

TERRA NOSTRA

Schriften der GeoUnion Alfred-Wegener-Stiftung – 2013/1

**SOCIO-ENVIRONMENTAL DYNAMICS
OVER THE LAST 12,000 YEARS:
THE CREATION OF LANDSCAPES III**

**OPEN WORKSHOP
15TH-18TH APRIL, 2013
KIEL, GERMANY**

PROGRAMME AND ABSTRACT VOLUME



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**Open Workshop – Socio-environmental Dynamics over the Last 12,000
Years: the Creation of Landscapes III. 15th-18th of April 2013, Kiel**

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GeoUnion Alfred-Wegener-Stiftung – Berlin, April 2013

Address of Johannes Müller,

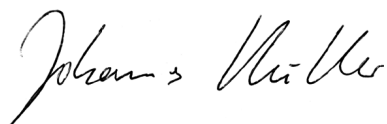
Speaker of the Graduate School “Human Development in Landscapes”

The concept of the Open Workshop “Socio-Environmental Dynamics over the Last 12,000 Years: The Creation of Landscapes III” results from the scientific work of the Graduate School “Human Development in Landscapes”. As a basis, this work is founded on the interdisciplinary research of scholars in natural, life, cultural and social sciences and is concerned with the formation of prehistoric and historic societies. For the third time, the meanwhile biannual event will take place at CAU Kiel.

It is our understanding that social space and natural environment amplify the concept of landscape: different layers of human activities are visible in societal fingerprints on the environment. Global tendencies, regional developments, and local episodes interact in processes of human and environmental change. The development of social space is linked to ideological systems used by societies for economic reasons or ritual purposes. Thus, the study of landscapes does not only concern environmental, demographic, and social aspects but also ideological changes. A transdisciplinary effort of scientists and scholars is necessary to achieve a better understanding of societies beyond landscapes.

Within this framework, public lectures and different sessions will be held during the workshop. The sessions represent the dynamics and perceptions of social landscapes for different time periods and different environments. In this respect, the experimental character of joint activities of scholars and scientists from different subjects is visible within each session. Furthermore, there are sessions that deal with methodological and theoretical progress concerning new investigation technologies, modeling and the dynamics within special fields of interest.

The workshop is being financed by the German Research Foundation (Deutsche Forschungsgemeinschaft, DFG) within the framework of the Graduate School “Human Development in Landscapes” as a part of the Excellence Initiative at Kiel University.



Johannes Müller

Speaker of the Graduate School
“Human Development in Landscapes”

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MONDAY		TUESDAY	WEDNESDAY	THURSDAY
	9.00 - 10.30	Session 1 Session 3 Session 5 Session 7 Session 9 Session 10	Session 2 Session 3 Session 6 Session 8 Session 9 Session 10 Session 12	Session 2 Session 8 Session 10 Session 13-14 Session 15
10.00 - 13.00 Registration in the foyer (Leibnizstr. 1)	10.30 - 11.00	Coffee break		
	11.00 - 12.30	Session 1 Session 3 Session 5 Session 7 Session 9 Session 10	Session 2 Session 3 Session 6 Session 8 Session 9 Session 10 Session 12 Session 13-14	Session 2 Session 8 Session 9 Session 10 Session 13-14 Session 15
13.00 - 13.15 Welcome - Introduction 13.15 - 17.30 Public lectures	12.30 - 14.00	Lunch break		
	14.00 - 15.30	Session 1 Session 5 Session 7 Session 9 Session 10	Session 2 Session 6 Session 9 Session 10 Session 12 Session 13-14 session 15	Final discussion: Plenary meeting
	15.30 - 16.00	Coffee break		
	16.00 - 17.30	Session 1 Session 5 Session 7 Session 9 Session 10	Session 2 Session 6 Session 9 Session 10 Session 12 Session 13-14 session 15	Final discussion: Plenary meeting
18.30 Exhibition Opening (in German) 20.00 Ice breaker	19.30		Conference dinner	

Session 1 | From Lateglacial Forestation to Holocene Drowning

Session 2 | Civilizations, Rivers and Their Floodplains Throughout the Holocene

Session 3 | Human Exploitation of Aquatic Landscapes

Session 5 | Wood and Charcoal: Socio-Economic Constraints of a Resource and Environmental Indications of a Proxy

Session 6 | Into New Landscapes: Subsistence Adaptation and Social Change During the Neolithic Expansion in Central and Western Anatolia

Session 7 | Between Site and Synthesis: Missing Landscapes of the Southwest Asian Early Neolithic

Session 8 | Experiencing Mobility: Movements of People and Objects in the Ancient Near East in the 1st Millennium BC

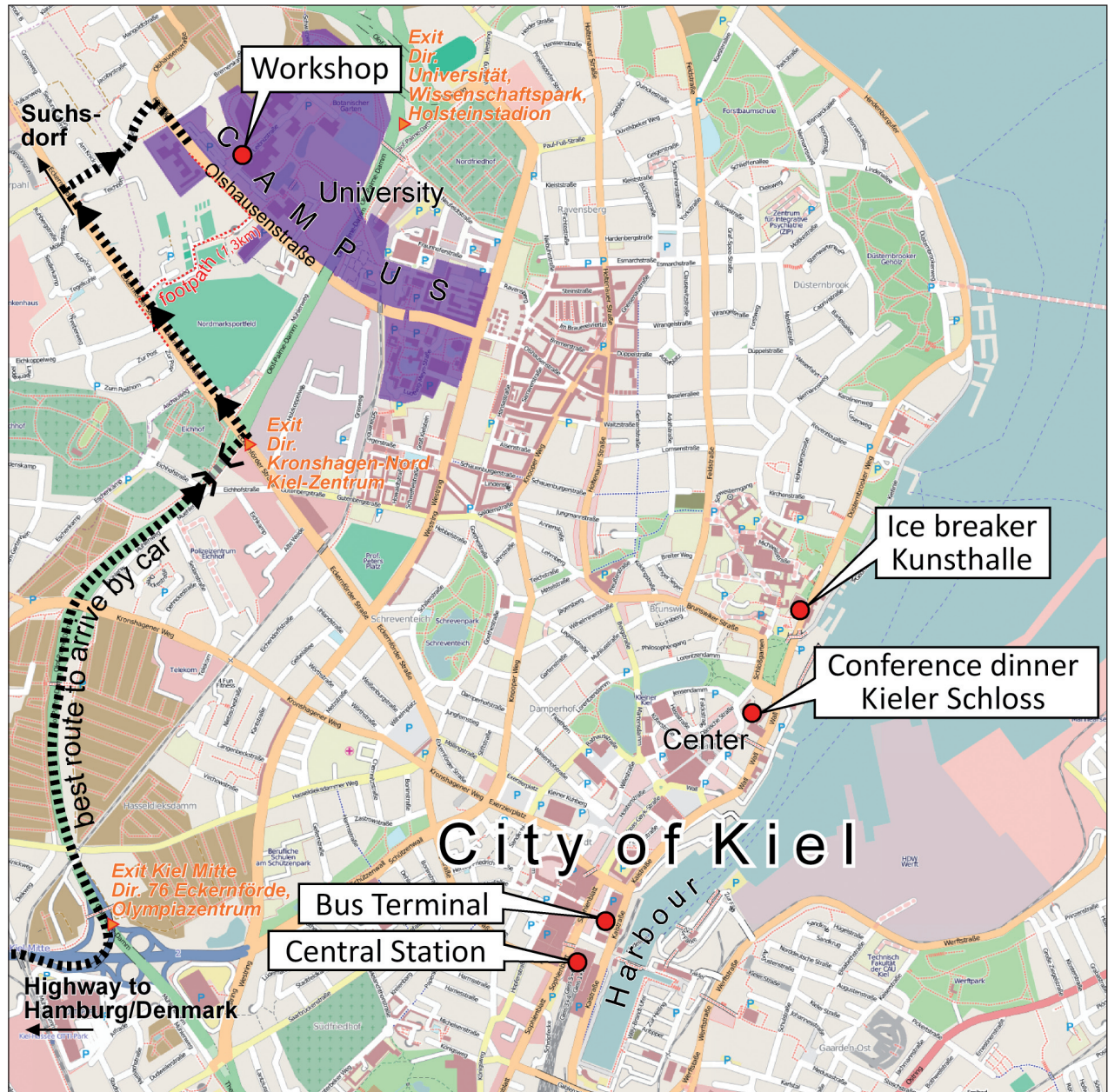
Session 9 | Transitional Landscapes? Spatial Patterns, Standardised Burials, and Intensified Communication in the 3rd Millennium cal BC in Europe: Globular Amphora, Corded Ware, and Bell Beaker Complexes in Context

Session 10 | "Setting the Bronze Age Table": Production, Subsistence, Diet and Their Implications for European Landscapes

Session 12 | Social and Environmental Change in Pre-Hispanic Latin America

Session 13-14 | Joint Session: Modelling Interaction and Data Management

Session 15 | The Archaeology of Pollution



Map: Edited for the Open Workshop by F. Bauer based on a map from www.openstreetmap.org

Registration: Leibnizstraße 1, Foyer of the seminar building

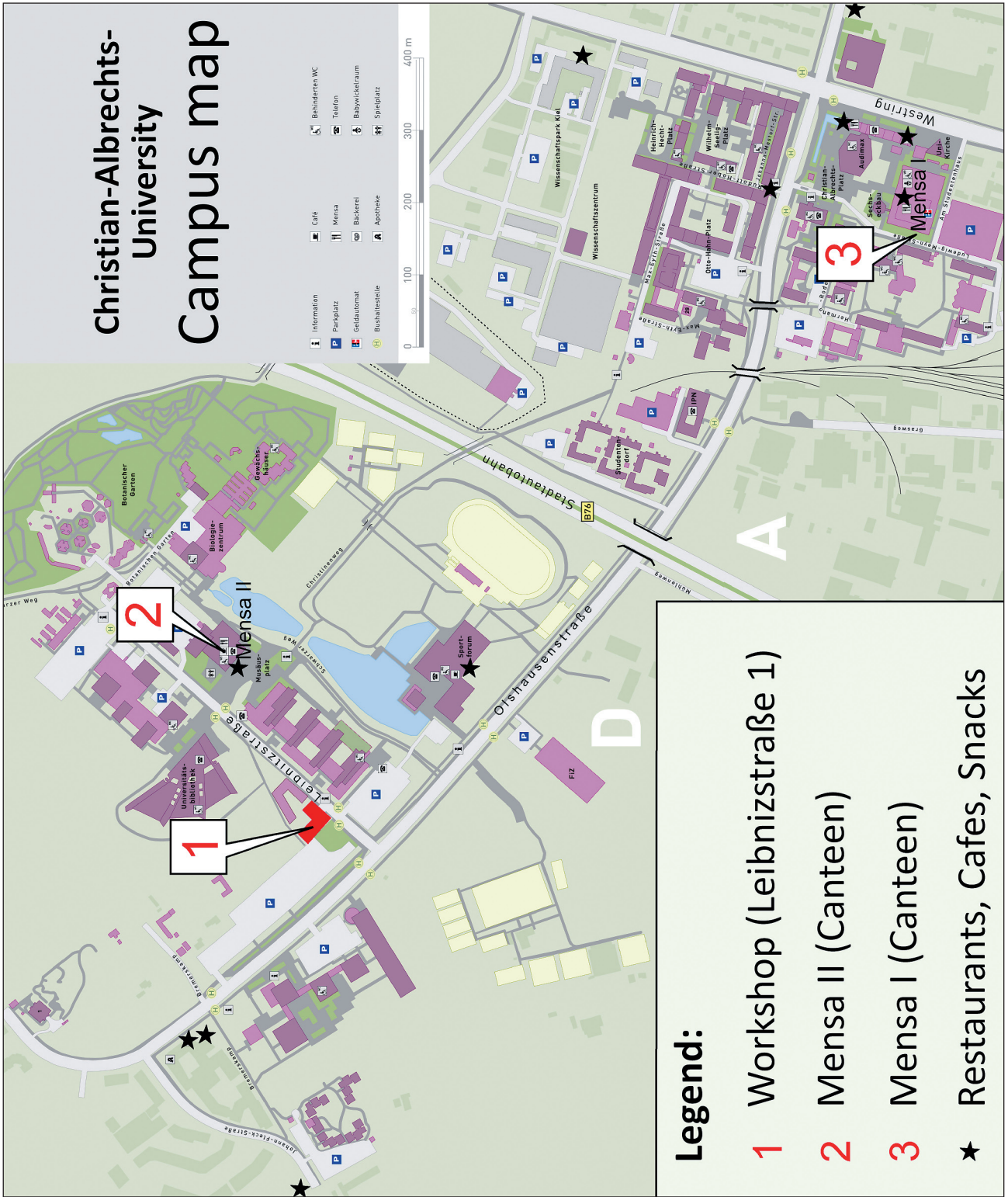
Workshop Public Lectures: Klaus-Murmann Lecture Hall, Leibnizstraße 1,

Workshop Sessions: Leibnizstraße 1, Seminar building

Exhibition Opening Venue: Antikensammlung-Kunsthalle Kiel, Düsternbrooker Weg 1, 24105 Kiel

Ice breaker Venue: Antikensammlung-Kunsthalle Kiel, Düsternbrooker Weg 1, 24105 Kiel

Conference Dinner Venue: Kieler Schloß, Dänische Str. 44, 24103 Kiel



Plan: Created by the Press Office of Kiel University, edited for the Open Workshop by F. Bauer

Monday 15th of April

REGISTRATION

10.00 | Registration in the foyer of seminar building

Venue: *Leibnizstraße 1*

WELCOME / INTRODUCTION

Venue: *Leibnizstraße 1, Klaus-Murmann Lecture Hall*

13.00 | Thomas Bosch, Vice-President of Kiel University

13.10 | Johannes Müller, Speaker of the Graduate School "Human Development in Landscapes", Kiel University

PUBLIC LECTURES: KEYNOTE SPEAKERS

Venue: *Leibnizstraße 1, Klaus-Murmann Lecture Hall*

13.15 | Daniel Sandweiss, University of Maine
Long-term Human Ecodynamics in the Heartland of El Niño: Climate and Culture on the Coast of Peru

14.00 | Cheryl Makarewicz, Kiel University
Free from Hearth and Home: Neolithic Taskscapes and the Emergence of Non-Kinship Social Institutions in the Near East

14.45 – 15.15 Coffee break

15.15 | Leendert Louwe Kooijmans, Leiden University
Digging in the Dutch Mountains

16.00 | Albert Hafner, Bern University
Landscapes above the Treeline: Archaeological Evidence from Prehistoric Sites in the Swiss Alps

16.45 | Engdawork Assefa¹, Hans-Rudolf Bork², Johannes Müller², ¹Addis Abeba University, ²Kiel University
Terraces and Black Smiths in Southern Ethiopia: Environmental and Ethnoarchaeological Approaches

SOCIAL ACTIVITIES

Venue: *Kunsthalle, Düsternbrooker Weg 1, 24105 Kiel*

18.30 | Exhibition Opening (in German):
Manipulierte Landschaften: 10,000 Jahre Veränderung

20.00 | Workshop Ice breaker

SESSION 1**FROM LATEGLACIAL FORESTATION TO HOLOCENE DROWNING**

**Asterisk for presenting authors, if more than one author is listed*

Tuesday 16th of April

9.00 | Heikki Seppä, University of Helsinki
Integrated Records of Biome Changes during the Last Glacial-Interglacial Transition in Europe (Invited)

9.30 | Sonja B. Grimm¹, Mara-Julia Weber^{2*},
¹MONREPOS, RGZM Archaeological Research Institute,
²Centre for Baltic and Scandinavian Archaeology
It is not Strength but the Duration (...) that Makes Great Men – Mid-Lateglacial Environmental Events and their Impact on Hunter-Gatherer Societies in Western Central Europe

10.00 | Håkon Glørstad, University of Oslo
Deglaciation, Sea Level Changes and the Holocene Colonisation of Norway

10.30 – 11.00 Coffee break

11.00 | Nicky Milner, University of York
Hunter-Gatherers and Climate Change from 10,000 – 8000 BC: A Changing Lakescape in the Vale of Pickering, UK (Invited)

11.30 | Monika Žemantauskaitė, Lithuanian Institute of History
The Palaeolithic and the Mesolithic in the Territory of Lithuania: Current State of Research

12.00 | Daniel Groß*, Ulrich Schmölcke, both Centre for Baltic and Scandinavian Archaeology, Schleswig
Reconstructing Local Environments – the Early Holocene Friesack Example

12.30 – 14.00 Lunch break

14.00 | Hans Ahlgren, Stockholm University
Of Hares and Men – Ancient DNA Analyses Indicate Mesolithic Translocation of Wild Animals to a Remote Island in the Baltic Sea

14.30 | Niklas Hausmann, University of York
Duvensee 13 - A Reevaluation

15.00 | Svea Mahlstedt, Wildeshausen
Land Use in Mesolithic Northwestern Germany

15.30 – 16.00 Coffee break

16.00 | Carmen Liebermann, Archaeological Heritage Office Saxony
Hunter-Fisher-Gatherers in the South of the Northern Lowlands

16.30 | Julia Goldhammer, Akademie der Wissenschaften und der Literatur Mainz
Fished up from the Baltic Sea – A New Ertebølle Site near Stohl Cliff Line (Bay of Kiel)

17.00 | Harald Lübke*, Ulrich Schmölcke*, both Centre for Baltic and Scandinavian Archaeology
Mesolithic Hunter and Fisher in a Changing World – A Case Study on Late and Terminal Mesolithic Sites in Wismar Bay, Mecklenburg-Vorpommern, Germany

SESSION 2

CIVILIZATIONS, RIVERS AND THEIR FLOODPLAINS THROUGHOUT THE HOLOCENE

*Asterisk for presenting authors, if more than one author is listed

Wednesday 17th of April

9.00 | Liviu Giosan, Woods Hole Oceanographic Institution
The Missing Link: Feedbacks Between Climate and People via Fluvial and Coastal Dynamics (Invited)

9.45 | Aline Garnier¹, Eric Huysecom², Chrystel Jeanbourquin^{2*}, Yann Le Drezen³, Laurent Lespez¹, Serge Loukou², ¹University of Caen, ²University of Geneva, ³University of Paris¹
Human Occupation and Paleoenvironment in Mali during the Last Two Millennia: Examples of the Guringin and the Yamé Rivers

10.05 | Sylvain Ozainne^{*1,2}, Aziz Ballouche¹, ¹Université d'Angers, ²University of Geneva
Floodplains or Dune Fields? Environmental Settings of the First Food-Producing Cultures in West Africa

10.30 – 11.00 Coffee break

11.00 | Aziz Ballouche, Université d'Angers
Landscapes of the Lower Valley of the Oued Loukkos (Province of Larache, Morocco) since the Middle Ages. Paleoenvironmental Data and Historical Sources.

11.20 | Lydie Dudová, Institute of Botany ASCR, Brno
A Medieval Meadow Established in an Alder Alluvial Forest: A Case Study from the Eastern Sudetes

11.40 | Kristina Penezic^{*1}, Dragana Filipovic², Nenad Tasic³, ¹University of Heidelberg, ²Oxford University, ³University of Belgrade
Landscapes and Lifestyles at Neolithic Vinča – Belo Brdo (5600 – 4200 BC), Serbia

12.00 | Peter Bisták³, Zuzana Borzová², Ján Jahn², Anna Smetanová^{1*}, ³Monuments Board of the Slovak Republic, ²Constantine the Philosopher University, Nitra, ¹Comenius University, Bratislava
The Valley of Connections and Divisions – Kostolianska dolina Valley, Slovakia

12.30 – 14.00 Lunch break

14.00 | Stefanie Berg-Hobohm¹, Jens Bussmann², Eva Leitholdt^{*3}, Andreas Stele², Christoph Zielhofer³, ¹Bavarian State Conservation Office, ²Osnabrueck University, Leipzig University
Fossa Carolina – Bridging the Central European Watershed

14.20 | Peter F. Biehl^{*1}, Amy Boogard², Ingmar Franz³, David Orton⁴, Sonia Ostaptchouk⁵, Jana Rogasch⁶, Eva Rosenstock⁶, Philippa Ryan⁷, Patrick Willett¹

¹SUNY Buffalo; ²Oxford University, ³Freiburg University, ⁴Cambridge University, ⁵Musée Nationale d'Histoire Naturelle Paris, ⁶FU Berlin, ⁷British Museum
And a River Runs Through... Environmental and Cultural Change around 6,000 in the Konya Plain, Turkey

14.40 | Poster Discussion**15.30 – 16.00 Coffee break**

16.00 | Dorothy J. Merritts^{*}, Michael Rahnis, Robert Walter, all Franklin & Marshall College
Late Quaternary Landscape Evolution and the Historic Rise and Fall of Mid-Atlantic US Streams (Invited)

16.45 | Tony G. Brown, University of Southampton
'Natural' Streams in Europe: An Eco-Historical Model

17.05 | Annegret Larsen¹, Fabian Aschenbach¹, Maren Jähne¹, Joshua Larsen², ¹Kiel University, ²University of Queensland
The Legacy of Mill Dams in Low-Order Streams in Central Europe

Thursday 18th of April

09.00 | Rolf Aalto, Tim Barrows, Julia Marquard^{*}, University of Exeter
Colonial Soil Loss Fingerprinted and Quantified over Multiple Timescales in the Christina River Basin (Pennsylvania, USA)

09.20 | Hans von Suchodoletz^{*,1,2}, Martin Menz^{1,3}, Dominik Faust¹, ¹TU Dresden, ²University of Leipzig, ³Senckenberg Natural History Collection Dresden
The Holocene Fluvial Dynamics of the Marneuli Depression in Eastern Georgia

09.40 | Dominik Faust^{*}, Daniel Wolf, TU Dresden
Driving Forces of Holocene Fluvial Dynamics of the Guadalete River (SW-Andalusia)

10.00 | Hans-Rudolf Bork^{1*} and Christine Dahlke², ¹Kiel University, ²University of Hildesheim
Development of the Yanjuangou River near Yan'an (Shaanxi, China) during the Holocene

10.10 | Robert Walter^{*1}, Dorothy Merritts¹, Jeffrey Hartranft², Paul Mayer³, ¹Franklin and Marshall College, Lancaster, ²Department of Environmental Protection, Pennsylvania, ³US Environmental Protection Agency
The Big Spring Run Stream Restoration Experiment: Watershed Restoration and Ecosystem Services in a Stream Impacted by Legacy Sediments

10.30 – 11.00 Coffee break

11.00 | Discussion: "Legacy Sediments"

SESSION 3

HUMAN EXPLOITATION OF AQUATIC LANDSCAPES

*Asterisk for presenting authors, if more than one author is listed

Tuesday 16th of April

9.00 | Natalya Shishlina, State Historical Museum, Moscow
Eurasian Steppe Nomads and Exploitation of Aquatic Landscapes in the Bronze Age: Food, Trade and Mobility (Invited)

9.30 | Caroline Mougne^{*1}, Catherine Dupont², David Giazzon³, Elven Le Goff³, Cyril Marcigny³, ¹Université de Rennes, ²CNRS, ³INRAP
Marine Invertebrates at Bronze Age Settlements of the Normandy (Northwestern France)

9.50 | Jennifer R. Jones^{*}, Jacqui Mulville, both Cardiff University
Discontinuity and Change: Exploring the Role of Marine Resources of the North Atlantic Islands in Past Coastal Communities.

