landscape, or the presence of this vegetation in the close vicinity of the site. A landscape model was developed in collaboration with the Projects A2 and F2 of the CRC1266. The model is based on the topographic, soil and archaeological data, and on ethnographic comparisons, and it suggests the possibility that the area around the site was forested in the Chalcolithic, in agreement with recent pedological analyses, and that only much drier conditions could have led to a severe environmental change due to human impact.

Transformation in the contact zone ,Gulf of Corinth’ (E1)
Torben Keßler (Institute of Classics Archaeology, Kiel University)
The transition from the Bronze to the Iron Age in Greece – in the frame of our project understood as the time between the 12th and the 8th century BC – is a phase of major
changes with regard to the structure of the society involved. After the destruction of the Mycenaean palaces around 1200 BC a century of relative stability set in, followed by a time which is commonly known as the ‘Greek Dark Ages’. Mainly, this name was chosen because of the loss of literacy during that period and the fact, that the archaeological remains in general are less copious than before and after. What we can recognize, however, is the emergence of the polis, the Greek city-state, which becomes visible during the 8th century and which reflects a new, and differently institutionalized, form of community than had existed before.

In our project, which is concerned with the regions surrounding the Gulf of Corinth, I am approaching this transformation by means of pottery studies, with a special focus on decoration. Two aspects render the decoration of pottery a most fruitful area of research: its high sensitivity regarding change, and its comparatively good traceability within the archaeological literature. That applies no less for pottery from the Greek Early Iron Age. I believe that the high degree of detail that I am recording (based on evidence from the material published) regarding the distinct potter’s and painter’s choices will produce some insights into spatial patterns that have not been recognized so far. By looking carefully at decorative elements of the different ceramic shapes existing, I hope to be able to advance our knowledge of when and where certain geographical areas related more closely to each other, while others seemed to develop rather isolated. In my opinion, contact between acting entities was a vehicle of major importance for the societal transformations that took place at the dawn of the polis culture. The diachronic observation of connectivity on different spatial levels – ranging from the local sphere of a site, to the regional area of a settlement chamber, and, finally, up to the level of inter-regional relations – is a useful indicator of change that accompanied these transformations. Even more so in the case of our working area and time frame, since the geoscientific proxies that have been collected by the other parts of our project do not point to any major climatic or environmental change during this transitional period...

Human, landscape, architecture. Hellenistic building complexes in the context of human action and perception (E3)

Asja Müller*, Michael Feige* (Institute of Pre- and Protohistoric Archaeology, Kiel University)

Project E3 investigates the transformation of the interrelation between built architecture and landscape during the Hellenistic period (ca. 4th to 1st century BC) in the Mediterranean. This period can be regarded as a key moment in the history of human design of landscape features since it saw a massive change in the relationship between architecture and landscape. Therefore, the project focuses on architectural interventions and their consequences for the shaping of the landscape (and vice versa) as well as the influence that human action and perception have on this process.

In order to better understand these multi-layered interactions, the project examines two architectonically related, but functionally very different action contexts: Hellenistic sanctuaries in the eastern Mediterranean and Roman Villas in Late Republican Italy. The Hellenistic sanctuaries under consideration are investigated with regard to different analytic layers. On the most basic layer the choice of location will be considered, that is to say their topographical and urbanistic embedding. This is followed up by the discussion of typical natural (e.g. groves, caves, springs etc.) as well as architectural features (e.g. stairs, retaining walls, columnar halls etc.). On the most complex level, both kinds of features are related in order to ask how these architectural complexes are structured altogether (e.g. by the principles of symmetry, horizontal and vertical graduation or rhythmization). Thus, the comparison with the sanctuaries of Archaic to Classical as well as Roman date will reveal the transformations of Hellenistic landscape-architecture interaction as well as basic human practices intrinsically linked to it (e.g. movement and perception).

Using new construction techniques, from the 2nd century BC onward Roman villas copied elements originally used in sanctuary architecture, which were then applied to create and structure spaces for activities of agriculture and private leisure. More than ever before, the landscape itself became part of the architecture.

Climate and society between 6000 and 3000 BP in Southern Iberia. Preliminary synopsis from overarching and local investigations (F1)

Martin Hinz*, Artur Ribeiro*, Jutta Kneisel†, Christoph Schneider†, Ralph Schneider†, Mara Weinelt†

1 Institute of Archaeological Sciences, University of Bern
2 Institute of Pre- and Protohistoric Archaeology, Kiel University
3 Institute of Geosciences, Kiel University
4 Graduate School “Human Development in Landscapes”, Kiel University

The F1 project aims to identify transformative events in societies of Southern Iberia, and whether these transformations are a result of climatic deterioration in the region. The project started with the collection of archaeological and paleoclimatological indicators, which in their current aggregation provide a complex picture of Southern Iberian societies and climate fluctuation.

From the perspective of paleoclimate, 6 drought phases between 6,000 and 3,000 BP could be identified, and these can be correlated to the archaeological record, more specifically, changes in settlement sizes as inferred from 14C sum curves. In particular, it is possible to recognize a potential relation between the rise of chalcolithic societies and their “collapse” (from 2200 to 1200 BCE) with some climatic developments, whereas Bronze Age societies (1200 BCE onwards) seemed to have been more resilient and fared considerably better in face of similar climatic developments.
Qualitative approaches are also currently being applied to the archaeological data, in order to obtain a more fine-grained perspective on how these societies developed in light of climate change. This includes the study chalcolithic ditched enclosure sites of southern Portugal, such as Monte da Contenda where we have already conducted field work, and Perdigões, which is being research by one of our close collaborators, with the aim of understanding what happened to these communities during the end phase of the Chalcolithic.

Analysis of lake sediments as tool for high-resolution reconstructions of human-environmental interactions- examples from the Mesolithic period in northern Germany (F2, B2)
Stefan Dreibrött*, Ingo Feeser2, Marco Zanon2, Walter Dörfler2, Daniel Groß2, Harald Lübke3
1 Institute of Ecosystem Research, Kiel University
2 Institute of Pre- and Protohistoric Archaeology, Kiel University
3 Centre for Baltic and Scandinavian Archaeology (ZBSA), Foundation Schleswig-Holsteinische Landesmuseen, Schloss Gottorf

Lake sediments prove environmental archives on the continents that store critical information about Holocene human-environmental interactions and thus transformations of landscapes and societies. Micro-structure analysis of annually laminated lake sediments allows a reconstruction of palaeo-environmental processes on the continents in a unique precision. Climate variability, landscape development and hazards, like volcanic eruptions, which were people faced by, can be studied on a sub-annual level. Additionally, investigations on lakeshore sediments allow the detection and dating of lake level changes. A comparison of the palaeo-environmental data with the archaeological record allows to consider about possible consequences for ancient people, and necessities of adaption strategies often considered as one driver of societal transformation.