10.10 | Sofía Sanz, UAM Madrid
Aquatic Landscapes and Identity. Neolithic Process at Coasts of the Iberian

10.30 – 11.00 Coffee break

11.00 | Emuobosa Akpo Orijemie, University of Ibadan
Aspects of Human-Ecological Relations in Ahanve, Coastal Southwestern Nigeria

11.20 | Andrzej Pydyn, Nicolaus Copernicus University in Torun
Crossing the Cold Seas – The Use of Boats for Long Distance Mobility and Exploitation of Aquatic Resources

11.40 | Mateusz Popek, Nicolaus Copernicus University in Torun
Mesolithic Fishery on the Polish Coast of the Baltic Sea

12.00 | Matthew Meredith-Williams¹, Geoff Bailey¹, Niklas Hausmann¹, Abdullah Alsharekh²
¹University of York, ²King Saud University
Responses of Pre-Historic Coastal Communities to Sea Level Change on the Southern Red Sea

12.20 | Niklas Hausmann, University of York
Stable Isotope Research from Red Sea Shell Middens on the Farasan Islands, Saudi Arabia

Wednesday 17th of April

9.00 | James Barrett, Cambridge University
Changing Tides: The Archaeology and Historical Ecology of Medieval Sea Fishing (Invited)

9.30 | Valdis Bērziņš¹, Harald Lübke², John Meadows^{2,3}, Mudīte Rudzīte⁴, Ulrich Schmölcke^{*2}, and Ilga Zagorska¹, ¹University of Latvia (LVI), ²Centre for Baltic and Scandinavian Archaeology (ZBSA), ³Leibniz-Labor für Altersbestimmung und Isotopenforschung, Kiel University, ⁴University of Latvia, Museum of Zoology.
Rīņņukalns, Latvia: the Re-discovery of a Neolithic Freshwater Shell Midden

9.50 | Sanna Kivimäki, University of Helsinki
Increase of the Population and Decrease in the Population Increase and Residential Mobility Decrease – Logistical Organization of Fisher-Hunter-Gatherer Sites in the Northern Lake Saimaa Complex, Finland 4500 – 3500 cal BC

10.10 | Miikka Tallavaara^{*1}, Kristiina Mannermaa¹, Jukka Rintala², Pirkko Ukkonen¹, ¹University of Helsinki, ²Finnish Game and Fisheries Research Institute, Helsinki
Hunter-Gatherer Population Dynamics and Aquatic Resource Use: A Case from Holocene Finland

10.30 – 11.00 Coffee break

11.00 | Gytis Piličiauskas, Lithuanian Institute of History, Vilnius
Exploitation of Freshwater Lagoons in Lithuania, 4000-1800 cal BC

11.20 | Bente Philippsen, Aarhus University
Inland Ertebølle Culture: the Importance of Aquatic Resources and the Freshwater Reservoir Effect

11.40 | Aikaterini Glykou^{*1}, Oliver Craig², ¹Kiel University, ²University of York
Exploitation of Marine Resources during the Mesolithic-Neolithic Transition at the Southwestern Baltic Sea Region

12.00 | Ricardo Fernandes^{*1}, Marie-Josée Nadeau², Pieter M. Grootes², ¹GS HDL, Kiel University, ²Leibniz Laboratory for Radiometric Dating and Isotope Research, Kiel University
Going Fishing in the Neolithic: Archaeological, Isotopic, and Radiocarbon Evidence

12.20 | Harry Kenneth Robson^{*3}, Søren Andersen¹, Kurt Gron², ³BioArch, University of York, ¹Moesgård Museum, ²University of Wisconsin-Madison
Isotopic Evidence of Environmental, Subsistence, and Cultural Changes across the Mesolithic-Neolithic Transition at Havnø, a Danish “Køkkenmødding”

Posters of session 3 exhibited during the whole workshop:

Ricardo Fernandes^{*1}, Marie-Josée Nadeau², Pieter M. Grootes², ¹GS HDL, Kiel University, ²Leibniz Laboratory for Radiometric Dating and Isotope Research, Kiel
Catholic Fasting Rules and Radiocarbon Dating

Ricardo Fernandes^{*1}, Marie-Josée Nadeau², Pieter M. Grootes², Marek Brabec³, Andrew Millard⁴, ¹GS HDL, Kiel University, ²Leibniz Laboratory for Radiometric Dating and Isotope Research, Kiel, ³Academy of Sciences of the Czech Republic, ⁴Durham University
FRUITS for Fish: Intake Estimates of Aquatic Foods Using a Novel Bayesian Model

Ricardo Fernandes^{1,2*}, Natalya Shishlina³, Ursula Brosseder⁴, **Marie-Josée Nadeau², Pieter M. Grootes²**
¹GS HDL, Kiel University, ²Leibniz Laboratory for Radiometric Dating and Isotope Research, Kiel University, ³Archaeology Department of the State Historical Museum, Moscow, ⁴University of Bonn
Human Dietary Radiocarbon Reservoir Effects in the Eurasian Steppe

SESSION 5

WOOD AND CHARCOAL: SOCIO-ECONOMICAL CONSTRAINTS OF A RESOURCE AND ENVIRONMENTAL INDICATIONS OF A PROXY

*Asterisk for presenting authors, if more than one author is listed

Tuesday 16th of April

Session chair: Vincent Robin

9.00 | Thomas Ludemann, University of Freiburg
Landscape Anthracology – Linking Past Fuel Economy and Vegetation Ecology (Invited)

10.00 | Wiebke Kirleis¹, Hannes Knapp^{2*}, Oliver Nelle³,
¹Kiel University, ²Johannes Gutenberg University Mainz,
³Institut méditerranée de biodiversité et d'Ecologie marine et continentale
Charcoal Usage during the Middle Ages in the Harz Mountains – Wood Selection and Overexploitation of the Woodlands

10.30-11.00 Coffee break

Session chair: Doris Jansen

11.00 | Bert Groenewoudt, Cultural Heritage Agency of the Netherlands
Charcoal as a Proxy for Reconstructing Late Prehistoric and Early Historic Landscape Dynamics and Settlement Mobility

11.30 | Volker Arnold¹, Florian Gloza-Rausch², Oliver Nelle^{3*}, Arne Paysen⁴, Björn-Henning Rickert⁵,
¹Museum for Archaeology and Ecology Dithmarschens,
²Noctalis Bat Center, ³Institut méditerranée de biodiversité et d'Ecologie marine et continentale,
⁴Isentosamballerer, Historical Handicraft and Housework Technology, ⁵Kiel University
Historical Charcoal Production in Regions of the Northern European Plain: Resources, Woodland Reconstruction and Implications for Today's Biodiversity Conservation.

12.00 | Alexandre Chevalier^{1*}, Jean Plumier², Nicolas Thomas³, Marie Verbeek², ¹Royal Belgian Institute of Natural Sciences, ²Service de l'Archéologie, Service Public de Wallonie (SPW), ³Institut National de Recherches Archéologiques Préventives
Fuel Selection, Wood Exploitation and Forest Management by Middle Ages Belgian Brass Blacksmiths between the 13th and 16th Centuries along the Meuse River

12.30 – 14.00 Lunch break

Session chair: Thomas Ludemann

14.00 | Kirsti Hänninen¹, Welmoed Out^{2*}, Caroline Vermeeren¹, ¹BIAX Consult, ²Spanish National Research Council (CSIC)

The Study of Woodland Management by Analysis of Branch Age and Diameter: Possibilities and Restrictions

14.30 | Doris Jansen, GS HDL, Kiel University
Charcoal Remains from the Königsgrab (Lüdelzen 6) in the Western Altmark

15.00 | Fevzi Kemal Moetz³, Oliver Nelle², Tim Mattis Schrödter^{3*}, ¹Istanbul University, ²Institut méditerranée de biodiversité et d'Ecologie marine et continentale, ³GS HDL, Kiel University
Aktopraklik and its Environments – An Integrated Botanical Approach

15.30 – 16.00 Coffee break

Session chair: Oliver Nelle

16.00 | Poster session:

Jan Novák^{1*}, Martin Novák², Jiří Svoboda², Petr Šída³, Jan Prostředník⁴, ¹University of South Bohemia, ²Institute of Archaeology, AC ČR, ³University of Hradec Králové, ⁴Museum of the Bohemian Paradise
Vegetation Changes Recorded in Sandstone Rockshelters with Long Stratigraphic Sequences (Paleolithic - Medieval Period) in Northern Bohemia

Ralf Hesse, Landesamt für Denkmalpflege Baden-Württemberg
Charcoal Burning Platforms in the Southern Black Forest: from LIDAR Point Cloud to Spatial Patterns of Resource Use

16.30 | Jean-Louis Edouard¹, Mélanie Saulnier^{2*}, Brigitte Talon², ¹Center Camille Jullian, CNRS, ²Institut Méditerranéen de Biodiversité et d'Ecologie marine et continentale
Subalpine Forest History and Dynamics in the French Alps (Queyras): Climatic and Human Pressure

17.00 | Oliver Nelle¹, Vincent Robin^{2*}, ¹Institut méditerranée de biodiversité et d'Ecologie marine et continentale, ²Kiel University
Charcoal Records from Natural Archives in Northern Central Europe: What do They Tell us about Past Fire Regime Characteristics and Determinisms?

17:30 – 18:00**Final discussion**

SESSION 6**INTO NEW LANDSCAPES: SUBSISTENCE ADAPTATION AND SOCIAL CHANGE DURING THE NEOLITHIC EXPANSION IN CENTRAL AND WESTERN ANATOLIA****15.30 – 16.00 Coffee break****16.00****Final discussion****Wednesday 17th of April****9.00 | Benjamin Arbuckle**, Baylor University
*Introduction and Welcome***9.10 | Sarah Kansa**, Alexandria Archive Institute
*Overview of Open Context Datasharing in Zooarchaeology (invited)***9.35 | Alfred Galik**, Veterenary Medicine University, Vienna
*Species Frequencies and Neolithic Farming Communities in Western Anatolia***10.00 | Benjamin Arbuckle**, Baylor University
*Sheep and Goat Management and the Spread of Pastoral Economies in Central and Western Anatolia: A Biometric Approach***10.30 – 11.00 Coffee break****11.00 | David Orton¹ and Levent Atici²**, ¹University College London, ²University of Nevada Las Vegas
*Sheep and Goat Management in Neolithic Anatolia: Epiphyseal Fusion and Dental Data***11.30 | Lionel Gourichon**, Centre d'Etudes Préhistoire Antiquité Moyen Age
*Biometric Evidence for Early Cattle Management in Central and Western Anatolia***12.00 | Arek Marciniak¹ and Benjamin Arbuckle²**, ¹Adam Mickiewicz University, ²Baylor University
*Cattle Management in Neolithic Anatolia: Dental Eruption and Wear and Epiphyseal Fusion Evidence***12.30 – 14.00 Lunch break****14.00 | Canan Cakirlar**, University of Groningen
*Biometric Evidence for Pig (*Sus scrofa*) Exploitation in Central and Western Anatolia***14.30 | Jacqui Mulville**, Cardiff University
*Pig Management in Neolithic Anatolia: Epiphyseal Fusion and Dental Age Data***15.00 | Dragana Filipovic**, Oxford University
*Arable and Pastoral Land-Use at Early-Mid Neolithic Çatalhöyük: The Archaeobotanical Evidence***15.30 | Friederike Stock**, University of Cologne
First Settlements and their Environments along the Coasts of Central Western Anatolia

SESSION 7**BETWEEN SITE AND SYNTHESIS:
MISSING LANDSCAPES OF THE
SOUTHWEST ASIAN EARLY NEOLITHIC**

**Asterisk for presenting authors, if more than one author is listed*

Tuesday 16th of April

9.00 | Bill Finlayson, Council for British Research in the Levant, London
Creating the Neolithic World: The Social Integration of Neolithic Communities across Southwest Asian Landscapes

9.20 | Anna Belfer-Cohen*, **A. Nigel Goring-Morris**, both The Hebrew University of Jerusalem
When Environment Meets Culture – Case Studies from the Arid Region of Southern Levant (Invited)

9.50 | Matthew Jones¹, **Amaia Arranz Otaegui²**, **Tobias Richter^{*3}**, **Lisa Yeomans⁴**, ¹University of Nottingham, ²Universidad del País Vasco-Euskal Herriko Unibertsitatea, ³University of Copenhagen, ⁴Independent Scholar
Reconciling Social and Natural Landscape Approaches in the Late Epipalaeolithic: a Case Study from the East Jordanian Badia

10.10 | Douglas Baird, University of Liverpool
Boncuklu and Pınarbaşı. Variable Landscape Exploitation and Social Interaction in the Adoption and Rejection of Cultivation in the 9th–8th Millennia BC Central Anatolia

10.30 – 11.00 Coffee break

11.00 | Gary O. Rollefson, Whitman College
The Other Landscapes: Integrating the Hunting-Pastoral Exploitation of the Jordanian Badia with Neolithic Agricultural Communities (Invited)

11.30 | Michal Birkenfeld, The Hebrew University of Jerusalem
Pre-Pottery Neolithic B Settlement Systems in the Lower Galilee, Israel: A Multi-Scale Approach

11.50 | Matthew Kroot, University of Michigan
Property Rights and Subsistence Practices Across Neolithic Landscapes: The 'Assal-Dhra' Archaeological Project

12.10 | Daniel Contreras*, **Cheryl Makarewicz**, both Kiel University
Modeling Arable Landscapes of the Early Holocene: Emergent Cultivation at el-Hemmeh

12.30 – 14.00 Lunch break

14.00 | Bo Dahl Hermansen, Moritz Kinzel*, both University of Copenhagen
The Built Environment of the PPN – Changing Spaces for Changing Practices?

14.20 | Ceren Kabukcu, University of Liverpool
The Nature of Neolithic Impacts on the Environment: Early Holocene Oak Woodland Establishment and Spread in Inland SW Asia

14.40 | Amy Bogaard, University of Oxford
Locating Early Farming Landscapes in SW Asia and Europe Using Archaeobotanical Approaches

15.00 | Eleni Asouti, University of Liverpool
Memory, Hunter-Gatherer Knowledge Transmission Strategies and Environmental Change in Late Epipalaeolithic and Early Neolithic Southwest Asia

15.30 – 16.00 Coffee break

16.00 | Trevor Watkins, University of Edinburgh
Response and final discussion

SESSION 8
EXPERIENCING MOBILITY: MOVEMENTS
OF PEOPLE AND OBJECTS IN THE
ANCIENT NEAR EAST IN THE 1ST
MILLENNIUM BC

Wednesday 17th of April

9.00 | Introduction

Mobile People: Reality and Representation

9.05 | Charlotte Schubert, University of Leipzig
Nomads, Barbarians and Scythians: Idealisation and Cultural Difference (Invited)

9.35 | Silvia Balatti, GS HDL, Kiel University
Movements of People in Mountainous Environment: the Case of the Zagros in the 1st Millennium BC

10.05 | Harmen Huigens, University of Leiden
Set in Stone: Archaeological Remains of Mobile Societies in Jordan's Black Desert

10.35 – 11.00 Coffee break

Movements of People and Knowledge

11.00 | Karen Radner, University College London
Brain Drain: Foreign Scholars at the Assyrian Imperial Court (Invited)

11.30 | Chiara Matarese, GS HDL, Kiel University
Greeks Working for the Achaemenid King: The Case of Persepolis

12.00 | Justine Walter, University of Leipzig
Serida and Da Xia: Central Asia's Role in the Bi-directional Knowledge Transfer between Europe and China during the 1st Millennium BC

Thursday 18th of April

9.30 | Sabine Müller, Kiel University
Macedonians Abroad: Strategies of Commemorating Alexander's Expansion

10.00 | Lutz Berger, Kiel University
Arab-Muslim Expansion in the 7th Century Fertile Crescent and Beyond: Causes and Repercussions

10.30 – 11.00 Coffee break

11.00 | Pierfrancesco Callieri, University of Bologna
Hellenistic Art on the Iranian Plateau: Movements of Objects, Movements of People (Invited)

11.30 | Sarah Kiyarad, University of Heidelberg
The Voyage of a Dwarf God: Bes Amulets in the Achaemenid Empire

12.00 | Enrico Foietta, University of Torino
Four Inlaid Jewellery Pieces from Hatra. An Unusual Case of Study between Mesopotamia and the Caucasian Area

12:30 – 14:30 Lunch break

14:30 Final discussion

SESSION 9**TRANSITIONAL LANDSCAPES? SPATIAL PATTERNS, STANDARDISED BURIALS, AND INTENSIFIED COMMUNICATION IN THE THIRD MILLENIUM CAL BC IN EUROPE: GLOBULAR AMPHORA, CORDED WARE AND BELL BEAKER COMPLEXES IN CONTEXT**

*Asterisk for presenting authors, if more than one author is listed

Tuesday 16th of April

9.00 | Volker Heyd, University of Bristol
A European Union of Ideologies or the Cattle-isation of Europe? Globular Amphora, Corded Ware and Bell Beaker Pottery Users in an Interconnected Europe 3500 – 2000 BC (Invited)

9.30 | Florian Klimscha, DAI – Eurasia Department
Long-Range Contacts in the 3rd Millennium as Exemplified by Stone and Metal Weapons

10.00 | Martin Furholt, Kiel University
Multi-Dimensional Networks in the Late Neolithic: Uncovering Globular Amphorae, Corded Ware and Bell Beaker Linkages within Regional Contexts

10.30 – 11.00 Coffee break

11.00 | Jonas Beran, Archäologie Manufaktur GmbH
Empires and Revolutions in the Third Millennium. Supra Regional Rule and Extra Economic Compulsion as Causative Background of Wide Spread Cultural Phenomena

11.30 | Manfred Woidich, FU Berlin
Cultural Heterogeneity of the Western Globular Amphora Culture as a Result of a Complex, Cascade-Like Expansion Process

12.00 | Marzena Szmyt, Adam Mickiewicz University & Poznan Archaeological Museum
Eastern Destinations of the Globular Amphora Culture: Central European Patterns in New Landscapes of Eastern Europe

12.30 – 14.00 Lunch break

14.00 | Luise Lorenz, Kiel University
The “One” and the “Other” – Reconstruction of Communication Structures Based on the Distribution of Funnel Beakers and Globular Amphorae in Megalithic Graves in Northeastern Germany

14.30 | Andrzej Pelisiak, University of Rzeszów
The Beginnings of Mobile Husbandry in Mountain Periphery: The Late Neolithic Transformations (Funnel Beaker and Corded Ware Cultures) in Southeast Poland and Climate Change

15.00 | Janusz Czebreszuk*¹, Marzena Szmyt^{1,2}, ¹Adam Mickiewicz University, ²Poznan Archaeological Museum
Social, Economic and Cultural Transformations in the 3rd Millennium BC between the Oder and the Vistula Rivers

15.30 – 16.00 Coffee break

16.00 | Robert Hofmann, Kiel University
Does the Spatial Subdivision of Large Corded Ware Cemeteries Reflect the Socio-Political Organisation of Final Neolithic Societies?

16.30 | Jakob Westermann, Moesgaard Museum
From Grave Compositions to Cultural Constellations: Spatial Analyses of Burials from Vikletice in Northern Bohemia

17.00 | Jan Kolar, Masaryk University
Social and Spatial Patterns at the Beginning of the 3rd Millennium cal BC in Eastern Czech Republic (Moravia): Case Study Corded Ware Culture

Wednesday 17th of April

9.00 | Marie Besse*, Jocelyne Desideri, University of Geneva
Cultural Choices and People during the 3rd Millennium BC: The Petit-Chasseur Site in Sion (Valais, Switzerland) (Invited)

9.30 | Johannes Müller, Kiel University
Global Bell Beakers or a Mosaic of Regional Social Spaces: An Evaluation of Different Concepts?

10.00 | Tim Kerig¹, Jutta Lechterbeck*², Matthias Merkl², ²State Office for Cultural Heritage Baden-Wuerttemberg, ¹University College London
Different Landscapes – Different Lifestyles?

10.30 – 11.00 Coffee break

11.00 | Ralph Großmann, GS HDL, Kiel University
Interrelations among Corded Ware and Bell Beaker? Material Cultures and Identities within the 3rd Millennium

11.30 | Uffe Rasmussen, Moesgaard Museum
Gaasemosen – A Contribution to the Study of the Economic Strategy of the Single Grave Culture

12.00 | Niels Johannsen, University of Aarhus
Landscapes, Socioeconomic Organizations and Funerary Customs of the Jutland Peninsula during the Final 4th and the 3rd Millennium BC: Understanding Travels in Life and Death?