In the presented contribution, a comparison of results from early Holocene sediment sequences of northern German lakes (Poggensee, Woseriner See, Schweriner See) with the available palaeo-environmental and archaeological records (Duvensee, Hohenviecheln) is presented to illustrate the potential of lake sediment studies to disentangle ancient transformation processes.

Palaeoenvironmental transformation on different spatial scales: from local to over-regional patterns (F2, D3)
Ingo Feeser*, Jutta Kneisel, Stefanie Schaefer-Di Maida (Institute of Pre- and Protohistoric Archaeology, Kiel University)

Palaeoenvironmental investigations in context of the CRC 1266 comprise analyses of archives reflecting human-environmental interaction on different spatial scale. Small sediment archives in the vicinity of archaeological sites, so called near-site archives, strongly reflect local land-use activities. Investigations of sediments from medium to large lakes, so called off-site archives, are commonly used to reconstruct regional developments. By comparing different archives it is possible to differentiate and identify signals of environmental change from a local to over-regional scale. This aims at evaluating the role of environmental factors during phases of archaeological identified socio-cultural transformation as well as reconstruct environmental consequences of such changes.

This paper will focus on preliminary results of palynological investigations (CRC 1266 subproject F2) of a short peat sequence from a small depression close to a Bronze Age cemetery at Mang de Bargen, northern Germany. On-going archaeological investigations at this site (CRC 1266 subproject D3) revealed evidence for local burial and settlement activities from the Bronze to Pre-Roman Iron Age. Interpreting the near-site pollen record of Mang De Bargen, we aim at reconstructing the local land-use history and compare it with the Archaeological evidence. The results are put into context of regional and over-regional developments as derived from palaeoenvironmental off-site analyses.

Dynamics of plant economies in ancient societies (F3)
Dragana Filipovic*, Wiebke Kirleis (Institute of Pre- and Protohistoric Archaeology, Kiel University)

The archaeobotanical research project of the CRC 1266 is concerned with the development and changes in plant production, i.e. the dynamics of past plant-economic systems, for which the evidence can be found in the archaeobotanical record. The geographical regions of interest to the project are central and northern Europe. We use archaeobotanical and archaeological data produced within the ongoing or already completed research initiatives at Kiel, in addition to the relevant published data. My work within this project focuses on crop cultivation and use at a selection of settlement sites in northern Germany and Slovakia dating to the Neolithic and Late Bronze Age. The Neolithic case studies include several sites in northeastern Schleswig-Holstein (in the Oldenburger Graben region) from the end of 4th/beginning of 3rd millennium BC, and the LBK site of Vrable in western Slovakia (6-5th millennium BC). The site of Wismar-Wendorf in Mecklenburg-Vorpommern (8-7th century BC) serves as a Late Bronze Age case study. The aim of my work is to investigate in more detail certain aspects and elements of past crop production that varied within and between the respective periods and regions, particularly those that changed from one period to the next. A further goal is to explore if and how agricultural change articulated with...
shifts and new developments in other aspects of life, principally technology, but also distribution of farming settlements and their interaction with the natural environment. The outcomes of my work contribute to the scope of the CRC1266, which seeks to identify and shed light on large-scale, profound changes (transformations) in the lifestyle and social and natural environment of prehistoric and early historic communities.

The presentation will show some aspects of crop cultivation at the Neolithic Oldenburg sites and the LBK Vrable. Further, possible cause-and-effect of changes observed in the crop spectrum and farming routine during the Bronze Age in northern Germany will be discussed. Some thoughts on the presence/absence of correlation between the trends and tendencies in agriculture and changes/advances in technology and settlement pattern will be offered. As part of this project, I designed and am conducting the so-called “Millet Dating Programme” with the idea to establish a high-resolution chronological frame for the appearance of common millet in Europe and for its full inclusion in the agrarian production systems. My presentation will include initial results of this work and will emphasise their significance, as they contribute to investigations into how this Bronze Age agricultural novelty impacted on plant economy and if/how it related to other innovations (in crop production and beyond) characterising this period.

**Genomic analysis of a Middle Neolithic community in Germany reveals time estimate of 5300 BCE for admixture between hunter-gatherers and farmers (F4)**

*Alexander Immel*, Katharina Fuchs, Christoph Rinne, Julian Susat, Clara Drummer, John Meadows, Sabine Schade-Lindig, Johannes Müller, Almut Nebel, Ben Krause-Kyora

1 Institute of Clinical Molecular Biology, Kiel University
2 Institute of Pre- and Protohistoric Archaeology, Kiel University
3 Laboratory for Radiometric Dating and Stable Isotope Research, Kiel University
4 Landesamt für Denkmalpflege Hessen, Schloss Biebrich
5 Institute of Clinical Molecular Biology, Kiel University

The Neolithic period is associated with socio-cultural and technological changes and presents a major transformation in human subsistence strategies which may also have exposed humans to previously unknown diseases, which is one research focus of subproject F4.

During this period, local hunter-gatherers admixed with incoming farmers from the Near East while both groups co-existed in Europe over a long period of time. Here, we present genomic data of 50 individuals from a Middle Neolithic farmer community in Western Germany that showed a very high proportion of hunter-gatherer ancestry. We estimated the admixture date of early farmers and hunter-gatherers that gave rise to this population around 5,300 years ago and find several hunter-gatherer-like phenotypes in this Neolithic farmer population. Our results demonstrate the ongoing admixture between farmers and hunter-gatherers that was a major driving force in the transformational processes of the Neolithic demographic transition. Despite the poor health state, as reflected by paleopathological analysis of the skeletal remains, we find no evidence of infectious disease, thus providing no support for the hypothesis that infectious crowd diseases emerged during the Neolithic transformation.

**POSTER SESSION:**

The never-ending why – Theories on Neolithic monumentality (A1)

*Johanna Brinkmann (Institute of Pre- and Protohistoric Archaeology, Kiel University)*

Many scholars have approached the question of monumentality in the Northern European Neolithic, either stressing socio-functional (e.g. territorial markers, inter-group competition, cultural memory, instruments of power), economic (e.g. recruitment of labour) or ideological functions (e.g. new belief system). While a certain degree of overlap exists in terms of the general idea concerning the significance of the megalithic monuments, it becomes apparent that specific premises are often predisposed, but not reflected (e.g. predominance of intergroup competition, surplus production, necessity for leadership, connection between megaliths and recourses). In most cases these premises are not proven by means of archaeological evidence, what should, however, be viewed as an essential principle in interpreting megalithic monuments. Furthermore, the question how labour was mobilized is rarely a subject of discussion. A general lack of supporting archaeological evidence – especially the absence of settlement data in many areas – is a major obstacle in the interpretation of the northern European megaliths as well as the often applied premise that burial practices are a direct reflection of social relations. By examining existing theories on Neolithic monumentality and discussing them against the archaeological record of three study areas (British Isles, Scandinavia and northern Germany) in the period between 4500-1800 BC, a comparative approach is applied. A focal point is the analysis of continuity and discontinuity in the archaeological record (e.g. megaliths, material culture, settlements, burials rites, non-funerary monuments) and the linking of theoretical concepts to the archaeological record using middle range theories. The dissertation is part of focus 1 and sub-cluster A1 of the CRC. Sub-cluster A1 seeks a theoretical conceptualization transformation processes of prehistoric and archaic societies. Therefore, the aim of this dissertation project is to develop a theoretical reflection of transformation processes in Neolithic monumentality visible in the archaeological material.
POSTER SESSION: In search for the Bølling-Oscillation — new palynological data on old questions at lake Bølling, Denmark (B1)
Sascha Krüger*1
1 Centre for Baltic and Scandinavian Archaeology (ZBSA), Foundation Schleswig-Holsteinische Landesmuseen, Schloss Gottorf

In 1942 Johs. Iversen extended the common classification of Lateglacial biostratigraphy based on a pollen analysis from Lake Bølling, Denmark. His assumptions concerning the Bølling-Oscillation were based on sedimentological features and high birch pollen values in two pollen samples before the beginning of the Allerød. In order to further refine the knowledge on the Bølling-Oscillation, Hartmut Usinger investigated the locus classicus in 1982. The method of pollen-size-frequency distribution was applied on birch pollen but never published and the results got lost over time. Therefore the method as described by Usinger (1975, 1978, 1981c) is performed on the dataset again. The general focus is set on the distinction of birch pollen types in order to shed light on the question of the migration of tree birches into northern Europe especially before the Allerød – one of the major transformations of the Lateglacial landscape. The results show that the dataset can immensely refine Iversen’s pollen zones. A clear dominance of dwarf birch pollen during the Bølling-Oscillation is demonstrated. Furthermore, the record reveals that Iversen’s assumption concerning the existence of a climatic oscillation prior to the Allerød can be confirmed at the locus classicus.

POSTER SESSION: Chronological models of Tripolye mega-sites development: Testing with radiometric dates (D1)
Liudmyla Shatilo (Institute of Pre- and Protohistoric Archaeology, Kiel University)

The question of Tripolye mega-sites (in Cherkassy and Kirovograd regions) chronology is still of current interest, despite the fact that there have been numerous models constructed. This is one topic addressed in subproject D1, which deals with the processes of formation and collapse of the Chalcolithic Cucuteni-Tripolye mega-sites with regard to social conditions and consequences, spatial behaviour, the organisation of subsistence and economy and the use of environmental resources. Regarding chronological models, a few blocks of questions are under discussion, among them: 1) development of one site taken separately (intra-site chronology, possible existence of several “phases” of development and its duration); 2) the position of large and small sites within one or few regional groups on the time scale, etc. Not less important is the problem regarding the correlation (diachronic or synchronous) of different pottery styles, including the ceramics of the so-called “eastern” and “western” Tripolye. Recently a large collection of radiometric dates has been obtained, including the ones that were received within the implementation of subproject D1 “Population agglomerations at Tripolye-Cucuteni mega-sites”. Based on this database, some chronological models of the development of Tripolye in the region of mega-sites should be revised. In this work I also discuss how absolute dating can help in understanding the aforementioned issues.

POSTER SESSION: Social transformations at the end of Neolithic Central Germany (D2)
Clara Drummer (Institute of Pre- and Protohistoric Archaeology, Kiel University)

Around 2900 BCE, different burials practices indicate a fundamental change in social organization in the German Lower Mountain Range: from Late Neolithic collective inhumations in megalithic graves to Final Neolithic single graves under burial mounds. Recent aDNA-studies also suggest a possible population changes, triggered by steppe-migration processes to Central Germany associated with Corded Ware pottery. More detailed archaeological studies towards defining and explaining this change are still rare. In order to understand the social transformations in this region, the focus of the study presented lies on burial communities as social group identities. The aim of this study is to detect changes in group identities in two ways: The first way examines possible elements of group identification through burial deposition rules and pottery decoration style. The second way is the identification of group communication through social networks based on personal ornaments and copper exchange. By combining both ways, a closer description of different burial practices and group identities is possible: Are there clear cuts or are there any connections between different burial communities? A comparison of these Late and Final Neolithic group identities can detect in how far a transformation took place. First results demonstrate that in Late Neolithic are groups with different social identities, which were connected in a dense communication network based on personal ornaments. These groups are distinguishable from each other by different expressions of burial practices, like grave architecture and deposition rules, as well as different styles of pottery decoration.

When comparing burials and settlements, the intensity of Late Neolithic group-expression differs between burial and settlement context. Stronger group distinctions were visible within the burials, while in settlements the diversity is higher than within burials. This is indicated by decorations of Final Neolithic pottery, which occur more often in Late Neolithic settlements than in burials. Moreover, this pottery, which was common as Final Neolithic grave good, connects both the Late Neolithic collective burial rite and the Final Neolithic individual burial rite, because the pottery can be found also in Late Neolithic graves. It might be the case that not only immigration of new people contributed to the transformation, but also...
that this transformation already began in the Late Neolithic. Only later this resulted in fundamental changes visible in burial practices.

POSTER SESSION: Late Neolithic pottery production in the central German low mountains (D2)
Marianne Talma1, Susanne Güter2
1 Institute of Pre- and Protohistoric Archaeology, Kiel University
2 Landesamt für Denkmalpflege Hessen, Außenstelle Marburg

This study is part of the CRC1266 D2-subproject Agriculturalists and early metallurgists that investigates the appearance of the Corded Ware phenomenon during the late Neolithic (3500-2800 BC) in the central German low mountains in relation to social, technological and economic changes. During this transformative period, communities continued to experiment with (the function of) materials, subsistence strategies and mortuary treatment. One of these versatile materials is clay, a rock containing clay minerals of less than 2μm in size that varies in plasticity based on the amount of water in the clay mineral structures. Clay often contains traces of other minerals and/or rock fragments, and its uses vary from polishing abrasives (i.e. metallurgy) to pottery. Based on the intended use, potters can add additional mineral or rock phases (temper) to influence the properties of the clays, and these added or naturally present phases can help to identify the geological context of the clays or temper used. Pottery can change contexts and functions during its use, which is apparent from the vessels found in Wartberg settlements and gallery graves that range from coarse tempered cooking ware to finely polished collared flasks. Alongside what is seen as typical Wartberg ceramics are pottery fragments classified as Bernburg type, Corded Ware and Globular amphora. To investigate possible connections between the local Wartberg pottery and these different types, production traces and mineral phases were studied on ceramics from museum collections with microscopy, ceramic petrography, geochemical analysis (portableXRF, powder-XRD) and x-ray microtomography (μCT). This was complemented with field data (local clays, production and firing experiments) in collaboration with Susanne Güter (Denkmalamt Marburg) and archaeological open-air museum Zeiteninsel Marburger Land.