12.30 – 14.00 Lunch break

14.00 | Rune Iversen, University of Copenhagen
Traditions and Transformations – Eastern Denmark in the Third Millennium BC

14.30 | Sandra Beckerman¹, Dick Brinkhuizen², Otto Brinkkemper³, Virginia Garcia-Diaz⁴, Jos Kleijne*³, Lucy Kubiak-Martens⁵, Roel Lauwerier³, Gary Nobles¹, Tania Oudemans⁶, Daan Raemaekers¹, Bjørn Smit³, Liesbeth Theunissen³, Annelou Van Gijn⁴, Jørn Zeiler²,

¹University of Groningen, ²ArchaeoBone, Haren; ³Cultural Heritage Agency of the Netherlands, ⁴Leiden University, Leiden; ⁵BIAX Consult, Zaandijk; ⁶Kenaz Consult, Berlin

Corded Ware Settlements in the Low Countries: Late Neolithic Behavioural Variability in a Dynamic Landscape

15.00 | Miloš Spasić, Belgrade City Museum
Lost in the Third Space: Hybridization of Late Eneolithic Identities in Eastern Serbia

15.30 – 16.00 Coffee break

16.00 | Gabriella Kulcsár, Research Centre for the Humanities Hungarian Academy of Sciences
Transition to the Bronze Age: Networks along the Danube in the 3rd Millennium BC

16.30 | Piotr Włodarczak, Polish Academy of Sciences Cracow Branch
Is it so Different? Remarks on Burial Practises of Globular Amphorae and Corded Ware Societies in Lesser Poland

17.30 | Sławomir Kadrow, University of Rzeszow
Information Transfer in Early Bronze Age in East-Central Europe

Thursday 18th of April

11.00 | Final Discussion

12.30 – 14.00 Lunch break

SESSION 10**“SETTING THE BRONZE AGE TABLE”:
PRODUCTION, SUBSISTENCE, DIET AND
THEIR IMPLICATIONS FOR EUROPEAN
LANDSCAPES**

**Asterisk for presenting authors, if more than one author is listed*

Tuesday 16th of April

9.00 | Selina Delgado-Raack*, **Roberto Risch***, both UAB Barcelona
Social Change and Subsistence Production in the Iberian Peninsula during the 3rd and 2nd Millennium BC (Invited)

9.30 | Péter Czukor, **Anna Priskin**, **Vajk Szeverényi***, **Andrea Torma**, **Anikó Tóth**, all Móra Ferenc Múzeum, Szeged
Subsistence, Settlement and Society in the Late Bronze Age of Southeast Hungary: The Case Study of the Fortified Settlement at Csanádpalota-Juhász T. Tanya

10.00 | Nicole Taylor, Kiel University
Food for Thought: Plant Macro-Remains and Spatial Organisation

10.30 – 11.00 Coffee break

11.00 | Christina Karlsson, Southampton University
Table Culture at the Bronze Age Tell-Site of Százhalombatta-Földvár, Hungary

11.30 | Mária Hajnalová¹, **Klára Šabatová*²**, ¹University Nitra, ²Masaryk University Brno
Tumulus Culture and Economical Change (Moravia, Slovakia)

12.00 | Mariya Ivanova, DAI, Römisch-Germanische Kommission, Frankfurt am Main
Subterranean Grain Storage and Management of Food Surplus at the Early Bronze Age Site of Vráble, Southwest Slovakia

12.30 – 14.00 Lunch break

14.00 | Helmut Kroll, Kiel University
The Plant Economy of Feudvar, a Fortified Bronze and Iron Age Settlement on a Loess Plateau at the Confluence of Tissa and Danube

14.30 | Manfred Röscher*¹, **Elske Fischer¹**, **Jutta Lechterbeck¹**, **Gegeensuvd Tserendorj¹** and **Lucia Wick²**, ¹Landesamt für Denkmalpflege im Regierungspräsidium Stuttgart, ²IPNA, Basel
Bronze Age Land Use and Food Production in Southwest Germany According to Botanical Off-Site and On-Site Data

15.00 | Wiebke Kirleis, Kiel University
The Contribution of Gathered Plants to Daily Diet in the Bronze Age

15.30 – 16.00 Coffee break

16.00 | Almuth Alsleben, Akademie der Wissenschaften und der Literatur Mainz
Spatial Distribution of the Cultivation of Spelt Triticum Spelta within the North European Bronze Age Culture

16.30 | Susanne Jahns, Brandenburgisches Landesamt für Denkmalpflege und Archäologisches Landesmuseum
The Reflection of Bronze Age Settlements in Pollen Diagrams from Brandenburg, Eastern Germany

Wednesday 17th of April

9.00 | Tony G. Brown, University of Southampton
The Environmental Context and Function of Burnt-Mounds: Production Technology and Landscape in the Irish Bronze Age

9.30 | Jens-Henrik Bech*, **Anne-Louise Haack Olsen**, both Museet for Thy og Vester Hanherred, Thisted
Late Bronze Age Land Use in Aeolian Landscapes of Thy, Northwest Denmark

10.00 | Ginette Auxiette¹, **Rebecca Peake*¹**, **Françoise Toulemonde²**, ¹INRAP, Paris, ²Université de Paris 1
Food Production and Diet During the Late Bronze Age in the Upper Seine Valley (France)

10.30 – 11.00 Coffee break

11.00 | Verena Tiedtke, GS HDL, Kiel University
Grave, Pig and Pine – Animals and Plants in a Lusatian Urn Field

11.30 | Barbara Teßmann, Charité Human Remains Project, Berlin
Preliminary Results of the Anthropological Analysis of the Late Bronze Age Cemetery Müllrose in Brandenburg

12.00 | Poster Session:

Federica Badino¹, **Marta Dal Corso^{2,4}**, **Giulia Furlanetto¹**, **Renata Perego^{1,3}**, **Cesare Ravazzi¹**, **Marco Zanon^{1*}**, **Wiebke Kirleis²**, ¹CNR-Istituto per la Dinamica dei Processi Ambientali, Milano, ²Kiel University, ³University of Basel, ⁴GS HDL Kiel University
Cultural and Climate Interactions in the Last 5.5 ka Vegetation History from the Garda Lake Region (N-Italy). A Comparison of New Palynological Records from Three Small Lakes

Katharina Fuchs^{1*}, Nataliya Berezina², Julia Gresky³,
¹GS HDL, Kiel University, ²MSU Scientific Research
 Institute and Museum of Anthropology Moscow, ³DAI
 Berlin

Scurvy – Malnutrition in the Caucasian Bronze Age

Penny Johnston, Co.Cork, Carrigtwohill
*Archaeobotanical Results as a Key to Understanding
 Social and Political Status of Middle Bronze Age
 Settlements in Southern Ireland*

Astrid Röpke*, Lisa Bringemeier, Astrid Stobbe, all
 University of Frankfurt am Main
*Prehistoric Expansion of Animal Husbandry and
 Environmental Changes in the Northern Alps – An
 Integrated Archaeobotanical, Geoarchaeological and
 Archaeological Approach*

**Iya Shuteleva*¹, Nickolai Shcherbakov¹, Tatiana
 Leonova¹, Alexandra Golyeva², Vladimir Lunkov², Uliya
 Lunkova²,** ¹Bashkir State Pedagogical University,
²Russian Academy of Science, Moscow
*Kazburun Burial Settlement Complex of Southern
 Transurals: Paleo-Landscape and Ancient Communities
 of Srubnaya and Andronovskaya Cultures of the Late
 Bronze Age*

12.30 – 14.00 Lunch break

14.00 | Marcus Groß, Alisa Hujic, Eva Rosenstock*, all
 FU Berlin
*Back to Good Shape: Biological Standard of Living in the
 Copper and Bronze Age (Invited)*

**14.30 | Claudia Gerling*¹, Alistair Pike², Volker Heyd³,
 Elke Kaiser¹, Wolfram Schier¹,** ¹FUBerlin, ²University of
 Southampton, ³University of Bristol
Setting the Table in the Eastern European Steppes

15.00 | Alisa Scheibner, FU Berlin
*Changes after the Revolution: Uniformity or Diversity in
 Late Neolithic and Bronze Age Diets?*

15.30 – 16.00 Coffee break

**16.00 | Alessandra Varalli*^{1,2}, Gwenaëlle Goude¹,
 Jacopo Moggi-Cecchi²,** ¹Aix-Marseille Université,
²Università degli Studi di Firenze
*Investigation of Italian Bronze Age Dietary Patterns:
 An Anthropological and Multi-Element Stable Isotope
 Approach*

16.30 | Yvonne van Amerongen, Leiden University
Fish in Bronze Age West-Frisia, The Netherlands

Thursday 18th of April

9.00 | Andreas G. Heiss¹, Hans-Peter Stika*², ¹University
 of Natural Resources and Applied Life Sciences, Vienna,
²Hohenheim University
*Bronze Age Crop Production – General Tendencies in
 Europe from Early towards Late Bronze Age*

9.30 | Final discussion

SESSION 12

SOCIAL AND ENVIRONMENTAL CHANGE IN PRE-HISPANIC LATIN AMERICA

**Asterisk for presenting authors, if more than one author is listed*

Wednesday 17th of April

9.00 | Ian G. Robertson, Stanford University
Teotihuacan as a Socio-Ecological Phenomenon (Invited)

9.30 | Volker Soßna, Kiel University
Breaks and Continuities in a 3,000-Year Cultural Sequence in Southern Peru. Did Climate Cause Cultures to Vanish?

9.50 | Emily McClung de Tapia, Universidad Nacional Autónoma de México
Prehispanic and Colonial Landscape Dynamics and Transformation in the Basin of Mexico

10.10 | Anne Baker¹, Alex Chepstow-Lusty^{*2}, Michael Frogley², Tomasz Goral¹, Melanie Leng³
¹Natural History Museum, London; ²University of Sussex, ³NERC, University of Sussex
4200 Years of Environmental and Social Change from the Cuzco Region, Peru

10.30 – 11.00 Coffee break

11.00 | Bernhard Eitel, Fernando Leceta*, Bertil Mächtle, Gerd Schukraft, all University of Heidelberg
The Effect of Pre-Hispanic Agriculture Practices on Soils in the Western Cordillera of the Peruvian Andes (Region Laramate, 14.5)

11.20 | Alexander Herrera^{*1}, Jean Marie Ramel²
¹Universidad de los Andes, ²Ecole Nationale Supérieure de l'Energie, l'Eau, l'Environnement
The Hydrology of Ancient Peruvian Terracing: Tombs and Amuna Acquifer Recharge Systems at Awkismarka (Huaylas, Peru)

11.40 | Heather Richards-Rissetto^{*1}, Jennifer von Schwerin², ¹Bruno Kessler Foundation, ²DAI Bonn
Exploring the Value of 3D Landscape Visualizations for Investigations of Ancient Maya Socio-Environmental Dynamics

12.10 | Discussion

12.30 – 14.00 Lunch break

14.00 | David Beresford-Jones, University of Cambridge
The Collapse of Nasca on the South Coast of Peru: Reconciling New Perspectives (Invited)

14.30 | Dan Sandweiss, Daniel F. Belknap, both University of Maine
Peruvian Beach Ridges: El Niño, Landscape Alteration, and Population Dynamics since the Mid-Holocene

14.50 | Bertil Mächtle*, Bernhard Eitel University of Heidelberg
The Role of the ENSO System for the Creation of Pre-Hispanic Landscapes in Southern Peru

15.10 | Discussion

15.30 – 16.00 Coffee break

16.00 | Ralf Hesse, Landesamt für Denkmalpflege Baden-Württemberg
Tillandsia Macrofossils Record Changes in Fog Moisture in the Peruvian Coastal Desert

16.20 | Alexandre Chevalier^{*1}, Michèle Julien², Danièle Lavallée², ¹Royal Belgian Institute of Natural Sciences, Brussels, ²CNRS, Nanterre
From Foragers to Producers: Exploitation of Wild Plant Species and Desert Gardening at the Archaic Site of Quebrada de los Burros, Peru

16.40 | Summary of session chairs

16.50 | Final discussion

JOINT SESSION 13-14

MODELLING INTERACTION AND DATA MANAGEMENT

*Asterisk for presenting authors, if more than one author is listed

Wednesday 17th of April

Interaction, Diffusion and Exchange

11.00 | Sabine Reinhold, DAI Berlin
Diffusion of Innovation— Thoughts about Arrows, Packages and Communication Corridors (Invited)

11.40 | Phillip Stockhammer, Heidelberg University
Conceptualizing Cultural Encounter in Archaeology

12.10 | Jutta Kneisel, Oliver Nakoinz*, both ¹Kiel University
Modelling Spread and Diffusion of Cremation Burials in the Bronze Age Using Radiocarbon Dates

12.30 – 14.00 Lunch break

Space of Interaction and Network of Interaction

14.00 | Andrew Bevan, Tim Kerig* and Stephan Shennan, all University College London
Revisiting Space-Time Systematics and Neolithic 'Culture' Areas

14.30 | Laurie Tremblay Cormier, Université de Bourgogne
Cultural Identities and Interaction between the Rhine and Rhone Valleys from the 10th to the 5th Centuries BC

15.00 | František Trampota, Masaryk University, Brno
Pottery, Flints and Axes – Markers of Social Organisation, Trade and Cultural Exchange in the Neolithic in the Dyje/Thaya River Catchment (Moravia and Lower Austria)

15.30 – 16.00 Coffee break

Networks of Transportation and Trading Networks

16.00 | Jutta Kneisel, Kiel University
Modeling Hats – The Spread of Lid-Ornamentation

16.30 | Deborah Schulz, FU Berlin
Grave Goods as a Marker of Communication and Exchange. The Cemetery of the Late Roman Iron Age and Migration Period from Jänschwalde, Lower Lusatia

17.00 | Katrin Kermas, FU Berlin
Transportation Systems in Late Iron Age and Roman Period of Gallia Narbonensis – Data Mining in Networks and Dealing with Uncertain and Imprecise Data

Thursday 18th of April

Databases

9.00 | Benjamin Ducke^{1*}, David Bibby², ¹Independent research consultant, ²Digital Archaeology, State Heritage Pathways to Seamless and Low-Cost 3D Data Acquisition and Management (Invited)

9.40 | Nils Müller-Scheeßel^{1*}, Robert Hofmann², ¹Römisch-Germanische Kommission, ²Kiel University
The Human Factor: Measuring Man-Made Errors in the Input of Large Databases

10.10 | Christoph Rinne, Kiel University
Documentation and Data Storage Strategies: Old Concepts and Old Media

10.30 – 11.00 Coffee break

11.00 | Philipp Gerth^{1*}, Felix Schäfer¹, Frank Henze², Alexander Schulze², Nadine Magdalinski³, ¹DAI Berlin, ²BTU Cottbus, ³HTW Dresden
OpenInfRA – A Web Based Documentation System for Archaeological Research – Concepts and First Prototypical Implementations

11.30 | Armin Volkmann, University of Würzburg
DARIAH: On the Road towards a Digital Research Infrastructure for Archaeologists

12.00 | Martin Hinz, Kiel University
Data Base 2.0 – How Web Based Solutions Can Improve Archaeological Data Processing

Posters exhibited during the whole workshop:

Benjamin Ducke^{1*}, David Bibby², ¹Independent research consultant, ²Digital Archaeology, State Heritage Management, Baden-Württemberg
"Survey2gis": Open Source Software for Processing 3D Survey Data into GIS Data

Radim Hédl, Eva Jamrichová, Jan Kolář, Petr Kuneš, Jana Müllerová, Péter Szabó*, all Institute of Botany of the Academy of Sciences of the Czech Republic
Archaeological Data Management in an Interdisciplinary Environment

Felix Schäfer, Maurice Heinrich, Martina Trognitz*, all IANUS, Deutsches Archäologisches Institut, Berlin
IANUS – A New Centre for Research Data from Archaeology and Ancient Studies

SESSION 15

THE ARCHAEOLOGY OF POLLUTION

*Asterisk for presenting authors, if more than one author is listed

Wednesday 17th of April

14.00 | Jana Rogasch^{*1}, Peter F. Biehl², Jacob Brady², Ingmar Franz³, David Orton⁴, Sonja Ostaptchouk⁵, Eva Rosenstock¹, Elizabeth Stroud⁶. ¹FU Berlin, ²State University of New York at Buffalo, ³Freiburg University, ⁴University College London, ⁵Musée Nationale d'Histoire Naturelle Paris, ⁶University of Oxford
Valuable Waste: Refuse Disposal at Çatalhöyük West (ca. 6,000 – 5,500 BC) (Invited)

14.25 | Thomas Knopf, University of Tübingen
Prehistoric Societies between Overexploitation and Sustainability: Examples, Meaning, Context

14.50 | Walter Dörfler, Kiel University
Is There Any Pollution in Prehistory?

15.15 | Discussion
General Aspects of Theory and Method

15.30 – 16.00 Coffee break

16.00 | Ulrike Sommer, University College London
Salt, Fire, Cress and Fennel – How to Create Pollution (Invited)

16.30 | Johannes Müller, Kiel University
Non-Symbolic Waste and the Possible Reinterpretation of Ritual Sites

16.45 | Kay Schmütz, Kiel University
Waste Disposal in the Neolithic Enclosure Hundisburg-Olbetal

17.10 | Robert Hofmann^{2*}, Nils Müller-Scheeßel¹
¹Römisch-Germanische Kommission, ²Kiel University
Detrimental Waste Disposal Behaviour as a Trigger for Social and Economic Change? A Case Study from the Central Bosnian Neolithic (5,200 – 4,300 BC)

Thursday 18th of April

9.00 | Eylem Özdoğan, Istanbul University
Adapting to or Modifying the Environment: Changing Strategies between the Neolithic and Bronze Age Settlements in Kirklareli

9.25 | Detlef Gronenborn, Römisch-Germanisches Zentralmuseum, Mainz
Tribal Wastelands? Addressing the Topic of Pollution for Neolithic South-Central Europe

9.50 | Jutta Kneisel, Kiel University
Case Study Bruszczewo – the End of an Early Bronze Age Central Settlement Due to Ecological Mismanagement?

10.15 | Discussion

10.30 – 11.00 Coffee break

11.00 | Karen J. Taylor^{*1}, Aaron P. Potito¹, David W. Beilman², Beatrice Ghilardi¹, Michael O'Connell¹,
¹National University of Ireland Galway, ²Department of Geography, ²University of Hawaii at Manoa.
Palaeolimnological Impacts of Early Prehistoric Farming at Lough Dargan, County Sligo, Ireland (poster)

11.25 | Aleksandr Diachenko, Institute of Archaeology, Kyiv
Polluting the Peripheral Landscapes: Spatial Behavior and Socio-Economic Development of the Tripolian Populations between the South Bug and the Dnieper

11.50 | Mara Weinelt, Kiel University
Global View: Climate and Pollution in Prehistory

12.10 | Final discussion
"Pollution" – Local to Global Scale

ABSTRACTS

PUBLIC LECTURES

Terraces and Black Smiths in Southern Ethiopia: Environmental and Ethnoarchaeological Approaches

Engdawork Assefa¹, Hans-Rudolf Bork², Johannes Müller³

¹Department of Geography and Environmental Studies, Addis Abeba University, ²Institute for Ecosystem Research, Kiel University, ³Institute of Pre-and Protohistoric Archaeology

No abstract available

Landscapes above the Treeline: Archaeological Evidence from Prehistoric Sites in the Swiss Alps

Albert Hafner
Institute of Archaeological Sciences, Bern University

The alpine zone of the Alps was long believed to have been of no interest to farming communities from the Neolithic. Until the 1990s, only archaeological finds from the Bronze Age were found in considerable quantities. The discovery of the Tyrolian Iceman, who was murdered around 3300 BC in a remote alpine region and at a high-altitude, changed this view completely. Recent investigations in high-alpine pass sites and shelters show that access to the regions above 2000 m a.s.l. started even earlier. In the Holocene, Mesolithic hunters were the first to leave clear traces of activities. Neolithic and Bronze age herdsman followed from the 5th millennium BC onwards and palaeoecological research can meanwhile confirm first human impacts by examination of high-alpine lake sediments. In the Bernese and Pennine Alps, we have strong evidence of a prehistoric land use system ranging from the low inner alpine Rhone valley to high alpine landscapes.

Digging in the Dutch Mountains

Leendert P. Louwe Kooijmans
The Faculty of Archaeology of Leiden University

There are Dutch mountains, below sea level, and these are indeed a wonderful and unimaginable world. They exist as result of the rather exceptional landscape genesis of the Rhine/Meuse delta, people settled on them from the Mesolithic onward in true wetland living conditions, and created sites that soon after were sealed in by sediments as a result of the sea level rise. Research opportunities are great and rewarding because of the conservation of all kinds of organics, ranging from wooden artefacts to fish remains and human skeletal material and because of the stratigraphy and

undisturbed patterns. Discovery of these hidden sites is, however, not simple and we owe their disclosure to active amateurs, to major infrastructural works and the implementation of the Malta convention in Dutch law. Excavation is not easy in a technical respect and needs a broad multidisciplinary team. But the local communities, their way of life and the landscape they lived in can, nevertheless, be characterized in great detail.

I will focus on two sites, excavated in 1997 and 2003, and the contribution they may give to our knowledge of the process of neolithisation. One site – HARDINXVELD – is comprised of two Late Glacial river dunes in the middle of the intracoastal plain, in use from 5500 to 4500 cal BC, covering the final Mesolithic and the initial ('availability') phase of contact with agrarian communities (LBK, Rössen, Blicquy) farther south. The other site – SCHIPLUIDEN – is a coastal location on a low coastal dune in a former tidal environment, dated to 3800–3500 cal BC, and represents a settled community, which had integrated animal farming and crop cultivation into the traditional exploitation of the full range of wetland resources.

The detailed view that we have on these wetland communities contrasts in almost all respects to the view we have on their neighbours of the dry upland. This generates the question to what extent the people living in both regions were linked up with each other. Should we assume different 'wet' and 'dry' communities each with their own attitudes and ways of life, or were both regions intimately linked? How representative are the sequence and societal transformation as attested in the delta environment for the process in a wider respect?

Free from Hearth and Home: Neolithic Taskscape and the Emergence of Non-Kinship Social Institutions in the Near East

Cheryl Makarewicz
Institute of pre- and Protohistory Archaeology, Kiel University

In the Near East, the so-called process of Neolithization is frequently associated with the development of a complex social structure centered on households and lineage-based Houses. Placing primacy on kinship as a way of mobilizing labor and structuring societies, and ignoring other more fluid forms of social organization, has the unintended effect of introducing an element of rigidity, precluding the possibility of long-lasting political relationships that are not kinship based.

Here, I explore an alternative model that attenuates the primacy of kinship in defining Pre-Pottery Neolithic social structure through a re-evaluation of the role of households and labor in broader Pre-Pottery Neolithic economic systems, and identify mechanisms for the emergence of non-kin institutions. I propose that 'practice networks' embedded in taskscape provides a critical arena in which multiple actors could break the chains of kinship and operate outside of lineage lines to

negotiate social relations and pursue political goals on their own terms, and thereby provided an avenue for the development of complex societies. As individuals began to engage in subsistence and craft activities with more diverse groups, they forged connections and defined territories in ways that enabled the development of alternate, non-kin coalitions and the definition of common interests among diverse groups with overlapping, but non-congruent compositions.