The presence of granite in some pottery from the Wartberg settlement of Wittelsberg indicates that they may not have a local but regional origin, one possibility being the Harz area as glacial erratics are less likely. The distribution of a decorative pottery style known as ‘type Lohra’ also suggests some form of regional mobility and connectivity of communities. The CRC1266 D2-subproject collaborates with the CRC1266 E1- and F4-subprojects to investigate subsistence and health of the Neolithic population from their case studies.

POSTER SESSION: Bronze Age transformations in Northern Germany (D3)
Stefanie Schaefler-Di Maida (Institute of Pre- and Protohistoric Archaeology, Kiel University)

In this contribution the PhD-project about Bronze Age Transformation processes in Northern Germany as part of the SFB 1266 Project Scales of Transformation - Human-environmental Interaction in Prehistoric and Archaic Societies - will be presented. The main aim of the project is to examine social and economic long-term changes, rapid turning points and collapses within Schleswig-Holstein. This region was selected because it provides good archaeological and environmental data collection, together with a pollen profile of the Lake Belau. The first step is to verify continuities or discontinuities in the record while as a second step, the questions of how Bronze Age transformations are recognizable, how fast they developed and how intense they were, will be addressed. More in detail, the changes in settlement activities around 1600 B.C., as well as modifications in burial rites around 1200 B.C. will be the main focus of this work.

Finally, this poster will present preliminary results from recent surveys and excavations at the site of Mang de Bargen (Bornhöved, Dist. Segeberg). The importance of Mang de Bargen, together with other sites in Schleswig-Holstein, lies in the impressive local constancy of the activities (especially around 1600 BC) and shows a record of the transition from inhumation to cremation around 1200 BC, as concrete points of transformations.

POSTER SESSION: Human and climatic landscape transformation in the Stymphalia polje, Greece (E1)
Joana Seguin1, John Bintliff2, Pieter Grooetes1,2, Christian Heymann3, Sturt Manning4, Ingmar Unkel1,3
1 Institute of Ecosystem Research, Kiel University
2 Department of Archaeology, Edinburgh University
3 Graduate School “Human Development in Landscapes”, University of Kiel (4) Cornell Tree Ring Laboratory, Department of Classics, Cornell University

Studying natural lakes as geo-archives in the direct vicinity of archaeological sites hold an enormous potential for interdisciplinary research on the interconnection of climate with human history. Lacustrine sediments generally record landscape changes in the lake catchment controlled by palaeoclimatic and human-induced changes. Within the German Collaborative Research Center 1266 “Scales of Transformation”, subproject E1 focuses on transformations in early Greek societies and landscapes around the Gulf of Corinth. Our project aims to reconstruct environmental and hydrological changes and their influence on the cultural development with a temporal focus on the Bronze Age/Iron Age transition (12th to 8th century BC). Particular emphasis
is placed on the complex interplay between natural and anthropogenic forcing of landscape change and the identification of suitable proxies to differentiate and better understand the diverse effects of socio-environmental interactions as preserved in the lake sediment.

Here, we present first results from the Northern Peloponnese. Sediment cores have been recovered from Lake Strymphonalia, the last remaining natural lake of the Peloponnese. The chemical composition of the cores can be measured with an X-ray fluorescence (XRF) line scanner, a useful method to obtain continuous, high-resolution proxies that reveal fluctuations in the past. We use our XRF proxies in combination with sedimentological and organic geochemical proxies as well as thorough Bayesian age-depth-modeling of 14C dates to identify changes in palaeoenvironmental conditions. To sustain our interpretation, we additionally apply a Principal Component Analysis (PCA), a more complete interpretive approach, to work out the dominating process controlling the lake geochemistry. Our data provides the first continuous record for the last 2,500 years of landscape development in Southern Greece. The upper 2 m of our master core yield insights into the vulnerability and resilience of the lake ecosystem to environmental change and to anthropogenic impact.

The most influential transformation in the lake development, as seen in our record, was the construction of the Hadrianic Aqueduct in 130 AD, which had a lasting effect on the lake hydrology. Furthermore, a phase of considerably high climatic instability was identified for the 7th and 8th century AD. This is largely in time with a cold anomaly termed “Dark Ages” (Helama et al., 2017) or from our perspective, more appropriately termed “Late Antique Little Ice Age” (LALIA; Büntgen et al., 2016). Additionally, we delimited periods of strong soil erosion in the catchment during the Byzantine period indicating intensive anthropogenic land-use. Our study shows how anthropogenic land-use changes coupled with climatic fluctuations influence the sedimentation processes in a shallow lake system.

In the near future, a comparison of this geo-archive with records from neighbouring paleolakes will enable to distinguish local from regional effects. Additionally, a highly promising modelling approach, pursued in cooperation with subproject A2, will allow to transfer the results from the location of the coring points into the area.

POSTER SESSION: Human/paleoenvironmental Interactions in Southern Greece during the Bronze Age-Iron Age transition: A Biomarker Perspective (E1)

Jan Weber*, Thorsten Bauersach, Lorenz Schwark (Institute of Geosciences, Kiel University)

Lake sediments serve as archives for detailed climate and environmental reconstruction and therefore are one main research objective of subproject E1 “Transformation processes in early Greek societies and landscapes”. Here, we present a high-resolution climate record of Lake Strymphon (Southern Greece) spanning the last ~14,000 years using organic-geochemical means. The focus is placed on climatic and environmental changes during the Bronze Age-Iron Age transition (12th - 8th century BC, “Greek Dark Ages”) as this period is characterized by massive social transformation in Greek societies. The end of the Greek Bronze Age is associated with the disappearance of the Mycenaean palaces while the polis system developed in the early Iron Age of the 8th century BC. It is still under debate which factor(s) triggered this crisis such as climatic or environmental changes which can be reconstructed with organic-geochemical methods. Distributions of biomolecules such as long-chain n-alkanes, n-alcohols and n-fatty acids are biological markers for higher terrestrial plants indicating changes in paleo-vegetation due to land-use during the early Iron Age. Molecular paleothermometer based on microbial membrane lipid composition (such as brGDGTs) are used for temperature reconstruction showing multiple climatic changes throughout the Holocene which are also potential factors affecting the ancient cultures.


Kim Annika Kittig (Institute of Classical Archaeology, Kiel University)

The early Iron Age, especially the 8th to 7th centuries BCE, forms a key transformation period in Greek history. The contacts with Egypt and the so-called ›Orient‹ are emphasized as an important trigger for the sociocultural transformations of this period, which include the introduction of new crafting techniques as well as the development of the polis-system and of monumental stone architecture and sculpture.

The dissertation project, which is realized within the scope of the CRC subproject A1, follows the assumption that the sociocultural transformations processes of the Early Iron Age take specific local forms. Therefore, the project is based on a set of different case studies situated in the Eastern Mediterranean. With Lefkandi, the Heraion of Samos and Naukratis they cover the archaeological contexts of burials, sanctuaries and settlements. Within the case studies different settings and contexts of intercultural contacts are analyzed, ranging from the trade with luxury goods and the employment of mercenaries to the establishment of trading posts and settlements. Thus, the case studies provide detailed insights into transformation processes as well as into the ongoing scientific discussions on the interplay of intercultural contacts and the sociocultural transformations of the Early Iron Age. The aim of the dissertation project is to critically reflect those explanatory concepts and to open up new perspectives and questions by turning to the cultural sciences, which offer a wide variety of different approaches concerning the question of intercultural contacts.
POSTER SESSION: Climate reconstruction and potential links to the demographic development from the Neolithic to the Late Bronze Age in southern Iberia (F1)
Julien Schirrmacher (Institute of Geosciences, Kiel University)

Organic geochemical and foraminiferal assemblage analyses were carried out on two high resolution marine sediment cores from the Alboran Sea (ODP-161-976A) and the Gulf of Cadiz (GeoB5901-2). These are used to decipher precipitation and vegetation changes as well as the oceanic conditions with respect to Sea Surface Temperature (SST) and marine primary productivity (MPP) during the mid- to late-Holocene. n-Alkane records as a proxy for precipitation changes suggest six distinct drought events at 5.40 ka BP, from 5.12 ka BP to 4.85 ka BP, from 4.79 to 4.73 ka BP, at 4.63 ka BP, from 4.42 to 4.34 ka BP and, from 3.75 to 3.73 ka BP. All drought events are associated with a major vegetation change towards C4 vegetation. The drought events are further accompanied by annual and spring/winter SST warming as well as decreasing MPP in the Alboran Sea. Altogether, the close correlation of the observed droughts with North Atlantic Oscillation (NAO)-like variability suggests the atmospheric circulation as important driving mechanism of terrestrial and oceanic variability at southern Iberia and the Alboran Sea, respectively. Oceanic variability in the Gulf of Cadiz, instead, is related to the North Atlantic Bond Events. In particular, during Bond Events 3 and 4 we found a dramatic increase in seasonality not described for the area before.

POSTER SESSION: The (trans)formation of the macrobotanical archive: a case-study from the Hungarian Carpathian Basin (F3)
Sofia Filatova (Institute of Pre- and Protohistoric Archaeology, Kiel University)

This PhD is embedded within subproject F3 “Dynamics of plant economy in prehistoric societies” of the CRC 1266 “Scales of Transformation”. The main objective of this study is to reconstruct the plant-food production regime and land use at the settlement of Kakucs-Turján throughout its successive habitation phases and to consider the results within the wider social and geographical contexts of the site. Kakucs-Turján is a fortified settlement located in the central part of the Hungarian Carpathian Basin. An area of the settlement was excavated from 2013 until 2016, uncovering a sequence of eleven successive habitation/activity phases spanning from the Early Bronze Age (2600-2500 cal. BCE) until the end of the Middle Bronze Age (1500/1450 cal. BCE). It is mainly the Middle Bronze Age layers that have been attributed to the habitation of the settlement; due to their fragmentary nature, the activities that took place during earlier phases of the settlement could not be indicated with certainty.

A rich variety of carbonised macrobotanical remains of seeds, fruits and wood charcoal have been retrieved during the excavations. This poster presentation will focus on giving an overview of the processes/activities that have contributed to the (trans)formation of the macrobotanical assemblages in Kakucs-Turján. This includes a consideration of how the remains were deposited and integrated in the archaeological features during each of the habitation phases. The ‘depositional histories’ of each habitation/activity phase are compared in order to indicate potential changes and/or transformations of activities related to plant-food production during the Bronze Age.

POSTER SESSION: Geophysics meets geoarchaeology: 3D facies mapping at the Mesolithic site of Duvensee (G2, B2)

1 Institute of Geosciences, Kiel University
2 Centre for Baltic and Scandinavian Archaeology (ZBSA), Foundation Schleswig-Holsteinische Landesmuseen, Schloss Gottorf
3 Institute of Pre- and Protohistoric Archaeology, Kiel University

In the frame of the CRC 1266  ‘Scales of transformation’ the Applied Geophysics group (Subproject G2) in collaboration with Subprojects B2 and F2 has the main task to understand the transformation of the landscape during the hunter-gathers occupation in Northern Europe. The ancient lake Duvensee is one of the best known archaeological sites of the Mesolithic in Germany (10000-6500 cal BP). The comparison between archaeological excavations during almost the last 100 years and geophysical surveys conducted in the last 10 years has allowed a reconstruction of the palaeoenvironment during the Preboreal and Boreal. In a GPR (200 MHz) survey of the landed-up Lake Duvensee we detected five previous islands, which carried Mesolithic camps according to results of a previous archaeological field study (Bokelmann, 2012). From the GPR reflection data we created a 3D model of the lake area based on a study of the velocity of the radar waves with depth. The 3D model includes spatial information of the main facies with time information from drillings and excavations. It allows a time-dependant reconstruction of activities related to plant-food production during the Late Preboreal and Early Boreal. With the regression of the water the other islands have been considered as a place for roasting hearths further in time. In particular the islands in the northern part (island 1 and 2) were probably the first outside the water, which might be a reason of a first colonization of them during the Late Preboreal and Early Boreal. With the regression of the water the other islands have been considered as a place for roasting hearths further in time. To investigate the stratigraphy we applied a multi-methods approach consisting of GPR (Ground Penetrating Radar) ERT (Electrical Resistivity Tomography), SH-wave seismics along a transect of 50m. The transect enables to compare the geophysical results with the stratigraphy from geoarchaeological corings and to extrapolate the
drilling results in the area. The transect shows a peat layer on top, a Gyttja layer underneath, overlaying non-organic sediments. It crosses the supposed shoreline identifiable as a transition between Clay and sand. The ERT and seismic tomography computations are constrained by the depth of each layer found from the corings and GPR. The resolution of each method with respect to the major facies is investigated by model computations and comparison to measurement results.

POSTER SESSION: Amplitude Analysis of GPR Data for Identifying Archaeological Features in Glacial Deposits (G2)

Diana Panning*1, Stefanie Schaefer Di-Maida2, Ercan Erkul1, Jutta Kneisel2, Harald Stümpel1, Christina Klein1, Erica Corradini1, Natalie Pickartz1, Wolfgang Rabbel1, Ingo Lütjens2
1 Institute of Geosciences, Kiel University
2 Institute of Pre- and Protohistoric Archaeology, Kiel University
3 Archaeological State Office Schleswig-Holstein

As a part of subproject G2 in the CRC 1266 “Scales of Transformation”, this work is about transforming magnetic and GPR data into information, which is useful to the archaeologists of the collaborating subproject D3. Archaeological features embedded in heterogeneous soils are difficult to identify in geophysical survey data if they resemble geological deposits in shape and material contrast. This applies especially to the interpretation of GPR data compared to other geophysical data. A major task, which shall be addressed by this poster, is to find prehistoric remains that contain mainly cobblestones, such as inhumation burials, but also urns or cooking pits found in fluvioglacial deposits consisting of boulder-enriched sand and gravel layers. Regarding geophysical prospecting the difficulty herein is to deal with the resulting ambiguities of data interpretation. This is demonstrated using GPR data gathered at the bronze-age site Mang de Bargen near the village of Bornhöved, in Schleswig-Holstein (N Germany).