Long-term Human Ecodynamics in the Heartland of El Niño: Climate and Culture on the Coast of Peru

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El Niño/Southern Oscillation is the most powerful driver of interannual climate change in the Pacific Basin. Sometimes changes are positive, such as a reduction in hurricanes. Often, however, El Niño is devastating--nowhere more than its heartland on the coast of Peru. There, torrential rains can ravage the desert landscape, destroying buildings, roads, canals, and fields and bringing plagues of insects and diseases. At the same time, the normally productive fishery is decimated. On the longer term, the synergy between earthquakes, rains, and wind can alter the landscape to make agriculture less sustainable. In this keynote address, I briefly discuss methods used to track ancient El Niños and I integrate archaeological and natural proxy records to explore the prehistory of El Niño over the 13,000+ years that people have lived in coastal Peru. Finally, I examine how this aperiodic, variable frequency phenomenon may have affected long-term human ecodynamics in the region by considering the interplay between individual, climatic events and extended alterations of climatic style.

SESSION 1**LATEGLACIAL FORESTATION TO HOLOCENE DROWNING**

**Asterisk for presenting authors, if more than one author is listed*

Of Hares and Men – Ancient DNA Analyses Indicate Mesolithic Translocation of Wild Animals to a Remote Island in the Baltic Sea

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The island of Gotland, located near the middle of the Baltic Sea, hosts a number of terrestrial mammalian species even though it has not been linked to the mainland and was covered with ice during the last glacial period. A majority of the terrestrial fauna now present on Gotland are known to have been brought there by people. One exception is the mountain hare (*Lepus timidus*) that was present on the island as early as 7400 BC. The questions on how and subsequently from where the mountain hare once reached the island must still be clarified. In this study, skeletal remains from prehistoric mountain hares are genetically analyzed to deduce their origins and genetic structures during different time periods, and also to discuss how they reached the island. A 130 base pair sequence of mitochondrial DNA from prehistoric hares was analyzed and compared to modern hares from different locations in Europe. The results show a discrepancy among the samples, creating two populations of different origin, which indicate that the female lineage of the mountain hare became extinct on Gotland at one occasion and that different events of colonization occurred on the island.

Deglaciation, Sea Level Changes and the Holocene Colonisation of Norway

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It has been known for a long time that large areas of the Norwegian coast facing the Atlantic Ocean were ice-free as early as the Allerød oscillation in the Late Pleistocene (approx. 11,800–10,600 cal BC). The vegetation, climate and landscape were probably quite similar to present-day Western Greenland and therefore habitable for humans. For this reason, the scientific literature on this topic is quite positive towards a possible human occupational phase on the western Norwegian coast as early as the Late Glacial period. In part, this argumentation is based on the presumed proximity between the Norwegian mainland and Doggerland that had been situated between present-day Denmark and Great Britain because of a much lower

global sea level. The agenda of this presentation includes the examination of the 14C-datings available from the oldest Norwegian settlement sites and compares them to the quaternary processes of deglaciation and sea level changes. The hypothesis put forth contends that humans did not settle the region of present-day Norway before a sheltering passage of islands and peninsulas had been created between the Swedish west coast (Bohuslän) and the Oslo area.

Fished Up from the Baltic Sea – A New Ertebølle Site Near Stohl Cliff Line (Bay of Kiel)

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In June 2012 scientific divers and students from Kiel University supported by the State Archaeological Department of Schleswig-Holstein excavated test trenches on a new Mesolithic site named “Strande”. Prior to this, two professional divers had found tree trunks and flint artefacts six metres below the surface. The site is characterised by different peat and organic silt layers, containing a large number of lithics as well as organic finds. These include wooden objects, botanical remains, bones of different marine and freshwater fish, as well as sea and land mammals. Notably, fragmented human bones were also found. Tree ring datings, radiocarbon dates of leister prongs, human bones and the inventory pinpoint the site to the older pre-pottery Ertebølle phase (5400–5000 BC). Sites of this time period are rare in the southwestern Baltic Sea area. Only very few sites, for example, Jäckelberg-Nord and Rosenfelde, have been examined in detail. Further investigations at Strande could give additional insights into the way of life during a time of rapid environmental changes. The inundation of land in the Baltic Sea area changed the habitat of humans within few generations. The Strande site illustrates, on the one hand, how humans kept their traditional way of living by hunting land mammals and, on the other hand, adapted to the new circumstances by using marine resources such as catching marine fish in the shallow waters, building log boats, and hunting seals.

It Is Not the Strength but the Duration (...) That Makes Great Men – Mid-Lateglacial Environmental Events and Their Impact on Hunter-Gatherer Societies in Western Central Europe

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The Lateglacial was characterized by significant changes in temperature and precipitation, which led to different water regimes and soil characteristics and consequently to variations in the floral and faunal communities. Hunter-gatherer societies are closely connected with their natural environments, for example, in their reliance on food and raw material resources. Therefore, these societies have to adapt to ecological changes. This interaction between the natural environment and social structures is reflected in the material remains preserved in the archaeological record.

In Western Central Europe, the second part of the Lateglacial was marked by two important events: the short-term eruption of the Laacher See volcano and the long-term climatic change of the Younger Dryas Stadial. These phenomena are compared in this study based on their respective impacts on the environment and the related adaptations of the societies who inhabited this mid-Lateglacial landscape. The violent eruption event seems to have had no sustainable impact on the environment in the regions buried by the fans of the Laacher See tephra, whereas the temperature decline marking the Younger Dryas led in some parts of Northern Europe to the re-establishment of permafrost conditions with concomitant more or less pronounced changes in the vegetation and the faunal composition. Comparable to these ecological changes, the modifications appearing in the Curve-Backed Point Group inventories following the volcanic eruption seem to be of a minor order, even in the vicinity of the Laacher See. By contrast, during the Younger Dryas a major change in the archaeological record can be noted, consisting in the appearance and dispersal of Tanged Point Groups which existed exclusively in the northern regions strongly affected by permafrost.

Reconstructing Local Environments – The Early Holocene Friesack Example

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The Mesolithic sites at Friesack (NE Germany) bear high potential for reconstructing the local environment of prehistoric settlements. Located in the Berlin-Warshaw ice margin valley approximately 500 m apart, two sandy ridges were occupied by hunter-gatherers between the

9th and 8th millennia BP. Due to the depositions in a bog area organic artefacts were well-preserved.

In this presentation we will focus on geological investigations and faunal remains of the sites of Friesack 4 and Friesack 27a as a basis for an environmental reconstruction of the local area in the Mesolithic. Other aspects, such as pollen diagrams and wooden remains, are also used to complete the image.

Duvensee 13 – A Reevaluation

Niklas Hausmann

The King's Manor Department of Archaeology, University of York

The Mesolithic site of Duvensee is famous for its preservation conditions and detailed insights into hunter-gatherer nut exploitation. In recent times, the importance of roasting activities at dwellings in later parts of the site has been the centre of discussion. This study discusses the results of the reevaluation of the final roasting events at the late boreal dwelling 13.

A more thorough analysis of the lithic assemblage and the excavation documentation confirms earlier assumptions about the lithic industry. It also reveals characteristics of the spatial distribution that refute the prior interpretation of a single hearth area.

The results rather indicate a wider use of roasting and a more complex use of the lake area than simple hazelnut exploitation around a single hearth. This raises questions on the seasonal importance of not just dwelling 13, but all the sites around Lake Duvensee and suggests a longer period of occupation than only in late summer and fall seasons.

Upcoming research will have to work around the prominence of hazelnuts in Duvensee when excavating additional dwellings along the lake or rethinking Mesolithic activities around the site.

Hunter-Fisher-Gatherers in the South of the Northern Lowlands

Carmen Liebermann

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The lignite open-pit mines of Nochten and Reichwalde in Upper Lusatia, Germany contain a wealth of Mesolithic finds and provide evidence suggesting changes in population dynamics during this period. The mining sites are located at the Lusatian ice-marginal valley in the southern part of the North European Plain. Since the Late Glacial period, the area has been reshaped by wetlands, dunes and coversands, making this region favourable for Late Palaeolithic and Mesolithic occupation. Most of the archaeological sites investigated to date by the Archaeological Heritage Office Saxony (LfA) in Nochten and Reichwalde belong to the Mesolithic and are generally vast and abundant. As they are located on sandy soils,

lithic material is the most important find category. A first analysis with mapped typo-technological attributes and AMS-dates indicates that the site complexes are generally not inextricable palimpsests, but can rather be differentiated according to time and space to a certain degree. This evidence suggests a succession of phases of human presence and of potential depopulation phases. There is currently a lack of radiocarbon data for Younger Dryas and Holocene campsites in Upper Lusatia, although single finds have been uncovered. However, campsites from the Late Mesolithic can be subdivided according to absolute dating and typo-technological properties. Details regarding the transition to the Neolithic are still scarce. Intensive field work in the flood plain of the Weißer Schöps River recently uncovered Neolithic sites and a palaeobotanical record which reveal promising new data for the period between 5500 cal BC and the onset of the Bronze Age. Finally, the results are presented in context with neighbouring regions, showing the supra-regional importance of Nochten and Reichwalde during the Mesolithic and the beginning of the Neolithic in Central Europe.

Mesolithic Hunter and Fisher in a Changing World – A Case Study on Late and Terminal Mesolithic Sites in Wismar Bay, Mecklenburg-Vorpommern, Germany

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In the 7th and 6th millennium BC the late and early terminal Mesolithic hunter/gatherer populations of the North European plain were confronted by massive changes of their environment not only by the increasing reforestation of the landscape but also by the rapid sea-level rise of the world ocean. This process led to the final flooding of the Baltic basin and to the origin of the present Baltic Sea. The investigation of the reaction of man on this fundamental environmental change was a main task of the geoarchaeological work group of the interdisciplinary DFG Research Unit "Sincos" (www.sincos.org) from 2002 until 2009.

One of the main regions of investigations was Wismar Bay in western Mecklenburg-Vorpommern. Several stone age sites were located in 6.5 up to 11 m deep water north off Poel Island. The sites are belonging to different phases of the Late Mesolithic and the Early Terminal Mesolithic between 6,500 and 5,000 BC. The best preserved sites were further investigated by underwater archaeological excavations. The paper will give a brief overview about the most important and newest archaeological and archaeo-zoological results of the investigations.

Land Use in Mesolithic Northwestern Germany

Svea Mahlstedt
Wildeshausen

More than 80 Mesolithic surface sites from four sampling regions in Northwestern Germany have been recently investigated with regard to the use of the landscape during this period.

The sampling regions of a size between 160 and 800 km² represent a large variety of landscape features: dry sandy areas with and without bigger rivers, a region characterized by the flood plain of a bigger river and another dominated by a larger lake. The Mesolithic settlement structures and intensities are quite different as well: Mesolithic settlement activity was much higher where open landscapes coursed by water level changes can be reconstructed than in the areas where dense forests defined the landscape.

Despite these differences and the generally expected palimpsest character of surface sites, multivariate analysis led to the assumption that the microlith combinations indicate an average age of the sites from all sampling regions. This would mean that certain sites were in use during an early phase of the Mesolithic and then abandoned, whereas other sites came into use in a later phase. Only a few bigger sites give the impression to have been in use throughout the entire Mesolithic. Bringing together the relative ages with environmental features of each site, a change of landscape use during the course of the Mesolithic can be traced. Three of four sampling regions show a shift of site positions that also can be found in an even more distinct manner in the nearby Netherlands: While earlier sites were situated in exposed and dry places, the younger ones tended to be located throughout the landscape in lower, sheltered and wetter places.

The ecological reasons for these settlement structures and distributions are going to be discussed in this paper as well as matters of orientation, tradition and territory.

Hunter-Gatherers and Climate Change from 10,000 – 8,000 BC: A Changing Lakescape in the Vale of Pickering, UK (Invited)

Nicky Milner
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The Preboreal is a key period in the human past following major climate changes at the end of the Ice Age. However, the human record for the Preboreal in Europe is extremely fragmentary and consequently poorly understood. There is a significant lack of dated archaeological sites and only a handful of these have produced well-preserved organic remains. Those sites that do exhibit such remains have an enormous potential to link palaeoclimate and palaeoenvironmental records with past human activity,

but archaeologists and palaeoclimate scientists have rarely taken advantage of each other's data.

The ERC funded POSTGLACIAL project sets out to implement an interdisciplinary, high-resolution approach to understand hunter-gatherer life cycles within the context of climate and environment change during the early part of the post-glacial period (ca. 10,000–8000 BC) in the Vale of Pickering. It examines three sites. The first of these, Star Carr, is one of the most famous Mesolithic sites in Europe which still yields exciting new discoveries, e.g. the "Earliest house in Britain" and an extensive platform of worked wood. The second is nearby at Flixton Island, first discovered in 1947 and mentioned in the Star Carr monograph. This was excavated again in 2012, revealing evidence for long blade technology and horse butchery, thus providing a picture of hunter-gatherer activities in the area before Star Carr was settled. The third site has been newly discovered, again on Flixton Island, but here the technology is of Deepcar type and probably dates later than Star Carr. The three sites together provide an insight into hunter-gatherer activities through time, but importantly, the archaeological picture is linked to high-resolution climate and environment data taken from the adjacent lake core records.

This paper will present the most recent research around the palaeo-Lake Flixton, examining changes in climate, environment and human activity through time.

Integrated Records of Biome Changes during the Last Glacial-Interglacial Transition in Europe (Invited)

Heikki Seppä

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The last glacial-interglacial transition from about 14.9 ka to 10 ka BP is characterized in Europe by a general warming trend, punctuated by abrupt warming and cooling episodes and by the deglaciation of the Scandinavian Ice Sheet with the associated fast exposure of new landscapes. Therefore, it represents a unique time period to use fossil evidence to explore the biotic responses and interactions during major natural environmental changes and perturbations and provides an ideal setting to use fossil records as an "ecological laboratory". The synthesis of abundant, wide-spread, and increasingly high-resolution pollen, plant macrofossils, plant and mammal megafossils, and other fossil records reflects the impact of warming and cooling episodes on plant and animal communities and ecosystems in the paraglacial region and documents the immigration of new plant and animal species to the ice-free regions of Northern Europe. When these biotic records are integrated with independent palaeoclimate datasets and the mapped deglaciation history, the plant and animal abundance and distribution dynamics that underlie the origination and termination of biome shifts

can be comprehensively reconstructed. The preliminary results of this synthesis show the consistent shifts in plant and animal communities at the beginning and the end of the Greenland Interstadial 1 (Bølling-Allerød) and highlight the unique and complex nature and properties of the paraglacial biome during the Greenland Stadial 1 (Younger Dryas) particularly in the surroundings of the Baltic Sea. The causal links between these biotic reorganizations and the nature of the abrupt climate switches are discussed.

The Palaeolithic and the Mesolithic in the Territory of Lithuania: Current State of Research

Monika Zemantauskaite

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This presentation provides an overview of the current state of knowledge and research on the Palaeolithic and the Mesolithic in Lithuania. It covers the scientific development in this field over the last twenty years of the independent country and highlights key problems in the research of the Pleistocene and the Early Holocene. Results of investigations are often published in Lithuanian, limiting the accessibility of the results to foreign researchers.

Research concerning the initial occupation of Lithuanian territory is still relevant, but a suspended issue. According to environmental reconstructions, after the retreat of the Weichselian glaciation, rather favourable climatic conditions were already present during the Bølling. In contrast, archaeological evidence does not support the presence of human activity before the Allerød. Despite the latter situation, some researchers attempt to argue for the opposite. The absence of absolute dates of excavated sites dated to the Final Palaeolithic leaves researchers with vast collections of surface finds or single artefacts/ecofacts identified as Palaeolithic in mixed assemblages from multi-period sites. Any cultural affiliation and periodisation of the Final Palaeolithic in Lithuania should therefore be treated with caution.

Archaeologists assume that a radical change in climate, i.e. the beginning of Holocene, triggered a change in material culture as well. Evidence from investigated sites in Lithuania and neighbouring countries indicates that Mesolithic settlements were established in varied environments, demonstrating well-developed adaptation strategies to adapt. Mesolithic settlements are found on the seacoast, as well as on the banks of rivers, lakes and lagoons. In the case of Lithuania, Mesolithic remains are often found in sandy, multi-period sites, what again limits possibilities for absolute dating. Because of the poor preservation of organic material in mineral soils and the lack of in-depth studies of recovered artefacts, we know relatively little about the social organization of Mesolithic communities.

SESSION 2 CIVILIZATIONS, RIVERS AND THEIR FLOODPLAINS THROUGHOUT THE HOLOCENE

**Asterisk for presenting authors, if more than one author is listed*

Colonial Soil Loss Fingerprinted and Quantified over Multiple Timescales in the Christina River Basin (Pennsylvania, USA)

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Intentional and unintentional anthropogenic land-use is a major geomorphologic factor and can re-contour entire landscapes. This study investigates anthropogenic influences in the form of agriculture, urban and suburban development, and second-growth-forest on erosion and vertical soil mixing rates within a river basin.

The catchment area of the Christina River Basin (CRB, Pennsylvania, USA) provides ideal conditions for this research. Before European settlement of the eastern part of the USA during the 1600s, there was little human impact on the landscape. Since European settlement, land-use has changed significantly because of deforestation, agricultural land-use, construction and breaching of mill dams, suburban land-use and afforestation. A quantification of sediment sources, sediment erosion and channel deposition over different time scales is the key focus of this research, using long-lived (meteoric ^{10}Be) and short-lived (^7Be , ^{137}Cs , ^{210}Pb) fallout radionuclide concentrations in different soil profiles. These radionuclides are easily adsorbed onto sediment particles when deposited on the soil surface and record sediment redistribution.

In this study, radionuclide inventories in undisturbed soil profiles are determined to characterise natural profiles and are subsequently compared to corresponding radionuclide concentrations of disturbed soil profiles. This allows us to quantify the movement of eroding top soils, from hill slopes to river bottoms, as well as erosion rates and vertical soil mixing rates at different time scales. The criteria used to determine suitable reference or natural sample sites include: no major sediment deposition or erosion had taken place, and the inventory used represents the expected radionuclide fallout of the catchment area and its subsequent radioactive decay.

Investigating floodplain development using the short-lived radionuclides ^{210}Pb and ^{137}Cs gives an insight into the erosion history of the watershed within the last 100 years. Initial ^{210}Pb and ^{137}Cs results of floodplain locations suggest that even small floodplains in the CRB watershed are still active, even though no change in land-use is occurring.

Landscapes of the Lower Valley of the Oued Loukkos (Province of Larache, Morocco) since the Middle Ages: Paleoenvironmental Data and Historical Sources

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The study area is a geographical entity organized around the floodplain of the lower river valley of the Oued Loukkos and the historic cities of Lixus and Larache. Owing to the dual natural and historical heritage of this area, the reconstruction of the recent history of its vegetation and its landscapes is particularly relevant.

In light of its former occupation in prehistory and antiquity, the area of Larache has played an important role in the Middle Ages and modern times with regard to the greater or lesser strained relations between Morocco and European powers. In history, the Loukkos River has always been a route of penetration inside the country and its mouth a strategic site. Since the 16th century, the port of Larache was also the main export outlet for products (cork, grains, wool) of Gharb and great cities of the hinterland such as Basra or Fez.

Based on a pollen diagram obtained in an adjacent valley, we propose here to reconstruct the outline of recent vegetation history (since the 14th century), especially the wetlands of the floodplain and the cork oak forest, which is the natural vegetation of the area. This information will then be associated with historical sources to assess the various factors of landscape dynamics identified since medieval times. The roles of different waves of Arabo-Berber populations and the need for economic exploitation of the forest to fight several attempts of Portuguese, Spanish and English occupation are examined.

Degradation of the forest is old because it occurred on the territory of the cork oak forest where clearing activities took place, mainly for cereal cultivation. Livestock and other human activities, such as logging for charcoal production, the firing of many lime and pottery kilns, as well as shipbuilding or fires due to incessant wars, also contributed to forest degradation.

Fossa Carolina - Bridging the Central European Watershed

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The Central European Watershed passes the Southern Franconian Jura in Bavaria, Germany, where it divides the Rhine-Main and the Danube catchments. In early medieval times when ships were an important means of transportation, Charlemagne decided to connect both

catchments by the construction of a canal that is well-known as Fossa Carolina (Karlsgraben).

Despite the important geostrategic significance of the construction, it is still uncertain whether the canal could ever have been used as a working waterway. In this study we present new 14C data from the continuous peat layer of the central part of the fosse. The 14C data document peat growth during Carolingian times and especially during the High Middle Ages. High-resolution stratigraphic records of the central trench fillings derived from grain size distributions and from peat and sapropel classifications indicate clear evidence for a limnic facies, suggesting the existence of former ponds. However, the majority of these limnic facies can be pinpointed to the High Middle Ages. The question whether the ponds were effectively used as a waterway needs to be further examined in geoarchaeological and archaeological studies.

And a River Runs Through...Environmental and Cultural Change Around 6000 in the Konya Plain, Turkey

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The Konya Plain in Central Anatolia is drained and irrigated today, but geomorphological research has revealed the Holocene history of this landscape as a wetland environment fed by a number of rivers originating in the surrounding Western and Central Taurus ranges. Çatalhöyük, with its two tells spanning a settlement history from the end of the 8th to the middle of the 6th millennium, is situated on the Çarşamba Çayı which formed the site's Neolithic lifeline. This paper will discuss possible changes of the river in the context of the shift of occupation from the East Mound to the West Mound at Çatalhöyük around 6000 cal BC as well as of the changes of settlement patterns from a single large site at Çatalhöyük East to a dispersed settlement pattern of smaller sites across the Konya Plain and of the significant changes in subsistence strategies, architecture and material. A connection with the '8.2k cal BP climate event' is tempting, and it could be argued that changing flood regimes and soil and water availability affected the suitability of individual areas for human occupation and necessitated the changes visible at Çatalhöyük and across the Konya Plain. However, it has to be kept in mind that some of these changes were already underway at the end of the 7th millennium on the East Mound and that some of them may be part and parcel of supra-regional trends which have been termed the "Painted Pottery Revolution" or the "Second Neolithic Revolution". Evidence of anthropogenic landscape degradation also

has to be considered before the collapse of settlement in the Konya Plain by 5500 cal BC can be viewed as the ultimate end of a climate-induced failure story which spurred the Neolithisation of Western Anatolia following the Çarşamba River up into the Lake District. Integrating zooarchaeological and archaeobotanical data on, for example, continuing use/deposition of wetland vegetation from the E to the W mound sequence with the material culture evidence, this paper discusses the role of the Çarşamba Çayı for the rise and fall of Holocene settlement in the Konya Plain.