To understand how typical archaeological features appear in the radargram, numerical models of selected key targets were created. For these synthetic radargrams were computed and compared with measured radargrams. For the modelling petrophysical properties of the subsurface were derived from electrical and electromagnetic induction data. The modelling demonstrates the influence that shape, depth of an archaeological feature and physical soil properties such as conductivity, permittivity and soil moisture have on the data. For practical purposes an amplitude analysis of the observed data can help to classify archaeological and geological features in GPR data. To support the interpretation magnetic data and archaeological documentation are used in addition. Finally a classification catalogue of signals that are characteristic to archaeological features is to be built. This shall help to understand data before excavations and thereby avoiding unnecessary excavations.

POSTER SESSION: Flexible Research Data Management (Z2)

Yannic Ole Kropp (Department of Computer Sciences, Kiel University)
Collaborative research projects provide a challenging context for data managers. Deep models, namespaces, perspectives and viewpoints from multiple academic domains cause challenges within such projects. Heterogeneous data, diverging working habits, and di ering standards are common. Communication and collaboration becomes a tough task in this context. In addition research itself is agile, dynamic, and evolving. Changes and revisions of data structures, requirements, and actual data values arise continuously and create a constant need for adaptations. No project wide working standards, models, or structures can be expected to be continuous throughout the complete run time of a project. Thus any static approach for managing data in research projects will fail to provide su cient support. The CRC1266 is a typical example for research related computation requirements or re ect these agile and dynamic interdisciplinary research projects. Its focus on transformations even encourages the diversity and evolution of structures. This contribution presents a novel approach to manage the data of such projects.

It was developed in the subproject Z2 of CRC1266 and bases on the separation of data storage and data usage. In contrast to known data management strategies it does not try to build joint working models for all project participants. The central research activities (in particular data computation and processing activities) shall be performed in the local working environments of the researchers. No researcher should need to adapt to unfamiliar structures, data models, or else just because he/she joined the project. Instead of a joint working model, a joint storage is established. This storage does not need to support (individual) research related computation requirements or re ect local working models and can thus be structured in a universal way. The structure is inspired by key-value stores and the RDF, combined with a sophisticated view generation technique. These views connect the local environments with the global store and thus transitively with each other. In case of changes within local structures, the views can be adapted way easier and way faster than any global working model could. In e ect we get a feasible and modern approach for handling data in research projects.

POSTER SESSION: Changes and catastrophes? Reviewing the North Atlantic climate during the later 3rd millennium BC (C1)
Jos Kleijne (Institute of Pre- and Protohistoric Archaeology, Kiel University)

CRC 1266 subproject C1 deals with Mesolithic and Neolithic Transformations in Northern Germany during seven different phases. Two late phases in particular focus on the environmental, cultural and social transformations during the 3rd millennium BC (the so-called TRANS-E and TRANS-F phases). It is around this time that the pan-European Corded Ware and Bell Beaker phenomena appear. Because of this development, it becomes possible to consider a different scale of analysis. By comparing different regions with each other, including CRC1266 subproject F1, a variety of possible regional responses and transformations become visible within the same cultural phenomenon. This greatly benefits our understanding of the regional Northern German situation. In this study developments in settlement and funerary activity, subsistence economy, material culture and landscape use will be compared. For this poster, an overview of the environmental developments in Northwestern Europe, at the start of the Late Holocene, the Meghalayan stage, will be given. Possible temperature and humidity changes will be reviewed on the basis of literature concerning the ‘4.2ka event’, taken from studies of several Atlantic and Nordic marine sediment cores, stalactites and peat bogs. Additionally, the volcanic eruption of Hekla-4 on Iceland, and its possible impact on climate, soils and vegetation in Northwest Europe will be assessed. How much these environmental changes affect past cultural and social transformations is however a different story.

POSTER SESSION: Investigating timescales of change in material culture: a study of the pre-roman Iron Age in Denmark
Helene Rose (Centre for Baltic and Scandinavian Archaeology (ZBSA), Foundation Schleswig-Holsteinische Landesmuseen, Schloss Gottorf)

A precise chronological framework is needed when investigating transformations and turning points in prehistory. In terms of settlement archaeology, the Bronze-Iron Age transition in Denmark (c.500 cal BC) is a continuous trend, but the introduction of urnfield cemeteries represents a clear cultural transformation. There is a great deal of stylistic variability in Iron Age cremation urns and associated metal objects, partly as a function of change over time. Pre-Roman Iron Age chronologies are based on artefact typologies, but it is difficult to harmonize metal and ceramic typo-chronologies. Due to the 14C calibration plateau between 750 and 400 cal BC, researchers have made little use of 14C dating. My PhD aims to provide robust, accurate and precise absolute dates for the main typo-chronological transitions in urnfield assemblages, by using Bayesian chronological models to interpret a large set of new 14C dates on cremated human bone from Aarupgaard, the largest known urnfield cemetery in Denmark, and smaller 14C data sets from the Arre and Sohale urnfields. The project has several components – eliciting prior information (typo-chronological attributions and horizontal stratigraphy), selecting and dating samples, quality assurance of the reproducibility of results, experimental investigation of the magnitude of wood-age offsets in cremated bone dates, and sensitivity testing of output against alternate models of the tempo of transformations. The results will provide the first independent estimates of the rate of change in material culture, indirectly providing absolute date ranges for settlements with similar ceramics, and will reveal population dynamics in urnfield cemeteries by assigning durations to typo-chronological phases.
One of the objectives of the Collaborative Research Center 1266 is to promote a joint research effort between different disciplines in order to unravel the mechanisms behind Early Holocene cultural and environmental dynamics. The cooperation between multiple research areas is a defining feature of the analysis currently ongoing at two interlinked study locations of subprojects F2, B2 and G2: Duvensee and Poggensee.

Poggensee is located ca. 17 km NW of Duvensee. The annually laminated sedimentary sequence recovered from this small water body and is currently under ongoing palaeoenvironmental analysis (e.g. sediment geochemistry, palynology) were carried out in connection with geophysical investigations in order to produce a landscape evolution model for this important wetland site.