Development of the Yanjuangou River near Yan'an (Shaanxi, China) during the Holocene

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The Huang He ("Yellow River") with its tributaries is a hot spot of fluvial dynamics and sediment transport due to intensive soil erosion on the Chinese Loess Plateau. The development of the small river Yanjuangou and its catchment (36°42' 6" N, 109°31'17" E) during the Holocene was investigated in detail. The Yanjuangou catchment has a total size of 2.02 km² at an elevation of 1056–1273 m a.s.l. It is a second order tributary of the Yan River, which drains into the Yellow River. The loess sediment has a thickness of more than 200 m and the Yanjuangou deeply cut into the loess sequence during the younger Pleistocene.

After natural vegetation removal during the Neolithic, vertical erosion by the Yanjuangou River was intensive. A strong modification of the landscape structure (reduction of field sizes) around 4700 cal BP reduced runoff generation and soil erosion on the slopes of the catchment until 1958 AD. Only minor vertical erosion occurred during this period. The campaign of the "Great Leap Forward" from 1958 until 1961 with the establishment of people's communes changed land use and landscape structures drastically. Thus, runoff generation and soil erosion increased by 3.000% to 20.000% in the Yanjuangou catchment. Check dams were established in the floodplain of Yanjuangou and huge amounts of loess were stored in the reservoirs above the dams.

'Natural' Streams in Europe: An Eco-Historical Model

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In Europe as in North America the prevailing model of 'natural' streams has been incised-meandering channels with silt-clay-dominated floodplains, and this model is the template to which streams are currently being

restored. This has been questioned for the Mid-Atlantic region of North America with present floodplain-channel-form being ascribed to the construction of weirs, and it has been postulated that this might also have occurred in Europe in the Medieval period. This paper tests this proposition using both geological and historical data from across Europe and goes on to examine the implications for channel-floodplain restoration and carbon sequestration. The stratigraphy and dating of floodplain sediments shows that early Holocene, pre-impact, European streams of orders 1-5 were frequently multi-channel anabranching (anastomosing) systems, often choked with vegetation and with high organic storage both in-channel and in wetlands. In most cases floodplains were either non-existent or limited to adjacent organic-filled palaeochannels, spring/valley mires, flushes and hydromorphic soils. During the mid-Holocene and particularly 2-4 ka, overbank silt-clay deposition transformed floodplains covering former wetlands and silting up secondary channels. This was followed by the management of floodplains to the point in the Medieval period when floodplain-channel systems were managed as part of a mill-based technological system. The final transformation in this sequence was the 'industrialisation of channels' through hard-engineering. The primary factor in this transformation was accelerated soil erosion caused by catchment deforestation and arable farming but with sediment delivery reflecting climatic fluctuations. Medieval mills, weirs and other channel modifications although part of the second transformation of the floodplain system, never obstructing the full width of the floodplain but perpetuating a spatially complex integrated water-land management system which had high biodiversity and appears to have been hydrodynamically stable. Unlike the situation in North America where channel-floodplain transformation was rapid and associated principally with the construction of valley-spanning water-mills, the transformation of European streams has taken place over a much longer time-period with three phases; catchment driven sedimentation, Medieval management and industrialisation. This has significantly reduced the role of floodplains and channels as carbon sinks. Due to a combination of catchment controls, ecological change and the cultural value of this historical legacy it is both impractical if not impossible to restore European rivers to their pre-transformation state, however, attempts to restore them to intermediate historical (pre-industrial) states with some areas of anabranching channels, floodplain woodlands and managed wetlands will have both ecological and carbon offset benefits. Sustainable restoration designed to maximise ecosystem services must be predicated on the awareness that modern European, as well as American streams, are imprisoned in the banks of their history.

A Medieval Meadow Established in an Alder Alluvial Forest: A Case Study from the Eastern Sudetes

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The pollen analysis of the Pstruží potok mire illustrates the medieval establishment of hay meadow land-use. At middle altitudes in the Czech Republic, meadows were generally established close to water streams, ensuring sufficient wetness and nutrient input. The pollen record provides evidence of vegetational change from alder-spruce alluvial forests with *Lonicera cf. nigra*, *Sambucus nigra*, *Valeriana officinalis* and *Lycopodium clavatum* in the undergrowth to meadows with grasses, sedges and a variety of herbs (*Potentilla*, *Ranunculus*, *Peucedanum*, *Cirsium* or *Caryophyllaceae*). At the same time, weeds and crops became abundant in the pollen record as well. Vegetation change is dated to 1160 AD, however, alder clearance already started in 870 AD. In historical sources, the first record of stable settlement in the area dates to the 13th century; earlier there is evidence for the irregular presence of humans close to mining sites in the region. However, the pollen analysis of the Pstruží potok mire demonstrates the presence of farmers prior to the 13th century and provides detailed documentation of the transition of natural alluvial forest to artificial grassland.

Driving Forces of Holocene Fluvial Dynamics of the Guadalete River (SW-Andalusia)

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The river Guadalete runs through the southwestern part of Andalusia (Spain) with its river head being located in the heights of the Sierra de Grazalema. On its course into the Bahia de Cádiz, the Guadalete passes a landscape of high sensitivity. Because of steep gradients in the headwater and several constructions of water reservoirs along the upper course, only the lower reaches of the river are suitable to reconstruct Holocene river history. The fluvial architecture is quite complex and shows phases of river aggradation, river stability including features of soil formation inside the sediment and phases of incision as well. However, fluvial behaviour and resulting sediment characteristics are likewise dependent on valley geometry as well as on land use changes and climatic modifications.

Particular landscape sensitivity is expressed by local tectonic activity primarily forced by the tilting of the marly Keuper substratum, as well as by high erodibility of the surrounding marl landscape, which underlies intense land usage.

Several profile analyses of gravel pits and corings enabled us to compile a standard profile, which provides information about the Holocene river history. In our

presentation we attempt to describe causes and effects of different sedimentation patterns, providing them with a chronological framework.

Human Occupation and Paleoenvironment in Mali During the Last Two Millennia: Examples of the Guringin and the Yamé Rivers

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Riverbanks and floodplains in Mali have been densely occupied during the last two millennia. Access to fertile land and water resources, as well as proximity to a means of transport which allowed trade are some factors that have contributed to human settlements in that landscape. From an archaeological point of view, the presence of hundreds of tells, i.e. artificial mounds resulting from the accumulation of debris of long-lived settlements built with mud brick, testify a great intensity of occupation between the 8th century BC and the 15th century AD. To illustrate this, we investigate Sadia, an archaeological site located on the Seno Plain in the valley of the Guringin River. Consisting of five distinct settlement mounds, it has been occupied since the 8th century AD and was abandoned at the end of the 13th century AD, as were many further tells in the Niger Bend. Scholars agree that the massive abandonment of these sites resulted from a combination of several factors, including climate change, political unrest and/or convergence of the population towards new emerging cities. In the Guringin Valley, twenty other tells have been identified, indicating that this region had attracted people in the past when more favourable conditions prevailed. Currently, the valley drains seasonal flows from the Bandiagara Plateau. It is an endorheic system characterized by temporary flows triggered during major rainstorms. These flows fuel pools that are active for six to seven months per year. These pools may have existed steadily and consistently over the last two millennia, providing a focal point for past populations who were able to exploit the potential of wetlands for agriculture, fishing, hunting and gathering for several centuries, as evidenced by the remains unearthed at Sadia. Archaeological and paleoenvironmental data of the Yamé River are also highlighted here to illustrate the interaction between human occupation and environment in Mali during the past.

The Missing Link: Feedbacks Between Climate and People via Fluvial and Coastal Dynamics (Invited)

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Geology & Geophysics, Woods Hole Oceanographic Institution

The development of early human civilizations was intimately linked to water availability. Changes in climate were thus more directly perceived through changes in rainfall patterns, river discharge, floods, and droughts rather than changes in temperature. Reconstructing the dynamics of large rivers as integrators of regional hydroclimate may provide the missing link between the evolution of human cultures and changes in climate. Using our recent studies and work in progress, I review several cases of large scale feedback between climate and humans via large rivers.

First, recent evidence indicates that fluvial landscapes in the Indus Basin Plain were largely fossilized during the Late Holocene, which provides an opportunity to explore the rise and fall of the oldest urban civilization on the Indian Subcontinent: the Harappa. Within our "Goldilocks Hypothesis", dependence on flood agriculture can explain the first occurrence and distribution pattern of archeological sites in the region as well as provide direct insight into the survival strategies of the Harappans after the monsoon declined.

Second, the combined measurement of continental and marine proxies from a core in front of the Godavari mouth provided the highest resolution reconstruction of the Holocene monsoon in peninsular India. One significant finding suggests that decadal to centennial variability in climate, rather than longer term trends, was crucial in the early development of agriculture in the region. However, the potential effects of agriculture may have also altered the landscape early enough to complicate onland and marine signals that remain to be detangled.

This topic is more vividly illustrated by the Danube and Ebro basins. In both watersheds, medieval to modern land use changes led to significant modifications of the river morphology, rapid delta expansion, and floodplain aggradation. In the case of the Danube River, this also included a complete transformation of the biogeochemical and ecological characteristics of the semi-enclosed Black Sea basin.

I conclude that without understanding the antiquity of anthropogenic signals and the potential feedback loops between humans and climate our Holocene palaeoclimate reconstructions may remain significantly imprecise.

The Legacy of Mill Dams in Low-Order Streams in Central Europe

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Historic dams of largely unknown age are a widespread feature within German 1st to 3rd order streams. It has been proposed that accelerated slope erosion due to deforestation and agricultural land use has been the reason for the aggradation of some Central European floodplains, however this process only explains the delivery of sediment to these rivers. First results show that valley bottom damming was also a critical mechanism for the effective trapping of this increased sediment load. In this study, we determine the onset and magnitude of this first impact of humans on riverscapes as a result of valley bottom damming, and examine the management implications. The extensive sedimentation of loam floodplains was precipitated by dam induced changes to the flow regime and, in turn, caused the observed (stratigraphical) change of the channels from multithread to meandering. This floodplain loam also blankets palaeo-wetland soil, which formed efficient carbon sinks. A modeling approach combined with the quantification of such stored sediments enables us to predict potentially remobilised sediments after dam removal.

Late Quaternary Landscape Evolution and the Historic Rise and Fall of Mid-Atlantic US Streams (Invited)

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Our study of 1st to 4th order watersheds in the unglaciated mid-Atlantic eastern US led to a new understanding of landscape evolution and geomorphic response to European settlement. Rather than the classic model of a single-thread meandering stream channel generating a broad floodplain over geologic time, stable Holocene wet meadows with small, vegetated multi-branching channels were converted to single-thread channels incised into historic millpond mud over centuries. Understanding this geologic record is crucial to riparian ecological restoration strategies in regions affected by these widespread historic phenomena. Tens of thousands of low-head waterpower dams constructed between ca. 1700 and 1900 led to regional base-level rises of >1.2 m that coincided with increased upland soil erosion rates from deforestation (including that for charcoaling), mining, and agricultural cultivation. Massive volumes of fine-grained upland soil entered valley bottoms and buried pre-settlement landscapes. For ~150 years, reservoirs filled with fine sediment, culminating in “valley

flats” mistaken for natural floodplains. Historic sediment wedges (1 – 5 m) thicken downstream to milldams and taper upstream. As water-powered milling ceased (late 19th – early 20th c.), base-level fall due to dam breaching (intentional and natural) led to incised streams with high banks of fine sediment. From lidar topography and field mapping, we document a doubling of channel gradient for hundreds of km of stream length. Incision stops at the regional groundwater table at a ca. 0.5-2 m thick Pleistocene periglacial lag gravel, overlying sub-planar bedrock. In turn, basal gravels are overlain by ca. 0.3-0.6 m of Holocene wetland soils. Microstratigraphy, radiocarbon dating and macrofossils indicate long-term stability and resilience of sedge-dominated wet meadows that produced organic-rich mucks since the early to mid-Holocene. Two remnants of unburied wet meadows at locations with no milldams are “living fossil” landscapes. With no equivalent in the late Quaternary sedimentary record, modern incised stream-channel forms in the mid-Atlantic region represent a transient response to base-level forcing and major changes in land use beginning centuries ago. Similar channel forms might exist in other locales where milling was prevalent. These channel forms can be decoupled from current land use. Even with no increase in storm water runoff or reduction in upland sediment supply, e.g., a breached dam causes incision, channel steepening, stream bank erosion, and increased suspended sediment loads.

Floodplains or Dune Fields? Environmental Settings of the First Food-Producing Cultures in West Africa

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During the third millennium cal BC, West Africa faces the beginnings of a general trend towards aridity and witnesses major socio-economic innovations, including the emergence and development of food-producing civilizations. In the last 20 years, direct AMS dates on botanical remains and well-dated archaeological contexts have increased knowledge on the emergence of food production. Agriculture is thus certified at the Sahara-Sahel interface from 2,500 cal BC by the appearance of domestic pearl millet (*Pennisetum glaucum*). In a first step, pearl millet cultivation may have been a secondary livelihood strategy practiced by fairly mobile groups with a still largely pastoral economy. From 2,000 cal BC, the expansion of agriculture then seems to play an important role in key processes of diffusion and acculturation in the Sahel-Sudanian belt of West Africa. However, the sub-regional environment associated with the emergence of production and the processes of anthropisation which led to the creation of the current landscapes remain poorly understood. Current knowledge is insufficient

to assess the role played at this time by the great river valleys (Niger, Senegal) in peopling events, but certain types of wet environments like the floodplains of seasonal watercourses or the vicinity of temporary ponds may have been favored by early farmers. These types of environments match the soil conditions of existing wild pearl millets (*Pennisetum violaceum*), whereas domestic pearl millets rather grow on well-drained sandy soils. This paper proposes a general review of hydrological, soil and vegetation parameters associated with the early evidences of West African agriculture between 2500 and 800 cal BC, in order to better understand the mechanisms of food production emergence and to assess the potential importance of secondary rivers for the diffusion of agriculture in the Sahel-Sudanian area.

Landscapes and Lifestyles at Neolithic Vinča – Belo Brdo (5600 – 4200 BC), Serbia

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The shift to a warmer and a more humid climate at the beginning of the Holocene in the Mediterranean region (compared to the dry and cold conditions of the Late Pleistocene) led to the expansion of mixed deciduous forests and forest undergrowth in the Balkans and the formation of Early Holocene palaeosoils. In this paper, the Early Holocene environmental developments and subsequent changes are explored at a micro-regional level along the lower parts of the Sava and the Tisza Rivers in Serbia, i.e. the area where they join the Danube, and in relation to several Neolithic settlements located in this area. Central to these considerations are newly available data from palaeoenvironmental and archaeobotanical studies at the long-lived Neolithic site of Vinča, Belo Brdo on the Danube near Belgrade. The results of recent palaeopedological, micromorphological, macro-botanical and archaeological investigations of the site, as well as relevant information from historical maps, satellite imagery, and on- and off-site coring, have been put together in order to reconstruct the environment prior to and during the Neolithic occupation of the site. The possible link between changes in the landscape and the settlement pattern at Vinča are explored against the backdrop of a dynamic fluvial system of the Danube and its nearby tributary (the Bolečica), particularly in terms of the evolution of soils underlying and surrounding the site as well as the vegetation types represented in the botanical assemblage. The emerging evidence points to a strong correlation between the changes in the Holocene environment and human behaviour, as seen, for example, in the choice of exploited natural resources, settlement size, architecture and perhaps also technology. Possible indicators of the same/similar trends at other Neolithic

sites in the region (e.g. Gomolava, Starčevo, Opovo) are explored.

The Valley of Connections and Divisions – Kostolianska dolina Valley, Slovakia

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The Kostolianska dolina Valley is situated in the Carpathian Mountains (Tríbeč) on the border of the Panonian Basin, represented by a loessic hilly land. The catchment has strongly diversified bedrock, mineral resources, local climate and soils. Its northern part has a characteristic colder climate, more precipitation, steeper slopes, shallow soils and forests. In the southern part with smooth slopes and fertile luvisols, agriculture predominates. Human activity in the catchment has been verified since the Paleolithic. Throughout history, settlement moved between the floodplain, slopes and mountains ridges so that land use consequently changed. In the Neolithic, the valley was settled, whereas the Lusatian culture preferred the mountain ridges. In the first half of the 10th century, the church of St. George, unique in Europe, was built at the northern situated village of Kostolany pod Tríbečom, which increased the cultural importance and extended connections to other religious centres. During medieval and modern times, the Drevenica River was a border of two different administration units and an ethnic border existed between the northern and southern parts of the valley. Recently, land use was unified in the mid-20th century during a so-called collectivization process. However, the archaeological sites are well-preserved in the Kostolianska dolina Valley and therefore the reconstruction of the settlement, of land use and human impact on the environment in different historical periods and a comprehensive overview of cultural history is possible. The effect of various environmental and cultural influences can be characterized. We present preliminary results of the interdisciplinary research project “Cradles of European Culture-Francia Media 850–1050” and acknowledge the support of the EC Project 2010-0653.

The Holocene Fluvial Dynamics of the Marneuli Depression in Eastern Georgia

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The Marneuli depression, located in the southeastern part of the Republic of Georgia, is a tectonic basin at the

transition of the Lesser Caucasus Mountains towards the Transcaucasian depression in the north. It is filled with several decameters of loose Quaternary deposits of fluvial, lacustrine, colluvial and aeolian origin, and crossed by the lower reaches of five rivers that left several meters of fluvial sediments along their courses. Stratigraphic, sedimentologic and chronologic investigations of these naturally outcropped sediments along some of the rivers (Algeti, Shulavericai, Khrami) demonstrate strong fluvial dynamics during the Holocene, leading to the formation of several morphological terrace levels encompassing different time slices. Causes of these active dynamics can only be assumed, but a comparison with palaeoclimatic and archaeological data possibly hint at a prominent climatic trigger. Furthermore, morphologic and stratigraphic data indicate a young westward shift of the course of the Kura River, the main receiving stream of all rivers of the Marneuli depression. This shift is obviously caused by recent tectonic activity along the western margin of the Kura fold-and-thrust-belt, and had probably also influenced the fluvial dynamics of the investigated rivers by a permanent change of their erosion base.

aquatic ecosystems that occupied valley bottoms. Here we discuss an on-going experiment at Big Spring Run (BSR) to test a novel restoration strategy based on this new understanding of the evolution of Mid-Atlantic streams during the Holocene and subsequent impacts of anthropogenic landscape changes following European settlement.

The Big Spring Run Stream Restoration Experiment: Watershed Restoration and Ecosystem Services in a Stream Impacted by Legacy Sediments

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Big Spring Run in south-central Pennsylvania (U.S.A.), is a small Appalachian Piedmont tributary within the Mill Creek watershed, a subset of the nested Conestoga River, Susquehanna River, and Chesapeake Bay watersheds. Chesapeake Bay is the largest estuary in the United States and serves as an economic and recreational hub for the Mid-Atlantic region. In 2000, the U.S. Environmental Protection Agency declared the Chesapeake Bay an impaired water body due to persistently high nutrient and suspended sediment loads that cause widespread eutrophication, anoxia, and aquatic ecosystem degradation. In 2009, President Obama signed an Executive Order declaring the Chesapeake Bay to be a “national treasure” and called upon the U.S. government to lead a renewed effort to “restore and protect” the Bay and its watersheds. In recent decades, stream restoration has played a key role in Bay restoration efforts, but with mixed success due - in part - to misdiagnosing a primary cause of stream impairments. Our research has shown that the construction of milldams and millponds in the 17th – 19th centuries, not modern urban and agricultural development, led to widespread valley bottom sedimentation, which degraded the once stable Holocene

SESSION 3**HUMAN EXPLOITATION OF AQUATIC LANDSCAPES**

**Asterisk for presenting authors, if more than one author is listed*

Isotopic Evidence of Environmental, Subsistence and Cultural Changes across the Mesolithic-Neolithic Transition at Havnø, a Danish “Køkkenmødding”

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Recent excavations at the shell midden at Havnø, Denmark, have yielded extensive faunal remains, dating to both the Late Mesolithic Ertebølle culture and the Early Neolithic Funnel Beaker cultures. Comprised of wild and domestic terrestrial species, fish, birds and human bones, the assemblage is among the largest Early Neolithic assemblages from Southern Scandinavia. In this study, fish, human, and mammal remains from wild and domestic species were analyzed for their bone collagen stable isotopic ratios of carbon and nitrogen to determine the extent, character, and intensity of changes across the Mesolithic-Neolithic transition at the site. Results indicate major changes in the protein component of the human diet concurrent with the arrival of farming, as well as shifts in the environments in which wild species were living. Furthermore, similarity is seen in the environments in which domestic cattle and contemporary Neolithic wild deer were feeding. Our fish data suggest that eel and flatfish have carbon isotope signals consistent with a marine origin, whereas a single measurement of roach dating to the Early Neolithic is evident of freshwater residency. Ultimately, these data yield important information about the local environment, diets, and cultural practices and lend insight into broader environmental changes during this period.

Changing Tides: The Archaeology and Historical Ecology of Medieval Sea Fishing (Invited)

James Barrett
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The sea was central to the social and economic lives of many in medieval Europe. Yet its study is confounded by liminality of all kinds. Maritime settlements and landscapes suffer from the vagaries of erosion and sedimentation. Past maritime networks crosscut present national research traditions. The archaeology of shore and sea is fragmented into diverse and highly

specialised fields, ranging from study of ships and boats to the chemistry of shell and bone. The maritime cultural landscape exists at the interface of the ideal and the impossible. This lecture aims to cross the resulting divides, exploring why people chose to (or not to) live on the sea, how they made a living from it and how social and environmental variables sometimes led to dramatic and unanticipated change. Its primary lens is a study of medieval fish trade around the North and Baltic Seas, anchored at times in the detail of recent excavations of maritime settlements in the archipelago of Orkney, Scotland.

Rīņņukalns, Latvia: The Re-Discovery of a Neolithic Freshwater Shell Midden

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Rīņņukalns, in northern Latvia, is the only well-stratified Stone Age shell midden in the Eastern Baltic, and is one of the few sites consisting mainly of freshwater mussel species. First excavated in the 1870s, and sporadically re-investigated until the 1940s, it produced ceramics, bone tools and some art objects, and human burials were found stratified within and under the midden. The archives from these excavations were thought to have been lost, however, and it was assumed that the site had been completely destroyed.

After a break of almost 70 years, the Institute of Latvian History, Latvia, and the Centre for Baltic and Scandinavian Archaeology, Germany began cooperative research on this important site. Excavations in 2011 demonstrated that significant parts of the midden are still intact, and can be dated to the late fourth millennium cal BC. The new midden exposure yielded rich assemblages of well-preserved fish bones, freshwater mussel and land snail shells, as well as herbivore, human and bird bones, and artefacts such as bone fish hooks. Human remains from the 1870s excavations have also been located and analysed. Stable isotope results confirm that the prehistoric inhabitants consumed significant quantities of freshwater fish and shellfish.

The co-occurrence of burials with the in-situ remains of a wide range of dietary species provides an excellent opportunity to use radiocarbon and other isotopic signals to reconstruct human diet and mobility, as well as refining the site's absolute chronology. Moreover, we are using the wealth of archaeological and palaeoenvironmental evidence to reconstruct the seasonality and technology of fishing, and to assess the impact of human subsistence behaviour on the aquatic ecosystem.

Aspects of Human-Ecological Relations in Ahanve, Coastal Southwestern Nigeria

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Palynological and archaeological studies of Ahanve, a coastal site in southwestern Nigeria, were undertaken. Pollen data indicated that the early phase of the site, from the 9th–17th century, was characterized by a secondary forest environment with the presence of some marine and freshwater bodies. Archaeological materials from this phase included abundant *Clarias gariepinus* (catfish), *Anodonta* sp. (bivalves), *Archachatina* sp. (African giant snail), animal bones, charcoal and hearths, salt residues, iron slag, pottery (with abundant aquatic snail shell attributes) and oil palm kernels. These materials suggest the utilization of diverse aquatic and terrestrial food resources, fire and salt production. In the second phase, the pollen record showed marked increases in plants and weeds associated with agricultural activities and hydrological disturbances. Animal bones, bivalves, African giant snails, iron slag and pottery (with aquatic snail shell attributes) decreased significantly while catfish completely disappeared. Secondly, charcoal and palm kernels exhibited phenomenal increases along with appearances of foreign smoking pipes, pottery with comb-teeth impressions (CTI) and an abundance of carved wood roulette (CWR). This data indicates environmental and socio-economic changes, reflects more reliance on plant food resources than aquatics, and displays European contacts.

Exploitation of Marine Resources During the Mesolithic-Neolithic Transition in the Southwestern Baltic Sea Region

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This paper presents a case study on the exploitation patterns of marine resources from the Late Mesolithic and Earliest Neolithic submerged site at Neustadt/Holstein in Northern Germany. Exploitation of marine resources was of incontestable importance for the subsistence of the inhabitants of the site, indicated by thousands of fish bones and bones of pinnipeds and cetacea. A special feature of this site was seal hunting. Predominant among the remains of sea mammals is the harp seal (*Phoca groenlandica*), followed by the grey seal (*Halichoerus grypus*) and the ringed seal (*Phoca hispida*). Estimation of the age of death of the seals and analysis of impact injuries caused by hunting weapons show an adaptation to the particular behaviour and habitat of the harp and grey seals. Particularly two seasons have been identified for the interception of harp seals which correspond to the two migration phases of the animals,

one in the late spring when they form their moulting rookeries and migrate to the summer feeding grounds, and one in the early winter when seals migrate to their breeding grounds and their breeding colonies. Hunting in spring primarily aimed at obtaining meat and skin, while hunting in late autumn when the seals return to their breeding areas had the seals' fat reserves as its main target.

Thus, this case study demonstrates the flexibility of Stone Age hunters and their ability to adapt their exploitation patterns to different environmental conditions and to their prey's habits, taking full advantage of this knowledge. Well-preserved lipids derived from the original use of the pots found at this site contribute to reconstruct the culinary practices at the period dating before and after the transition to agriculture. Therefore, lipids were extracted from ceramic vessels and carbonised surface residues. The presence of specific lipid biomarkers show that a significant proportion of the vessels continued to be used for processing marine and freshwater resources across the transition to agriculture in this region.

Going Fishing in the Neolithic: Archaeological, Isotopic, and Radiocarbon Evidence

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The process of Neolithisation is marked by a transition in the mode of subsistence with the domestication of plant and animal species, leading to a more or less gradual replacement of previously dominant hunter-gatherer practices by farming and pastoralism. Here, we investigate the continuity of certain hunter-gatherer practices, namely the exploitation of aquatic food resources within the Funnel Beaker culture (ca. 4100 – 2800 BCE) in Central and Northern Europe.

Independent lines of evidence, including food residue analysis, isotopic analysis, and radiocarbon dating, show the exploitation of aquatic resources during the Neolithic, albeit with varying intensities. From this, a complex picture of adopted subsistence strategies emerges.

A brief review of the different types of evidence pointing to exploitation of aquatic resources during the Neolithic will be presented together with recently obtained radiocarbon evidence. Comparative radiocarbon measurements of humans and associated artefacts from a closed secure context provide an optimal marker for fish consumption in regions where aquatic reservoirs are depleted in ¹⁴C. In these regions, human consumption of aquatic foods will result in fictitiously older radiocarbon ages when compared with associated terrestrial material. Such an approach has been applied to several inland German Funnel Beaker sites. For these sites, considerable radiocarbon age offsets demonstrate that

significant amounts of aquatic foods were consumed by Neolithic populations.

Catholic Fasting Rules and Radiocarbon Dating

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During the Middle Ages, the Catholic Church proscribed meat consumption during certain time periods. These included Ember days (Wednesday, Friday, and Saturday), Lent (six weeks before Easter), and Advent (approximately one month before Christmas). A full adherence to fasting rules could potentially imply that meat consumption was avoided during approximately half of the year. Nevertheless, dietary protein ought to be provided in sufficient amounts to maintain different body functions. Thus, populations with proscribed meat consumption had to obtain alternative high-protein food sources and these could potentially include aquatic foods. Previously published case studies relying on isotopic analysis of bone collagen ($\delta^{13}\text{C}$) have shown that certain historical populations upon their conversion to Catholicism (e.g. Vikings) modified their diets by increasing fish consumption. Fish intake could thus imply that humans potentially exhibit a dietary radiocarbon reservoir effect. Well-known examples from the medieval period include historical characters such as saints or aristocrats.

From different European locations bone samples were collected from several medieval individuals, mostly belonging to lower social classes. The samples span a wide time period (ca. 1000–1500 CE) and were obtained from both coastal and inland locations in Germany, Sweden, and The Netherlands. In each case the exact or an approximate date of death is known through historical information (e.g. battle records) or by dating associated artefacts (e.g. coffin dendro dating).

For each individual radiocarbon dating and isotopic analysis ($\delta^{15}\text{N}$ and $\delta^{13}\text{C}$) was performed on extracted bone collagen.

The results contribute to a current understanding of dietary habits, especially of the lower classes, during the European Middle Ages and illustrate the potential of dietary radiocarbon reservoir effects.

FRUITS for Fish: Intake Estimates of Aquatic Foods Using a Novel Bayesian Model

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Radiocarbon age corrections for humans having a dietary reservoir effect are often based on estimates of the intake of aquatic foods, determined through isotopic analysis. Thus, these estimates need to be both accurate and precise for a reliable and useful age correction. In order to provide truly quantitative estimates on the intake of aquatic food groups, an integrated approach methodology was developed consisting of four main points:

Determination of the isotopic baseline: This entails the determination/estimation of the isotopic signals of food groups accessible to and exploited by the ancient population studied.

Use of multiple dietary isotopic proxies: This includes the use of multiple isotopes measured on bulk collagen (e.g. $\delta^{13}\text{C}$, $\delta^{15}\text{N}$, $\delta^{34}\text{S}$), isotopic measurements on other bone fractions (e.g. $\delta^{13}\text{C}$ on bioapatite), and isotopic measurements at the compound level (e.g. $\delta^{13}\text{C}$ or $\delta^{15}\text{N}$ measured on individual amino acids).

Characterization of dietary routing: This involves the integration of dietary routing established from data analysis of controlled animal feeding experiments on omnivorous mammals.

Use of a Bayesian mixing model: This type of modelling provides the opportunity to overcome the limitations of simpler algebraic models. The advantages of Bayesian models include the use of an undetermined system in which the number of food groups exceeds the number of isotopic systems available, the incorporation of uncertainties in consumer and food groups' isotopic signals, and variability in isotopic enrichment. Within the Bayesian framework, it also becomes possible to integrate other potential sources of prior information. Model outputs include confidence intervals for the intake of different food groups.

A Bayesian model named FRUITS (Food Reconstruction Using Isotopically Transferred Signals) was developed with the capability of accounting for dietary routing. The structure and functioning of FRUITS is described and archaeological case studies are presented in which FRUITS was successfully applied to obtain accurate estimates on the intake of aquatic resources.

Human Dietary Radiocarbon Reservoir Effects in the Eurasian Steppe

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The Eurasian Steppe is characterized by temperate grasslands and defines a vast geographical area that connects Europe to Central Asia. Past populations living within this ecological biome are often associated with nomadic pastoralism that, once adopted, became a predominant mode of subsistence. However, recently published case studies, relying on radiocarbon and isotopic analysis of human and animal bone collagen, have demonstrated that past humans residing within steppe regions also consumed significant amounts of aquatic resources. This has been principally established through the comparative radiocarbon dating of human and associated terrestrial organic materials. In some instances, significant age offsets between associated samples were observed, indicating the presence of human radiocarbon dietary reservoir effects.

Here, we present new data from two geographical extremes: the Caspian Steppe and Northern Mongolia. Material collected from the Caspian Steppe originated from Bronze Age kurgans (burial mounds), while Mongolian material was collected from cemeteries of the Xiongnu period (3rd century BCE – 1st century CE), the time of the first steppe empire in Central Asia. From both locations closed archaeological contexts were selected and several associated pairs of human and terrestrial herbivore bones were obtained. Collagen extracted from bone material was prepared for radiocarbon and isotopic analysis (^{δ¹⁵N} and ^{δ¹³C}).

The results to be presented here represent an important contribution to current knowledge of the chronology of both archaeological cultures and to the potential identification of further cases of human radiocarbon dietary reservoir effects. Additionally, obtained isotopic data in humans and animals will help to clarify the complexity of the isotopic baseline associated with available food groups. These combine terrestrial C3 and C4 sources with isotopic signals that show a strong dependence on climatic influences.

Stable Isotope Research from Red Sea Shell Middens on the Farasan Islands, Saudi Arabia

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This paper introduces a palaeoecological study of prehistoric shell mounds on the Southern Red Sea. Around 3000 shell mounds dating to around 5000 BP have been

recorded on the Farasan Islands, 40 km west of the Saudi Arabian coastline. As such, the Farasan Islands form a key case study in the record of the prehistoric occupation of coastlines and the exploitation of marine resources. This study is part of an ongoing doctoral research project and focuses on palaeoclimatic reconstruction through stable oxygen (^{δ¹⁸O}) isotope analysis of *Strombus fasciatus* shells from two shell mounds in Janaba Bay, Farasan. Specifically, recent fieldwork focused on investigating the potential migration of modern *Strombus fasciatus* within the area of the excavated shell mounds in order to elucidate aspects of the mollusc's complex growth patterns. Understanding these growth patterns is vital to the robust interpretation of the isotopic data that can then be used to reconstruct palaeoenvironmental conditions during the growth of the shells. These results will ultimately be used to develop models of human-environment interaction and marine resource exploitation during this period and will provide a potential analogue for such exploitation in earlier prehistory.

Discontinuity and Change: Exploring the Role of Marine Resources of the North Atlantic Islands in Past Coastal Communities

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The insular environments of the North Atlantic presented a wealth of available resources to these communities. Isotopic studies have demonstrated that despite widespread consumption of marine resources on the islands during the Mesolithic period, as farming was introduced to the islands during the Neolithic marine resources ceased to be eaten, notwithstanding the presence of fish bones in Neolithic assemblages. This paper uses a combination of traditional zooarchaeological methods alongside isotopic analysis of humans and animals to explore the changing role of marine resources through time from the Neolithic period to the Norse period on the North Atlantic islands. The integration of these two very different lines of evidence enables a clearer understanding of the relationship that the ancient coastal communities of Orkney and the Outer Hebrides had with the sea.

The results demonstrate that marine foods appear to play a minor role in dietary behaviour on both Orkney and the Outer Hebrides during the Neolithic and the Bronze Age. During the Iron Age stable isotope evidence demonstrates that marine foods were used as animal fodder on the Western Isles, yet on Iron Age Orkney marine resources were not utilised to any great extent, suggesting divergent economic strategies between these two island groups. The arrival of the Vikings in the Norse period marks the beginnings of trade with marine resources of both island groups as demonstrated by

isotopic and zooarchaeological evidence, with herring being a major focus of trade on the Outer Hebrides and cod and saithe being utilised on Orkney. The diverging strategies in marine resource use between the islands and during each time period, resulting from social, economic and cultural factors, will be discussed to explore the highly dynamic relationships between past North Atlantic island populations and the sea.

Population Increase and Residential Mobility Decrease – Logistical Organization of Fisher-Hunter-Gatherer Sites in the Northern Lake Saimaa Complex, Finland 4500 – 3500 cal BC

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On the northern parts of ancient Lake Saimaa the exploitation of resources did not change considerably between 4500 – 3500 cal BC. Fish was the main source of nourishment both during the periods of Early Asbestos Ware (ca. 4700 – 3850 cal BC) and Typical Comb Ware (ca. 3820 – 3460 cal BC). Nevertheless, the number of known settlement sites and the distribution of their sizes indicate that significant changes occurred regarding the degree of residential mobility, the size of the population and possibly in the socio-political organization of the fisher-hunter-gatherers at about 4300 cal BC and especially between 3900 – 3800 cal BC. The latter time period witnessed some major environmental and demographic changes. On the one hand, the formation of the Vuoksi River (at ca. 3890 cal BC) and, consequently, the descent in the water level of Lake Saimaa occurred and, on the other hand, the possible migration of some new population from the east and the southeast transpired.

In this paper, the statistical distributions of the osteologically analyzed fauna from the periods of Early Asbestos Ware and Typical Comb Ware from the northern part of Lake Saimaa are compared. In addition, the settlement patterns of these fisher-hunter-gatherer communities are reconstructed for every two-hundred-year period between 4500 – 3500 cal BC. Finally, the spatial management of the settlement sites is examined by means of a rank-size analysis.

It is suggested that the decrease in residential mobility, the increase in the logistical organization of settlement sites and the growing importance of the central base camps were not that much a result of a shift in the exploitation of resources. Instead, the formation of the Vuoksi River may have altered the spatial organization of the Early Asbestos Ware settlement sites. This state of unbalance and the fresh shorelines may have allured newcomers to this area. The growth of the population possibly forced fisher-hunter-gatherers to intensify their exploitation of the environment, and, consequently, re-organize their settlement patterns.

Hunter-Gatherer Population Dynamics and Aquatic Resource Use: A Case from Holocene Finland

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In his seminal hunter-gatherer book, Robert L. Kelly suggests that an intense use of aquatic environments indicates an inability to hunt terrestrial resources as much as it was needed to meet caloric requirements. Kelly also links aquatic adaptations with high human population densities. All of this implies that population pressure would have been an important factor in turning foragers to aquatic resources. Here we evaluate this idea by comparing archaeological human population size proxy records, osteoarchaeological indicators of resource use, and palaeoenvironmental records of Early- to Mid-Holocene Finland. We show that the most intense use of aquatic resources indeed coincides with the highest forager population levels seen in the archaeological population proxy. However, in our research area, forager population growth correlated positively with the productivity of both terrestrial and aquatic environments, i.e., with overall food availability, suggesting that high human population levels do not indicate population pressure on resources – more likely the opposite. Although our results are still preliminary, we may argue that, rather than being the result of high human population density, intensified use of aquatic environments contributed significantly to population growth and high population density in prehistoric Finland. We also suggest that an intense use of initially lower-ranked aquatic resources became cost-effective along with increased environmental productivity.

Responses of Pre-Historic Coastal Communities to Sea Level Change on the Southern Red Sea

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Human response to environmental change is high on the research agenda. Here we examine the responses of pre-historic coastal communities to sea level changes of the Southern Red Sea. Nearly 3000 shell midden sites have been found on the Farasan Islands as part of ongoing research, currently funded by the ERC in the DISPERSE Project. These sites, dating to ca. 5000 BP, are aceramic with a strong focus on shellfish gathering and fishing. We have found evidence for sea level fluctuations, which

form a series of palaeo-shorelines across the islands. Changes in the distribution pattern of the shell middens over time were likely driven by these sea level changes.

We have identified and excavated a number of groupings of shell middens that exhibit the changed distribution pattern. Remote sensing and geoarchaeological techniques are also employed to further aid interpretation in an attempt to increase the resolution at which we can investigate this phenomenon. The preliminary results of this study are discussed here and implications for future research considered.

Marine Invertebrates at Bronze Age Settlements of the Normandy (Northwestern France)

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The role of marine invertebrates (shell, crustacean and urchin) in the diet of Bronze Age populations in France is still very little-known, mostly due to the few excavations realized for this period and the scarcity of malacological studies. However, the recent urban development in Normandy, in North western France, led to a lot of archaeological excavations. All these researches allow to reconstruct the Protohistoric landscape with a network of farms and an important transformation of the countryside (parcel and road systems). At the moment, three Bronze Age Norman settlements (from 1800 to 900 BC), contain the remains of marine invertebrates. These sites are located as far as 1 to 25 kilometres from the seashore. Several subjects will be discussed on the role of marine invertebrates at the Bronze Age in the economic practices (dietary choices, gathering territories, circulation networks, preparation and preserving methods, consumed quantities, management of marine wastes) and in the social practices (organization of the activities and of the persons linked to the exploitation of marine products, status of the sites). This topic of research will allow to understand more widely the relation between Man and the littoral during the beginning of Protohistory.

Inland Ertebølle Culture: The Importance of Aquatic Resources and the Freshwater Reservoir Effect

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The Ertebølle culture is a Late Mesolithic hunter-gatherer-fisher culture in Southern Scandinavia, Northern Germany and Poland. Archaeological finds as well as scientific analyses of humans and their artefacts

indicated the great importance of aquatic resources for this culture. This applied to both coastal and inland sites, where rivers and lakes were exploited. A large proportion of aquatic resources in human nutrition led to considerable reservoir effects in human bones and artefacts such as pottery.

In my presentation, I will focus on the exploitation of freshwater resources at inland sites in Northern Germany. Different methods for the identification of freshwater resources in prehistoric pottery will be presented. The freshwater reservoir effect in Northern Germany is large (up to 3000 years) and highly variable. Thus, I will discuss the impact of this reservoir effect on the radiocarbon dating of the earliest pottery from this region.

Exploitation of Freshwater Lagoons in Lithuania, 4000 – 1800 cal BC

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Large lagoons, i.e. the Pajūris and the Curonian, emerged during a regression of the Littorina Sea around 4500 cal BC. Both lagoons were isolated from the sea by long and narrow sandy bars, while large volumes of fresh water were supplied by inflowing rivers. Most of the Pajūris lagoon was overgrown and drained by 1800 cal BC, although its widest and deepest part survived as the shallow and boggy Lake Pape in present-day Latvia. One hundred years ago, the Curonian lagoon was a freshwater body in Germany with the richest fish reserves and it still retains the leading position in Lithuania today. Archaeological records together with historical sources and ethnographic data provide evidence that both lagoons were very productive food sources for Late Mesolithic and Neolithic populations.

What do we know about this exploitation of aquatic resources? The current presentation is a short overview of our knowledge on exploited species, fishing techniques and settlement patterns. Arguments for a fresh water reservoir effect of up to 800 years BP for the Curonian lagoon are also presented here for the first time.

Mesolithic Fishery on the Polish Coast of the Baltic Sea

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The main way of life in Mesolithic cultures was hunting, fishing and gathering. In different environments people used different variations of these three ways of attaining food. On the seashore most studies suggest that fishery and sea mammal hunting was a main activity. Therefore, the aim of this presentation is to describe various artifacts

identified as equipment of the ancient fishermen and methods of sea mammal hunting and fishery.

There are three methods to reconstruct sea mammal hunting and Stone Age fishery. First, there are artifacts identified as equipment for hunting sea mammals, and fishery equipment. A second method includes an archaeozoological analysis of bones. A third way to reconstruct hunting and fishing entails ethnological analogies.

On Polish archeological sites there are few artifacts identified as hunting and fishing equipment such as hooks, harpoons or net floats. We obtain more information from bones of fish and sea mammals. In Poland there are over a dozen archeological sites with bone findings. They provide us information about species and hunting periods. Ethnological analogies demonstrated methods of fishery and sea mammal hunting, for example, how nets, rods or fish pots were used. We can thus attempt to reconstruct hunting organization and the social meaning of this way of obtaining food.

The state of research on Mesolithic fishery and sea mammal hunting on the Polish coast is not yet sufficient. In light of this fact we focus on that aspect of Mesolithic community life to get a full picture of this Stone Age culture.

Crossing the Cold Seas – The Use of Boats for Long Distance Mobility and the Exploitation of Aquatic Resources

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In the postglacial environment, means of water transportation played a particularly important role. Boats were used for communications along a front of glacial and between numerous islands that appeared in changing landscapes. Vessels were also essential for the economy of the late Pleistocene and early Holocene communities. They were used for fishing and for hunting both land animals as well small and big sea mammals. Boats were used for transporting numerous goods, including stone products distributed for hundreds of kilometers along a coast. They were also essential for social contacts and ceremonial exchange, and possibly had a symbolic significance.

Evidence for a development of maritime communities in the late Paleolithic and particularly in the Mesolithic can be found in a few regions of Northern Europe. Early occupants of Western Sweden and Norway settled often on coastal areas. From the Archipelago of Bohuslän, hundreds of sites of the Hensbacka group are known, located on small islands, often facing an open sea. In the Preboreal period, similar communities of the so-called Fosna group occupied the coast of Norway from Oslo to Trondheim over a length of 700 km. They often

settled on islands that had an easy access to the open sea. Maritime hunters and fishers in a period of a few hundred years rediscovered and exploited coastal zones that reached far north.

Maritime mobile communities also developed in Western Scotland during the Mesolithic. Traces of their activities can be found on numerous islands, particularly on the Inner Hebrides. Boats were required not only to reach islands of Western Scotland, but also to settle the Isle of Man, Ireland, Shetland and possibly Orkney.

At the end of the Pleistocene and at the beginning of the Holocene, maritime communities developed in different parts of Northern Europe that used water transport to maintain their economy and social structures. It is possible that remains of many early maritime activities are now submerged as a result of postglacial sea level changes.

Aquatic Landscapes and Identity. Neolithic Process at Coasts of the Iberian Peninsula

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In this paper I would like to take the opportunity to present the role of marine resources in Iberian societies during the Neolithic transition between the VIth and the IIIrd millennium cal BC.