Poggensee was carried out in connection with geophysical investigations in order to produce a landscape evolution model for this important wetland site. The Duvensee palaeolake is prominently featured in the archeological literature due to the excellent preservation of its waterlogged Mesolithic dwelling layers. In this context, different palaeoenvironmental analysis (e.g. sediment geochemistry, palynology) were carried out in connection with geophysical investigations in order to produce a landscape evolution model for this important wetland site.

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List of participants

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Muhammad Abid
muhammad.abid@cornells.edu.pk
Centre for Climate Research and Development
COMSAT’s University
Park Road, Chak Shahzad Islamabad 45550 Pakistan

Maria Ahola
maria.ahola@helsinki.fi
Department of Cultures
University of Helsinki
P.O. Box 3 (Fakultetskatu 33) 00014 University of Helsinki Finland

Sensar Vazdi Ali Asghar
sensar@icogn.org
International Center on Qanats and Historic Hydraulic Structures
89161-88117 Daneshjoo Boulevard
Yazd, Iran

Alexandra Anders
anders.alexandra@tibk.ete.hu
Institute of Archaeological Sciences
Eötvös Loránd University
Egyetem tér 1-3
1053 Budapest Hungary

Anna Androviatsana
anna.androviatsana@th-luebeck.de
Department of Architecture and Civil University of Applied Sciences
Mendelssohn Weg 239
23562 Lübeck Germany

Andreas Angourakis
aa2112@cam.ac.uk
McDonald Institute for Archaeological Research
University of Cambridge
Downing Street
Cambridge CB2 3ER
United Kingdom

Volker Arnold
v.arnold@uni-kiel.de
Museum for Archeology and Ecology Albersdorf
Bahnhofstr. 29
25767 Albersdorf, Germany

Vesa Arponen
varponen@gh4d.uni-kiel.de
Institute for Classical Philology
Kiel University
Leibnizstraße 8
24118 Kiel Germany

Maria Carolina Avila Testa
carotias@gmail.com
Graduate School Human Development in Landscapes
Kiel University
Leibnizstraße 3
24118 Kiel Germany

Andrea Babbi
babbi@irmm.de
Leibniz-Forschungsinstitut für Archäologie des Romisch-Germanischen Zentralmuseums
Ernst-Ludwig-Platz 2
55116 Mainz Germany

Saeid Bahramiyan
Bahramiyan.Saeid@gmail.com
Laboratoire Archéorient
Maison de l’Orient et de la Méditerranée
Jean Pouiloux, l’université Lumière Lyon 7 rue Kaula
69365 LYON cedex 07 France

John Barrett
j.barrett@sheffield.ac.uk
Department of Archaeology
University of Sheffield
Minalloy House
10 – 16 Regent Street
Sheffield, S1 3NJ
United Kingdom

Yasmina Benferhat
Yasmina.Benferhat@univ-lorraine.fr
University of Lorraine
34 cours Leopold
CS 25283
54052 Nancy cedex France

Jean-François Berger
jean-francois.berger@univ-lyon2.fr
CNRS
University of Lyon 2
69676 Bron, France

Jostein Bergstad
jostein.bergstad@khm.uio.no
Museum of Cultural History
University of Oslo
P.O. Box 6762
St. Olav’s plass
0130 Oslo Norway

Leah Bernardo-Ciddio
lberardo-ciddio@umich.edu
Interdepartmental Program in Classical Art and Archaeology
University of Michigan
Kelsey Museum of Archaeology
434 South State Street, Ann Arbor, Michigan 48109 USA

Valdis Bezins
valdis-bezins@elvet.dz
Institute of Latvian History
University of Latvia
Kalpaka Bulvāris 4
1050 Riga Latvia

Maren Biederbick
maren.biederbick@ingolstadtdr.de
Deutsches Mediävistisches Museum
Anatomiestraße 18 – 20
85049 Ingolstadt Germany

Peter Biehl
pbiehl@buffalo.edu
Department of Anthropology
University of Buffalo
Department of Anthropology
University at Buffalo
380 Millard Filmore Academic Center
Buffalo NY, 14261-0026 USA

Thomas Birndorfer
th.birndorfer@ecology.uni-kiel.de
Institute for Ecosystem Research
Kiel University
Olshausenstrasse 75
24118 Kiel Germany

Nils Bleicher
niels.bleicher@zuerich.ch
Hochbauamt der Stadt Zürich
Lindenhofstrasse 3
8008 Zürich Switzerland

Petra Bewersdorff
bewersdorff@uni-kiel.de
Institute for Ecosystem Research
Kiel University
Olshausenstrasse 75
24118 Kiel Germany

Anna Androvitsanea
anna.androvitsanea@th-luebeck.de
Department of Architecture and Civil University of Applied Sciences
Mendelssohn Weg 239
23562 Luebeck Germany

Andreas Angourakis
aa2112@cam.ac.uk
McDonald Institute for Archaeological Research
University of Cambridge
Downing Street
Cambridge CB2 3ER
United Kingdom

Volker Arnold
v.arnold@uni-kiel.de
Museum for Archeology and Ecology Albersdorf
Bahnhofstr. 29
25767 Albersdorf, Germany

One of the objectives of the Collaborative Research Center 1266 is to promote a joint research effort between different disciplines in order to unravel the mechanisms behind Early Holocene cultural and environmental dynamics. The cooperation between multiple research areas is a defining feature of the analysis currently ongoing at two interlinked study locations of subprojects F2, B2 and G2: Duvensee and Poggensee.

The Duvensee palaeolake is prominently featured in the archeological literature due to the excellent preservation of its waterlogged Mesolithic dwelling layers. In this context, different palaeoenvironmental analysis (e.g. sediment geochemistry, palynology) were carried out in connection with geophysical investigations in order to produce a landscape evolution model for this important wetland site.

Poggensee is located ca. 17 km NW of Duvensee. The annually laminated sedimentary sequence recovered from this small water body and is currently under ongoing palynological, sedimentological and geochemical analysis. Given its proximity to Duvensee and the opportunity to produce a high-resolution palaeoecological record, the Poggensee sequence is set to become a reference point to explore the relations between Mesolithic communities and Early Holocene climate/vegetation dynamics in Northern Germany.
Rie Bloch
rib@cas.uk
Department of Archaeology and Heritage Studies
Aarhus University
Møesgård Allé 20
8270 Højbjerg
Denmark

Leonnard Brandstätter
leonnard.brandstaetter@uni-tuebingen.de
Institut für Ur- und Frühgeschichte und Archäologie des Mittelalters
Eberhard Karls University of Tübingen
Schöll. Hohentübingen
Burgstraße 11
72070 Tübingen
Germany

Ute Brinker
ute.brinker@web.de
Centre for Baltic and Scandinavian Archaeology (ZBSA)
Museum State Foundation
Schleswig-Holstein Schloss Gottorf Schlosseinsel 1
24837 Schleswig
Germany

Johanna Brinkmann
j.brinkmann@ufg.uni-kiel.de
Institute of Pre- and Protohistoric Archaeology
Kiel University
Johanna-Mestorf Street 2-6
24118 Kiel
Germany