There are differences between the Atlantic and Mediterranean communities, due in part to regional climate changes and coastal regional transformations, but also the cultural substrate Mesolithic. On this last point, the conservation of Mesolithic culture and lifestyles against mental and technological developments made by the Neolithic is related to the perception of aquatic landscapes. Thus, the Atlantic groups kept the mesolithic's way of life (fisher-hunter-gatherer) and their identity, because these societies had contact with neolithic communities but they stayed away from the Neolithic process the rest of the Iberian Peninsula until the IVth millenium cal BC.

Finally, the archaeological record of coastal sites with safe radiocarbon dates doesn't support the proposal of a "maritime pioneer colonisation" (Zilhão, 2001) for the Neolithic during the 6th millennium cal BC. In relation to the neolithic route of the Northwest Africa (Linstädter, 2008; Manen, Marchand and Carvalho, 2007), the archaeological record (particularly the almagra pottery) doesn't show an intense connection between both coasts of the Gibraltar Strait.

We will work key sites: Nerja (Málaga) and Cendres (Alicante), to the Mediterranean coast. And Retamar (Cádiz), Puerto de Palmares (Cádiz), Portuguese concheiros (Sado, Vale Boi, Padrao and Cabranosa) and Cantabrian concheiros to the Atlantic coast.

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of the Azov or Black Seas, but they died on the steppe surrounded by people of local origin and with a steppe type of diet. Among these newcomers were young girls and old men.

This suggests the development of cross-cultural links between steppe and the coastline populations. During movements these population groups developed trade relationships. A working hypothesis is put forward according to which key products of trade between different regions included salt and salt fish. There are many adult males with specific isotope values buried on the steppe. It is assumed that they spent much time in the coastlines areas of the West North Caucasus, near the Azov Sea, on the Taman peninsula.

Eurasian Steppe Nomads and Exploitation of Aquatic Landscapes in the Bronze Age: Food, Trade and Mobility (Invited)

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Starting from the Eneolithic Age onward and throughout the Bronze Age, the Eurasian Steppes became a peculiar cultural region that developed mobile pastoralism. Severe conditions of the steppe environment and constant dependence on pasture productivity and water availability made the mobile steppe population use all food resources of the exploited areas.

Dietary information obtained from ¹³C and ¹⁵N values of human bone collagen strongly indicates consumption of large quantities of aquatic resources (fish, mollusks, water plants) from steppe lakes and rivers. Isotope data is confirmed by fish bones and scales as well as mollusk shells identified in the content of vessels as well as fishing devices such as hooks, harpoons and imprints of knotless nets preserved on the bottom of clay pots.

Seasonality movements between summer and winter pastures could be found in open steppe areas, near river valleys as well as at the North Caucasus foothills and coastal lines of the Caspian and Black Seas.

Such high level of mobility was reflected in the change of local isotope values of human bone collagen. People with different isotope values appeared on the steppe. They consumed quite a lot of marine food. ⁸⁷Sr/⁸⁶Sr isotope values identified in the human enamel suggest that at least some of these individuals with a seafood diet system might have been born near the coastline

SESSION 5

WOOD AND CHARCOAL: SOCIO-ECONOMICAL CONSTRAINTS OF A RESOURCE AND ENVIRONMENTAL INDICATIONS OF A PROXY

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Historical Charcoal Production in Regions of the Northern European Plain: Resources, Woodland Reconstruction and Implications for Today's Biodiversity Conservation

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Historic charcoal production sites are well investigated in several low mountain ranges, as proxies for historical woodland usage. Its charcoal remnants in the soil serve as proxy for former woodland tree composition, and structure. The northern European plain is less investigated for its charcoal burners legacy, though people had a considerable need for charcoal as well. In this presentation, the current knowledge of the productions' extent and possibilities of woodland reconstruction are discussed for the region of Schleswig-Holstein, as well as a part of Mecklenburg-Vorpommern. It appears that there are certain regions with a high concentration of charcoal production sites, while in others these archives of woodland history exist only in small numbers, or none at all, which in part might be related to their preservation. Many woodland areas in Schleswig-Holstein were converted to open land, thus former sites are not recognisable any more in the landscape. Here, we give a first summary of investigations, and compare the charcoal spectra with those of regions further south in Germany. In Schleswig-Holstein, predominantly hornbeam (*Carpinus betulus*), beech (*Fagus sylvatica*) and alder (*Alnus glutinosa*) were used, along with oak (*Quercus sp.*), birch (*Betula sp.*), and some other deciduous tree species with minor importance. A big difference to charcoal production in low mountain ranges is the fact that so far, only sites with usage of small or maximum mediate diameter wood were found, while at the same time some small diameter fragments show high no. of growth rings (up to 118), indicating that branches of big trees were used as well for charcoal production, while the stems were utilised for construction purposes. This gives evidence of multi-purpose timber and wood usage of the woodlands concerned, e.g. by the operation of standard-with-coppice stands, an effective form of woodland

use, at the same time increasing woodland biodiversity with possible consequences until today, which will be discussed in the context of the conservation of the bat *Myotis bechsteinii*, a bat which is highly conservative to its woodland habitats, being dependent on old trees and high forest structural diversity.

Fuel Selection, Wood Exploitation and Forest Management by Middle Ages Belgian Brass Blacksmiths between the 13th and 16th Centuries along the Meuse River

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The influence of the Mosan copper and alloy industry, in particular brass production during Middle Age Western Europe, is an irrefutable historiographic fact. Cauldrons, bowls, and pans produced in the town of Dinant as well as in the nearby Bouvignes, were exported throughout French and English kingdoms, as far as Barcelona in Spain. In the 15th century, copper alloy artifacts produced in the Dinant region were so highly prized and considered that the town's name of Dinant was used in Paris to designate the boiler-makers, or the dinandiers (coppersmith).

Copper metallurgy in the Meuse region dates back at least to the Merovingian dynasty, with a workshop uncovered in the town of Namur at the "Grognon" site, dated to the 6th century. The copper metallurgy boom at the turn of the 12th century in both Dinant and Bouvignes are due to several causes. Although the Meuse region lacked copper and tin ores largely used in Middle Age metallurgy, very good communication ways provided by the Meuse River and its tributaries, as well as the establishment of strong commercial ties with the German towns of Cologne and Dortmund for copper supplies and with London for tin supplies, overcame this natural limitation. In addition, merchants were allotted specific privileges with the German towns, while a charter allowed them to establish a trading post on the Thames River. The dynamism of the Mosan merchants cannot however explain this metallurgy industry boom alone. Indeed, the Meuse region is rich in two products that are necessary for brass production: calamine that contains zinc oxide and natural refractory clay, derle, that is appropriate to build bricks, hearts, smelters and molds. Copper and brass production however ends abruptly in 1466 in Bouvignes, property of the earldom of Namur, and in 1554 in Dinant, property of the prince-bishop of Liège, when the two cities were defeated in the Burgundy wars led by Charles the Bold.

Since 1995, several archaeological excavations have taken place under the supervision of the Walloon Archaeological Service in the towns of Bouvignes

and Dinant. These excavations uncovered several coppersmith buildings, with their workshops and domestic spaces.

We will present the results of wood charcoal analyses from four different sites – Bouvignes Porte Chevalier, Dinant Oblats, Dinant Rateau and Dinant Churchill – that represent 13 different coppersmith workshop spaces dated between the 13th and the 16th centuries. Because Dinant and Bouvignes were competitors and depended on two rival political entities, our results are highly significant in terms of territory exploitation and cultural identities along the Meuse River.

Subalpine Forest History and Dynamics in the French Alps (Queyras): Climatic and Human Pressure

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In the context of global change, the assessment of species and forest past dynamics at the timberline is essential to improve knowledge about the present landscape and its evolution. Several palaeoecological approaches are simultaneously used for a reconstruction of past landscapes and evolutions.

Today, the subalpine forest in Queyras is mainly composed of larch, stone pine, mountain pine, fir and several shrubs such as ericaceae. The dynamics of subalpine forests are subjected to natural disturbance, particularly fires. By the end of Atlantic period, human perturbations by agro-sylvo-pastoral practices became an important factor which explains the landscape dynamics and the dominance of some ligneous species.

A pedoanthracology approach was used, aimed at specifying the different stages of postglacial colonisation at the timberline and specifying respective contributions of both natural and human impact on the floristic assemblage actually in place.

First results reveal an early recolonisation of stone pine and larch following the last glaciation. Larch and stone pine were installed in the Early Holocene (respectively 8873 – 9014 cal BP and 8702 – 9024 cal BP). Considering present changes, particularly the abandonment of human practices, current conditions at high altitudes might potentially allow forest establishment.

Climate-growth relationships evidence the high sensitivity of both stone pine and fir to hydrological conditions which attests the dry conditions of this massif. In addition, the study of the upper limit dynamics of subalpine forests during the Holocene reveals that global changes seem to favour larch. Whereas pedoanthracology results show permanent succession of larch and stone pine at the subalpine vegetation stage over the Holocene period, dendrochronology emphasizes the consequences of global changes: stone pine becomes increasingly sensitive

to climate warming, whereas larch seems to benefit from land use changes associated with temperature increase. According to these results, it is advised to make the network of observed sites denser and to improve the corpus of dendrochronology and pedoanthracology data in association with other ecological, palaeoecological and historical proxies. This will help investigations on high elevation forest diversity with regard to the past and forest response to global changes.

Charcoal as a Proxy for Reconstructing Late Prehistoric and Early Historic Landscape Dynamics and Settlement Mobility

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 Cultural Heritage Agency of the Netherlands

Provided they are recorded systematically, dated accurately and studied from a wider, interdisciplinary perspective, the archaeological traces of charcoal production can enhance our understanding of the dynamic history of forests in past landscapes. In the Netherlands the age and context of such traces, particularly those of the so-called 'pit kilns' from ca. 200 BC – 1400 AD found in the Pleistocene sandy areas in the north, east and south of the country, reveal that until well into the Middle Ages not only settlements and fields regularly shifted location, but also the forests 'moved' in their wake. Settlement drift allowed forests to regenerate on abandoned agricultural land. Since this inherent dynamism of the settlement system persisted for a very long time (it already began about three millennia before the period dealt with in the present paper), forest reclamation and regeneration could experience several cycles, as the presence of charcoal clamps from widely separate periods at some sites testifies. This had a lasting impact on soil fertility and vegetation. On the basis of data on the life span of settlements and the distance over which these shifted, a theoretical number of 60 – 80 settlement shifts can be deduced.

Most of the data used for this study come from rescue excavations brought about by the embedding of the Valetta Convention (1992) in Dutch law. The absence of any information on more recent periods is a result of the gradual introduction of above-ground charcoal clamps in the course of the Middle Ages (Lipsdorf 2001), which rarely left any traces in the Netherlands as a result of intensive exploitation of the soil.

The Study of Woodland Management by Analysis of Branch Age and Diameter: Possibilities and Restrictions

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Concerning the Mesolithic and the Neolithic, it is often suggested that people practiced woodland management such as pollarding and coppicing. Such management may have affected the selection of wood, and may also have had implications for planning and ownership. When excavations yield finds of hurdles or fish weirs, branch age and diameter are frequently used to argue in favour of management. However, conclusions are often based on small samples and on assumptions about tree growth.

To test whether former woodland management can be recognised in wood assemblages from archaeological excavations, models were developed that predict the expected age and diameter distribution of branches from unmanaged and managed trees. The models were tested by the analysis of branches from modern-day unmanaged and managed trees.

The first results of the research on modern-day trees support that the models can be used to discern management in the past, at least under certain conditions. It is however necessary to critically take aspects like sample size, natural disturbance/opportunistic wood collection and diameter selection into account. The new overview of the possibilities and restrictions of the method enables reviews of archaeological case studies.

Charcoal Burning Platforms in the Southern Black Forest: from LIDAR Point Cloud to Spatial Patterns of Resource Use

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 Office for Cultural Heritage Baden-Württemberg, Esslingen

Within an ongoing research project aimed at the spatially complete, LIDAR-based archaeological prospection of Baden-Württemberg, several novel visualisation techniques are used. Choosing appropriate data processing and visualisation techniques greatly improves feature visibility as well as mapping pace and quality. Visualisation techniques are thus a key factor in efficiently mapping the distribution of archaeological relief features.

Charcoal burning platforms represent one common type of archaeological feature in Baden-Württemberg. Of these, more than 10,000 have now been mapped on the basis of the LIDAR data, mostly in the southern Black Forest. Analysing the location data of these features provides valuable insights regarding spatial patterns of forest resource use. For example, small-scale vs. quasi-industrial charcoal production or relationships to elevation, slope and aspect and nearby settlements can be assessed.

Charcoal Remains from the Königsgrab (Lüdelzen 6) in the Western Altmark

Doris Jansen
 GS HDL and Institute for Ecosystem Research, Kiel University

Interpretations of charcoal analyses from archaeological contexts always have to deal with problems arising from stratigraphy and therewith chronology. In cases with clear archaeological connections, this enables the possibility of detailed analyses. However, this is not always given. Especially in burial mounds several construction periods can often be detected at one site. Further re-usages after the construction and other disturbances are common. This raises the question, if chronological analyses of landscape development around grave structures are possible with charcoal analyses. This is not only a question concerning anthracological methods, but includes an archaeobotanical aspect in general.

Within the framework of the DFG-project „Megalithic Landscape Altmark“, the development of the region during the Neolithic is investigated. Among other excavations, the passage grave Lüdelzen 6 (commonly known as the Königsgrab) was in the focus of the archaeologists. It was excavated in two field campaigns during 2009 and 2010. In the course of this, several hundred soil samples (floated) und hand-picked charcoal samples were extracted.

A total of ~180 samples (thereof ~160 floated soil samples) were collected and more than 2500 charcoal fragments were identified. *Quercus* (oak) is with more than 50% the most common taxon, other frequent taxa are *Pinus* (pine), *Fagus* (beech) and *Betula* (birch). Based on the exactly determined position of the single samples a more detailed evaluation is possible. Plotting on the profile drawing shows that *Quercus* occurred in all layers of the burial mound. For the other taxa, the situation is different. While *Pinus* almost exclusively occurs in the deepest layer, *Betula* is present since the second phase of burial construction and *Fagus* almost exclusively in the youngest layers. Despite disturbances caused by re-usage and other human activity, the position of the charcoal seems not to have been as heavily affected as feared. This demonstrates that every archaeological excavation provides an opportunity for an archaeobotanical analysis, which is related to detailed evaluation sample by sample.

Charcoal Usage during the Middle Ages in the Harz Mountains – Wood Selection and Overexploitation of the Woodlands

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The Harz Mountains is the northernmost low mountain range in Germany and towers above the North German

lowland plain. Various ore deposits caused long lasting human activity and especially mining as well as charcoal production lead to a huge perturbation of the woodlands. To elucidate possible selection of wood or wood charcoal in former smelting places and a settlement area of the western Harz Mountain during the 10th to 13th century dendro-anthracological analysis of six archaeological sites in elevations from 480 m to 630 m above sea level were carried out. Four of the investigated smelting sites were used for copper production and one for silver while the last site is a former settlement area. All in all 5850 charcoal pieces from soil and handpicked charcoal samples were identified and classified. The anthracological record shows the selection of beech charcoal for copper production from the Rammelsberg Cu-Zn-Pb sulfide-barite deposits, and it seems that *Picea abies* was more common in natural stands related to site conditions. Moreover, the charcoal assemblage of the seasonal copper smelting site Huneberg indicates two possible usage phases during the 11th century as well as an early overexploitation of the surrounding woodlands. The archaeological known increasing of mining activity towards the 13th century is visible in the charcoal record from the former settlement Johanneser Kurhaus. At the beginning of the settlement (10th century) the woodland consisted of a dense Fagetum and the charcoal assemblage is characterized by high values of *Fagus*, *Acer* and *Picea*. During the 12th and 13th century more and more wood of pioneer trees (*Betula*, *Corylus*, *Salix*, *Populus* and *Sorbus*) was used by the inhabitants of the settlement. Furthermore, the charcoal record from the Johanneser Kurhaus hints to the preference of spruce wood in the context of lead and silver production and supports the archaeological differentiation of the settlement site in three usage phases. In summary, the anthracological record of six smelting sites in the Harz Mountains shows the selection of distinct wood species for different smelting activities during the Middle Ages and allows the separation of different chronological phases within the archaeological sites.

Landscape Anthracology – Linking Past Fuel Economy and Vegetation Ecology (Invited)

Thomas Ludemann
Department of Geobotany, University of Freiburg

In our studies we analysed the charcoal remnants of historical mining, archaeo-metallurgical processes and traditional wood charcoal burning. Our main topic centered on analyses of archaeological macrocharcoals from wood charcoal kiln sites (kiln site anthracology) and how these can provide answers to questions of forest history and vegetation science with fine spatial resolution on a landscape level. Thousands of historical wood charcoal kiln sites are known. The large number, wide distribution and high densities indicate the high

significance of charcoal burning in the past. Moreover, it underlines the outstanding scientific potential of kiln site anthracological studies. They offer us unique possibilities to gain information on the ancient forests and the changes therein with fine spatial resolution on a landscape level. Examples of local and regional scale results of kiln site anthracology are given, with special regard to the natural diversity of growth conditions, tree species composition and wood supply (forest ecology). The relations of past fuel wood exploitation and the ecological conditions of the exploited forests are delineated by landscape sections of different spatial scales. In addition, methodological studies of recent and experimental charcoal burning have been carried out (recent and experimental anthracology). With these studies the methods used and the interpretations of the anthracological results are verified.

Generally, no selection of distinct wood species was made for charcoal production. All of the tree taxa to be expected for the natural conditions were exploited in the past and the frequencies of the taxa exploited reflect a natural situation. The tree species of the climax vegetation were mainly used; all other species were quantitatively unimportant. The individual sample sites show considerable differences in taxa composition and frequency, from which regular spatial patterns of the past tree species distribution have been deduced on a regional and local scale. These patterns can often be explained by regional and local differences in the ecological site conditions of the exploited forests. A pronounced dependency of fuel wood use on the natural local distribution of the tree species is discernible.

Vegetation Changes Recorded in Sandstone Rockshelters with Long Stratigraphic Sequences (Paleolithic - Medieval Period) in Northern Bohemia

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This study is focused on an anthracological and macroremains analysis of Paleolithic-Medieval layers in the sandstone areas of North Bohemia in the Czech Republic. The palaeolithic occupation layers have been discovered below the Mesolithic. At the Údolí samoty, Konejlova and Kristova jeskyne rock shelters we documented a thick and complex stratigraphy, while at the Janova zátoka rock shelter we recorded just a thin sedimentary sequence. Although the Údolí samoty and Janova zátoka rock shelters provided continuous stratigraphic and environmental records for the first time from the Late Glacial to the Holocene in this region, no significant changes in settlement and resource

exploitation strategies could be observed. These foragers were optimally adapted to the versatile landscape of sandstone plateaus and canyons throughout the climatic change in order to exploit changing vegetational resources.

At Údolí samoty, the presence of hazelnut shells was recorded continuously from an Aeneolithic layer (100 – 120 cm) to the Late Paleolithic (300 – 320 cm). A continuous record of hazelnut shells is important evidence of human activity in this type of environment. The Paleolithic layers are characterized by low species diversity, anthracomass and the amount of hazelnut shells. The surrounding vegetation best corresponds to an open pine forest where the species composition indicates unfavourable environmental conditions. In the Modele Mesolithic, the hazelnut shells and anthracomass show the highest quantity. The high amount of hazelnut shells probably correlates with the frequency of human occupation in the rock shelters. The same layers also show the highest species diversity. Surrounding vegetation can be reconstructed as a mosaic with the presence of sparse pine forests, species-rich oak forests (so called *Quercetum mixtum*), hazel shrubs and early successional vegetation with aspen and birch. The highest amount of oak charcoal is recorded from the upper Mesolithic period to the beginning of the agricultural period. During this period the presence of hazelnut shells is significantly reduced. Beech charcoals are abundantly recorded in the Bronze Age and during the La Tène period. In Medieval layers, a significant decline of species diversity and increasing representation of Scots pine is recorded.

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Charcoal Records from Natural Archives in Northern Central Europe: What do They Tell Us about Past Fire Regime Characteristics and Determinisms?

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Charcoal palaeo-records analyses, carried out recently in Northern Central Europe, provide evidence to reconstruct past fire regimes, on local to regional scales. This evidence provides insight particularly concerning past fire frequency, spatial extension of fire events, and the type of burnt forest systems. Such insights were inferred from the taxonomical analysis of charcoal assemblages extracted from soil samples of seven investigation sites in Germany, each site including a various number of sampled soil profiles. Four sites are localized in Northern Germany, in the federal state of Schleswig-Holstein. Three others are localized in the northernmost low mountain range in Central Europe, the Harz Mountains, in Central Germany. Moreover, macro-charcoal analyses were carried out on chrono-stratified archives (peat

sequences), sampled near the previously mentioned sites. For both approaches, a chronological frame of the charcoal palaeo-records based on radiocarbon dating was obtained.

The charcoal analyses enable an identification of fire event distribution during the Holocene, with a significantly increasing frequency during the Late Holocene. However, such global patterns of past fire frequency appear highly variable when observed at infra-regional scales, based on the complementarity of fire signals from macro- and mega-charcoal records. A large heterogeneity was also identified in the charcoal amount in both types of natural archives investigated. This latter aspect seems to indicate a large heterogeneity of the spatial extent of the identified past fire events, and maybe also be related to a heterogeneity of past fire intensity. Both insights on fire frequency and on spatial resolution seem to indicate the significant influence of human fire usage. This is supported by the taxonomical analyses which allow the identification of the dominance of *Fagus* and *Quercus* charcoal pieces in the soil charcoal assemblages. Based on the fact that broad-leaf forests are considered to be hardly flammable, it is assumed that the soil charcoal records from our investigated sites mainly resulted from man-made fire occurrences. Such anthropogenic fire usage might be related to various agricultural practices. Basically, fire might have been ignited to remove woodland cover, opening the land to agricultural usage or diminishing stem abundance in order to practice grazing-in-wood.