Jan-Piet Brozio
jbrozio@ufg.uni-kiel.de
Institute of Pre- and Protohistoric Archaeology
Kiel University
Johanna-Mestorf Street 2-6
24118 Kiel
Germany

Csaba Bodnár
bodnar.cs@gmail.com
Eötvös Loránd University
Egyetem tér 1-3
1053 Budapest
Hungary

Dušan Borić
dbr2128@columbia.edu
The Italian Academy for Advanced Studies in America
Columbia University
1161 Amsterdam Avenue
New York 10027, USA

Francesca Bonzano
francesca.bonzano@unicatt.it
Catholic University of the Sacred Heart
Largo A. Gemelli 1
20123 Milan
Italy

Queen Linda Chinozvina
lindachinovs@gmail.com
University of Zimbabwe
P.O. Box 2320
2016 Harare
Zimbabwe

Alessio Cinì
alecins@archeo.unifi.it
University of Florence
Department of Archaeology
Viale Pietrafitta, 1
50121 Firenze
Italy

Josep M. Comelles
josepcomelles@uv.cat
Medical Anthropology Research Center
Universitat de València
València
Spain

Erica Corradini
erica.corradini@fug.uni-kiel.de
Archaeology Institute of Pre- and Protohistoric Archaeology
Kiel University
Johanna-Mestorf Street 2-6
24118 Kiel
Germany

Helena Dawson
helena.dawson@topoi.org
Free University Berlin
Topos Building Dahlem
Hinterfrohnstraße 18
14195 Berlin
Germany

Alisa Demina
alsa.demina@gmail.com
National University of Kyiv-Mohyla Academy
Skovorody vol. 2
04070 Kiev
Ukraine

Sean Denham
Sean.denham@u.s.o
Institute of Archaeology
University of Stavanger
Peder Klos 130
4015 Stavanger
Norway

Philippe de Smidt
philippe.desmedt@ugent.be
Department of Soil Management
Ghent University
Coupure links 653
9000 Gent, Belgium

Aleksandr Diachenko
oleksandr.diachenko@gmail.com
National Academy of Sciences of Ukraine, Institute of Archaeology
Gerov Stalingrada 12
04210 Kiev
Ukraine

Gianpietro Di Maida
di_maida@neanderthal.de
Archaeology Institute of Pre- and Protohistoric Archaeology
Kiel University
Johanna-Mestorf Street 2-6
24118 Kiel
Germany

D Marta Dal Corso
mcolorso@ufg.uni-kiel.de
Institute of Pre- and Protohistoric Archaeology
Kiel University
Johanna-Mestorf Street 2-6
24118 Kiel
Germany

Linus Daugnora
daugnora@gmail.com
Institute of Baltic Sea Region History and Archaeology
Kalpeda University
Herkauš Manto 84
92296 Klapepta
Lithuania

Raffaela De Vela
daveill.net@gmail.com
Department of History; Institute of Classics
Leipzig University
Ritterstraße 14
04109 Leipzig
Germany

Anna C. Davison
anna.c.davison@gmail.com
Department of Geosciences
University of Reading
Leicestershire
PO Box 217
Whiteknights
Reading, RG6 2AS
England

Paul Duffy
paul Duffy@toronto.ca
The Archaeology Centre
University of Reading
19 Russell Street
Toronto, ON, M5S 2S2
Canada

Veronika Egenetmeyr
veronika.egenetmeyr@uni-greifswald.de
Arbeitssbereich Alte Geschichte
Greifswald University
Domstraße 2a
17487 Greifswald
Germany

Natalia Égíez
neguez@fkg.hun.uni-kiel.de
Graduate School Human Development in Landscapes
Kiel University
Leibnizstraße 3
24118 Kiel
Germany

Paul Erdkamp
perdkamp@vub.be
Vrije Universiteit Brussel
Pleinlaan 2
1050 Brussels
Belgium

Berit V. Eriksen
berit.eriksen@schloss-gottorf.de
Centre for Baltic and Scandinavian Archaeology (ZBSA)
Museum State Foundation
Schleswig-Holstein Schloss Gottorf Schlosseinsel 1
24837 Schleswig
Germany

Ercan Erkul
ercul@email.com
Institute of Geosciences
Kiel University
Otro-Hahn-Platz 1
24118 Kiel
Germany

Jonathan Etherer
jetherer@outlook.com
Institute of Pre- and Protohistoric Archaeology
Kiel University
Johanna-Mestorf Street 2-6
24118 Kiel
Germany
Maha Ismail-Weber
msmvalwebber@gmail.com
Branenburgisches Landesamt für Denkmalschutz und Archäologisches Landesmuseum
Wünsdorfplatz 4-5
15806 Zossen
Germany

Hrvoje Kalafatić
Hkalafatic@gmail.com
Institute of Archaeology
Jadovnica Gaja 32
10000 Zagreb
Croatia

J
Mateusz Jaeger
jaeger@amu.edu.pl
Institute of European Culture
Adam Mickiewicz University in Poznań
ul. Więsiowskiego 1
61-712 Poznań
Poland

Prassolov Jaroslav Aleksei
jaroslav.prassolowt@schloss-gottorf.de
Centre for Baltic and Scandinavian Archaeology (ZBSA)
Museum State Foundation
Schleswig-Holstein Schloss Gottorf
Schiöttstraße 1
24837 Schleswig
Germany

Leif Jonsson
info@jonssonskruseology.se
Lj Osteology
Aschebergsgatan 32
41133 Göteborg
Sweden

Dmytro Kiosak
dkiosak@ukr.net
Department of anthropology and ethnology of Ukraine
Odessa National I. I. Mechnikov University
ul. Elizavetska 19
65022 Odessa
Ukraine

Tuia Kirkkinen
tuia.kirkkinen@helsinki.fi
Department of Archaeology and Classical Studies
Cultural Research Laboratory
Oulu University
SF-90570 Oulu
Finland

Wiebke Kirleis
wiebke.kirleis@ufg.uni-kiel.de
Institute of Pre- and Protohistoric Archaeology
Kiel University
Johanna-Mestorf Straße 2-6
24118 Kiel
Germany

Carl Knappe
carl.knappe@tutoronto.ca
Department of the History of Art and Graduate Studies
Department of Art, Sidney Smith Hall
University of Toronto
100 St George Street
Toronto, Ontario M5S 3G3
Canada

Jan Kolar
jan.kolar@iubd.unibz.it
Department of Philosophy, History, Culture and Art Studies, Section of Archaeology
P.O. Box 3 (Fabianinkatu 33)
00014 University of Helsinki
Finland

Sascha Krüger
sascha@arch-schloss-gottorf.de
Centre for Baltic and Scandinavian Archaeology (ZBSA)
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Workshop Venue
Leibnizstraße 1