Aktopraklik and its Environments – An Integrated Botanical Approach

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Today, the archaeological site of Aktopraklik near the city of Bursa in Northwestern Anatolia is situated between modern industrial areas and olive groves. The site is known for its early pottery production in the region and dates from ca. 6400 cal BC to 5200 cal BC. Three different settlement areas (A–C) can be distinguished and thus allow for the distinction of three archaeological phases. In order to obtain insights on the environment during the Early Chalcolithic (5800–5400 cal BC), sediment samples were systematically collected at the excavation of area B during the field campaign in 2010. The botanical material derived from these samples provides information on human-environment relations at the beginning of the 6th millennium BC. The charcoal assemblages dominated by *Quercus* indicate a selective use of wood at least for building purposes. The small variety of woody taxa thus limits insights on the surrounding vegetation, whereas botanical macro-remains represent a range of herbaceous taxa accompanying arable crops. The latter

enable additional observations, e.g., the existence of moist stands indicated by *Cladium mariscus* or the use of plants providing collectible fruits such as *Olea* (kernels) or shells of Hazel fruits. Thus, the combined interpretation of wood charcoal and charred remains of fruits and seeds not only allows for the reconstruction of the woody vegetation, but also provides information on the diet and agricultural methods. Furthermore, the use of the botanical macro-remains allows for an improved understanding of site conditions and thus contributes to a better comprehension of the past environment.

SESSION 6**INTO NEW LANDSCAPES: SUBSISTENCE ADAPTATION AND SOCIAL CHANGE DURING THE NEOLITHIC EXPANSION IN CENTRAL AND WESTERN ANATOLIA****Sheep and Goat Management and the Spread of Pastoral Economies in Central and Western Anatolia: A Biometric Approach**

Benjamin Arbuckle
Department of Anthropology, Baylor University

In this paper, we focus on defining evidence for sheep and goat management in Neolithic settlements in central and western Anatolia. The focus of this paper is on using a rich biometric database from multiple sites to document both evidence for the spread of domesticated sheep and goats across Anatolia but more importantly to compare biometric evidence for management practices through time and space. By examining the distributions of individual measurements (normalness, skewness, kurtosis), as well as patterns in log-standardized measurements, we will define variations in herd management and relate these to the goals of herd production.

Sheep and Goat Management in Neolithic Anatolia: Dental Eruption and Wear

Levent Atici
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In this paper, we explore the origins and spread of sheep and goat herding through an in depth analysis of culling patterns. Using dental eruption and wear data from multiple sites in central and western Anatolia, we define evidence for early Neolithic caprine management. A second focus of this analysis is on understanding changes in management practices as herders move into more temperate regions of western and northwestern Anatolia in the seventh and sixth millennia BC.

Biometric Evidence for Pig (*Sus scrofa*) Exploitation in Central and Western Anatolia

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Institute of Archaeology, Groningen University

In this paper, we explore evidence for the hunting and management of pigs in central and western Anatolia. Although pig management has its origins in southeastern Turkey, practices of pig husbandry are relatively slow to spread to other regions of the Near East and Anatolia. Focusing on biometric data from multiple sites, we examine evidence for the spread of small-sized domestic

pigs as well as continued hunting of wild boar in central and western Anatolian sites. We interpret the complex evidence for pig exploitation in terms of environmental as well as cultural variables.

Arable and Pastoral Land-Use at Early-Mid Neolithic Çatalhöyük: The Archaeobotanical Evidence

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This talk addresses the complex taphonomy of archaeobotanical remains at Neolithic Çatalhöyük in order to make direct inferences on agricultural activities and land use at the site. The residues from the two major formation processes – crop processing and dung burning – are mixed in many deposits. In a new analysis of archaeobotanical evidence from the early-mid Neolithic sequence at Çatalhöyük, a range of archaeobotanical, ecological, experimental and statistical approaches were applied in order to ‘disentangle’ arable weeds from dung-derived taxa in the archaeological deposits. The distinctive effects on the assemblage of crop processing and dung burning are now recognised, and the taxa arriving via two different routes identified.

The arable weed record is used to explore the nature and scale of agriculture. The results demonstrate that intensive cultivation of crops sown in autumn on long-lived plots was practised throughout the period. Based on these results, and incorporating insights from geomorphological, pedological and wood charcoal analyses, inferences are made about the location and extent of cultivated land. The plant remains deriving from sheep/goat dung form a basis for consideration of aspects of livestock diet such as seasonality, method and location of animal feeding. Most of the ingested plant material appears to derive from grazing and reflects use of a variety of habitats around the site for much or all of the year. Evidence of stubble grazing suggests that sheep/goat dung was used as fertiliser as well as for fuel.

The archaeobotanical evidence points to close functional integration of crop and sheep husbandry (‘intensive mixed farming’), with implications for issues such as settlement location, agricultural productivity and long-term sustainability, as well as for the social context of farming at this Neolithic ‘megasite’ in central Anatolia.

Species Frequencies and Neolithic Farming Communities in Western Anatolia

Alfred Galik
Institute of Anatomy, Histology und Embryology, Veterinary
Medicine University, Vienna

In this paper we explore patterns in mammalian exploitation using NISP data from multiple sites in central and western Anatolia. In addition to identifying regional differences in species preferences in regards to both hunting and herding behaviors and relating these to environmental parameters and cultural preferences, we also focus on identifying changes in species preferences through time from the eighth to sixth millennia cal BC.

Biometric Evidence for Early Cattle Management in Central and Western Anatolia

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Centre d'Etudes Préhistoire Antiquité Moyen Age (CEPAM, UMR
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In this paper, we summarize biometric evidence for cattle management and hunting in the Neolithic of central and western Anatolia. In particular, we focus on exploring evidence for size decrease reflecting the spread of domestic cattle across Anatolia as well as evidence for continued hunting of local aurochs. Since cattle exhibit sexual dimorphism, biometric data will also be used to identify evidence for cattle management practices related to the exploitation of meat, traction, and milk. This will include detailed analysis of the age and sex composition of culled animals which may show significant changes from the earlier Neolithic of Central Anatolia to the later Neolithic of northwest Anatolia where dairy production likely increased in importance.

Overview of Open Context Datasharing in Zooarchaeology

Sarah Kansa
Alexandria Archive Institute, Berkeley, California

In this paper, we describe the use of Open Context as a platform for sharing and publishing zooarchaeological databases. We use the Neolithic Animal Exploitation in Central and Western Anatolia Working Group as a model for showing how large numbers of datasets can be linked together and made available for collaborative analyses. It is argued that Open Context represents an effective way to make archaeological datasets available and is also necessary for undertaking large-scale collaborative projects such as those being undertaken by the Neolithic Animal Exploitation in Central and Western Anatolia Working Group.

Cattle Management in Neolithic Anatolia: Dental Eruption and Wear and Epiphyseal Fusion Evidence

Arek Marciniak
Institute of Prehistory, Adam Mickiewicz University, Poznan

In this paper, we synthesize a large body of age data from multiple sites in Anatolia in order to examine the origins and spread of cattle management in the region. Using both epiphyseal fusion and dental eruption and wear datasets we present evidence for the spread of cattle management across Anatolia, as well as the development of unique regional patterns in cattle management. Finally, we also address evidence for aurochs hunting in the Anatolian Neolithic.

Pig Management in Neolithic Anatolia: Epiphyseal Fusion and Dental Age Data

Jacqui Mulville
School of History, Archaeology and Religion, Cardiff University

In this paper, we explore evidence for pig management in central and western Anatolia. Focusing on epiphyseal fusion and dental age data, we define patterns of management and hunting as they relate to both geographic location as well as chronology. In particular, we attempt to differentiate culling practices and ages produced by hunting versus early management.

Sheep and Goat Management in Neolithic Anatolia: Epiphyseal Fusion Data

David Orton
Department of Archaeology, University College London

In this paper, we summarize evidence for the age of kill-off of both sheep and goats from multiple sites in central and western Anatolia. Focusing on epiphyseal fusion data, we address evidence for the origins of herd management practices in Neolithic central Anatolia as well as evidence for changes in herd management as Neolithic pastoral economies spread west across Anatolia and into Turkish Thrace.

First Settlements and their Environments along the Coasts of Central Western Anatolia

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The lecture presents results of different geoarchaeological studies with focus on Çukuriçi Höyük and other prehistoric sites in the region of Ephesos (e.g. Arvalya Höyük) in

Western Turkey. Excavations of settlement remains from the 7th millennium BC offer the picture of a developed Neolithic culture founded by first settlers with material relations to Inner Anatolia, but also closely linked to the sea. Geoarchaeological survey results of the broader region hint to an intentional choice of first settlement foundations in the prehistoric landscape.

Çukuriçi Höyük was situated on a small ridge, flanked by rivers. The geoarchaeological research performed around the settlement mound aimed at determining the thickness and age of the settlement layers as well as the spatial extent of the tell throughout the different periods of its settlement. Other goals were the reconstruction of the topography in the environs of the mound.

In total, 19 drillings up to a depth of 8m were retrieved from the tell area. For a better understanding of the depositional environments, geochemical and sedimentological analyses as well as the determination of the macro- and microfauna were done. The chronological framework was rendered by AMS-¹⁴C age estimates and diagnostic ceramics. During its time of occupation until the Bronze Age Çukuriçi Höyük had never been situated directly at the Aegean coast; the closest distance was c. 1.5 km.

A complementary approach aims at reconstructing the land use intensity of the former settlers by determining slope instability phases and the quantification of colluvial layers at adjacent hills. These off site land use intensities will be linked to geochemical and physical properties as well as bio remains of the settlement layers quantified as matter fluxes. On site and off site data will be compared and different phases of sustainability might be inferred. Preliminary results of this approach will be presented.

The presentation will focus on the landscape scenario and the oldest settlements during the 7th millennium BC.

SESSION 7**BETWEEN SITE AND SYNTHESIS:
MISSING LANDSCAPES OF THE
SOUTHWEST ASIAN EARLY NEOLITHIC**

**Asterisk for presenting authors, if more than one author is listed*

**Memory, Hunter-Gatherer Knowledge
Transmission Strategies and Environmental
Change in Late Epipalaeolithic and Early
Neolithic Southwest Asia**

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In the Neolithic archaeology of SW Asia symbolic behaviours and the creation of the earliest “public” built environments have been traditionally viewed as cultural phenomena to be studied in isolation from “mundane” environmental/ landscape change and subsistence socioeconomics. In turn, much of the symbolism has been interpreted through decontextualized frameworks positing loosely defined sexual, gendered or religious “meanings” for its varied regional manifestations. However, such interpretations tend to ignore the potential of symbolic behaviours and “public” architecture to act as stores of environmental/landscape and other forms of historical knowledge, and as instruments for its vertical and horizontal transmission among broader social groups. Using select case studies from different cultural and ecological regions in the northern and the southern Levant, I will demonstrate that the dramatic increase of symbolism and associated architectural elaboration during the PPNA had very little to do with the emergence of Neolithic “village life”, the negotiation of gender relations, and much less with the transition from foraging to food production. Instead it embodied distinct hunter-gatherer strategies and practices for the memorialisation and transmission down the generations of knowledge about landscape-scale events whose potential impacts required the maintenance and mobilisation of broader intra-regional alliances. Apart from its congruence with the available evidence such an interpretation may also assist in resolving long-standing debates on: (a) the assumed role of climatic stress vs. opportunity as instigators of agricultural origins (by arguing that neither acted as the causal factor), and, (b) the assumed role of PPNA symbolic behaviours and “public” architecture as instigators of Neolithic “village life” (by arguing that they were totally unrelated).

**Boncuklu and Pınarbaşı. Variable Landscape
Exploitation and Social Interaction in the
Adoption and Rejection of Cultivation in the
9th – 8th Millennia BC Central Anatolia**

Douglas Baird
University of Liverpool

As the session proposers indicate, the nature of landscape exploitation and engagement has often been believed to alter fundamentally with the adoption of agriculture, both economically and ideologically. The existence of 2 contemporary communities in the 9th-early 8th millennium BC Konya Plain, at the period when cultivator communities emerged in central Anatolia, allows us to explore the landscape exploitation context of the adoption and rejection of cultivation and to investigate the extent to which the adoption of cultivation required changing landscape practices. For these communities the symbolic significance of encounters of and in the landscape may have strongly influenced the economic practices involved in a transition to ‘farming’ or indeed its rejection. In addition, the symbolic representation of landscape encounters at these sites, provides insights into the social engagements that accompanied activity in the landscape and here we can also explore a history of interaction between 2 closely juxtaposed but somewhat different early Holocene communities which also provides part of the context for the spread of farming.

**When Environment Meets Culture – Case
Studies from the Arid Region of Southern
Levant (Invited)**

Anna Belfer-Cohen, A. Nigel Goring-Morris
Institute of Archaeology, The Hebrew University of Jerusalem

Research in the arid margins of the Southern Levant has revealed cultural entities related to and interacting with analogues in the more mesic Mediterranean zone. Yet these terminal Pleistocene/Early Holocene foraging entities appear to display unique traits reflecting local adaptations at times when environmental conditions deteriorated. By examining specific examples we attempt to illustrate the manner in which local groups in the landscapes of the arid margins endeavored to maximize their adaptation to the environmental conditions, growing apart from communities further away in the Mediterranean zone, all of this in order to retain and prolong their individual cultural adaptations.

Pre-Pottery Neolithic B Settlement Systems in the Lower Galilee, Israel: A Multi-Scale Approach

Michal Birkenfeld

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In many aspects, the Pre-Pottery Neolithic B in the Southern Levant (PPNB; ca. 8500–6400 cal BC) represents a peak in Neolithization processes, when settlements became larger and more densely populated and exchange systems intensified. When examined, the archaeological record indicates that settlement and associated subsistence patterns display considerable regional variability; adaptations to local conditions in different regions contributed to the formation of distinct local patterns and a mosaic of different subsistence types. This realization has raised the need for a broader frame of reference, collating and integrating the diverse site-oriented studies together into a discussion of regional-scale settlement patterns, subsistence modes, social organization and various cultural traits.

This paper presents preliminary results of research focusing on the PPNB settlement system in the Lower Galilee, Northern Israel. The Lower Galilee is a well-defined geographical unit, ~760 km² in area, and provides an excellent opportunity to carry out an integrated regional study. Archaeological research in the area has been extensive and includes recent, ongoing and past excavations, as well as several surveying projects. So far, more than 40 archaeological locales dating to the PPN have been documented in the Galilee.

Using this rich dataset, spatial and locational analyses are conducted using GIS applications. Based on the notion that issues of social organization, interaction and change should be mirrored in both intra-site spatial and inter-site settlement patterns, several scales of assessment are employed. This interplay between the site, its surroundings and the larger social and settlement matrices within which it is situated, should provide the required depth of observation and should enable the investigation of local PPNB dynamics. Thus, through shedding light on local subsistence patterns and landscape utilization, we might reach a better understanding of larger-scale processes and of the dynamics operating in Neolithic settlement and expansion.

Locating early farming landscapes in SW Asia and Europe using archaeobotanical approaches

Amy Bogaard

School of Archaeology, University of Oxford

In this paper I assess strategies for making inferences on the nature and social configuration of early farming landscapes in south-west Asia (and Europe). I consider

the potential of stable isotope-based approaches to plant (alongside animal and human) assemblages as a complement to more conventional archaeobotanical approaches, such as ecological interpretation of archaeobotanical weed assemblages. Such multi-stranded bioarchaeological work can not only yield insight into the nature of early farming practices and taskscape but also a context in which to interpret on- and off-site 'ritual' activity, and more broadly the relationship between changing subsistence patterns and forms of community.

Modelling Arable Landscapes of the Early Holocene: Emergent Cultivation at el-Hemmeh

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Availability of cultivable land is a critical component of the transition from gathering to plant food production, yet surprisingly the role of arable plots in the emergence of barley cultivation and domestication is poorly understood. Research at el-Hemmeh, a PPNA settlement located in the Wadi el-Hasa, Jordan, is currently focused on this transition from gathering to farming. However, allying on-site investigations with independent data from the site's environmental context has been complicated by local alluvial geomorphology, which has produced landscapes that are quite literally missing—at best slightly altered and at worst almost entirely eroded away.

Drawing on recent studies which have integrated geomorphic and archaeological investigations to address the challenges posed by dynamic Levantine landscapes, we explore here the use of a geoarchaeological approach that incorporates data from alluvial and archaeological stratigraphy, archaeological site locations, and geomorphic survey, synthesizing these data in a GIS. Such an approach enables the reconstruction of the physical features of the Early Holocene landscape that Hemmeh's population would have inhabited. A reconstructed landscape model, in turn, allows us to construct meaningful, plausible, and quantifiable estimates of such environmental characteristics as the availability of cultivable land—a key feature in considering the processes involved in the transition from foraging to food production.

Perceptions of what constitute a productive field suitable for cultivar production of course vary over time (and within societies) according to such variables as land availability, subsistence goals, and socially constructed systems of value. With this in mind, we focus here on establishing the parameters of potential productivity, without necessarily claiming that past peoples were exploiting all of the land that we characterize as accessible and arable. In the context of el-Hemmeh, we use a GIS

constructed from stratigraphic data and geomorphic field observations to explore the parameters of Holocene landscape change in the Wadi al-Hasa and the potential impact(s) of those changes on our interpretations of the early Neolithic.

Construction of landscape models allows us to render assertions about potential resource availability concrete and testable. For instance, a reconstructed alluvial surface makes it possible to quantify the amount of watered land within a given distance of Hemme, and consider what kinds of behavioral strategies might have been involved in early experiments with cultivation and domestication.

Creating the Neolithic World: The Social Integration of Neolithic Communities across Southwest Asian Landscapes

Bill Finayson

Council for British Research in the Levant, London

Recent calls to consider the Neolithic of Southwest Asia as a polycentric network have done little to fill the analytical gap between site reports and regional synthetic accounts. Landscape remains a largely unexplored context for early low-level food producing societies in Southwest Asia, yet it provides an important venue for many of the actions that were taking place in the new economies and societies that were developing (including herding, emergent trade networks, and mobility associated with activities such as ritual and continued hunting and gathering).

Our interpretations of early food-producing societies have been remarkably devoid of people. It could be argued that agency and the reproduction of society have little value in explaining change on the scale we can see during the transition to food-producing societies, while attempts to use network theory have so far only been undertaken at an abstract level over the region. Yet, excavation evidence is increasingly showing well-defined community identities, potentially existing at a scale not much larger than the individual site.

The community structures we have found suggest that sites were strongly internally integrated, and the examples of the difference between sites suggest a degree of isolation. Yet we know that there are commonalities that bind these sites together into a Neolithic world. If we consider societies as communities, operating at different scales and with varying mobilities, we can recognise that they were inevitably enmeshed in multiple networks of varying scales. In an effort to bring people into centre stage, I will explore the role of communal agency embodied in the dwelling perspective, to consider how routines operated at many different scales within the taskscape creating these networks, leading to the constantly and massively interconnected world we approach through a polycentric framework.

The Built Environment of the PPN – Changing Spaces for Changing Practices?

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Neolithic architecture has always been seen as an indicator for social changes, changing territorial behavior and changed ritual practices. But does architecture really represent these connotations? The modifications of building structures during the PPN, as can be observed at sites such as Shkārat Msaied, can give, along with the changes of spatial relationship between the interior and the exterior, some hints at such developments. This contribution will explore the relationship between Neolithic settlements, their surrounding and settlement organization. The spatial changes at the settlement of Shkārat Msaied will be discussed in detail from an architectural point of view in context with related rituals and burial practices.

The Nature of Neolithic Impacts on the Environment: Early Holocene Oak Woodland Establishment and Spread in Inland SW Asia

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The Pleistocene-Holocene transition in SW Asia, correlating with the emergence of Neolithic lifeways, was marked by a series of abrupt climatic shifts that impacted regional landscapes. In this paper I present new charcoal macro-remain data from three sites in central Anatolia that span the 9th-late 7th millennia cal BC: Pınarbaşı, Boncuklu, and Çatalhöyük. These data will be discussed in the context of other palaeovegetation evidence, aiming at understanding Neolithic impacts on vegetation at a landscape scale. In my analysis I evaluate the disparities observed in vegetation change dynamics between inland and littoral areas of SW Asia, despite the shared pattern of climate improvement at the onset of the Holocene. The spatial and temporal patterns observed in archaeological macro-charcoal assemblages are interpreted in terms of the creation of new anthropogenic habitats through the selection of particular species as fuel, timber and fodder, the active management of trees and woodlands (including coppicing and pollarding), and increasing caprine grazing pressures on grassland vegetation through time. I demonstrate that the spread of deciduous oak woodlands in the inland plateaux of Southwest Asia was closely correlated with selective woodcutting and the establishment of caprine pastoralism. These activities impacted on competing tree species and grasses alike, thus providing oaks with the competitive advantage. This situation contrasted with the conditions observed

in the Mediterranean littoral that was characterised by less acute seasonal fluctuations in temperature and ground moisture. There, woodlands and grasslands co-existed in park-like formations for millennia prior to the Neolithic. I conclude that vegetation types such as the “oak park woodland” and the “woodland steppe” (traditionally considered by Zohary, Hillman and others as the natural woodland vegetation of inland SW Asia) in reality may represent some of the earliest fully managed, anthropogenic landscapes in SW Asia.

Property Rights and Subsistence Practices across Neolithic Landscapes: The ‘Assal-Dhra’ Archaeological Project

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In this paper I present survey and excavation data from the ‘Assal-Dhra’ Archaeological Project (ADAP) in West Central Jordan, focusing on the subsistence-settlement system of Wadi ‘Assal (The Canyon of Honey) during the Middle-Late Pre-Pottery Neolithic B (M-LPPNB). These data are brought to bear on analyses of changes in property rights, resource access, and subsistence practices in the West-Central Jordanian Highlands during the Early Neolithic. The transition from a foraging to a farming economy is one of the most widely studied processes attested to in the archaeological record. Despite this abundance of research, there are still significant gaps in the material evidence used to understand how and why this transition occurred. One such lacuna in the archaeology of the Middle East is an absence of archaeological data relevant to economic practices during the Neolithic derived from non-village contexts. This lack of data is especially problematic for the study of subsistence change as the vast majority of food production behaviours occur outside of residential spaces in village-based communities. ADAP begins to address this gap in our knowledge through the analysis of regional resource availability and utilization, as well as excavation at the first non-village site focused on subsistence production yet identified from this time period: al-Khayran. Regional settlement and local catchment analyses contextualize al-Khayran, a subsistence production field house dating to the M-LPPNB, within the broader landscape of the Early Neolithic. Results from ADAP show the value of extending the scope of research beyond the village, as they have shed light on previously unknown aspects of Neolithic subsistence systems and economic relations. Specifically, ADAP’s regional and local catchment analyses support the contention that individual households mobilized new concepts of property already identified in village contexts to monopolize access to specific limited natural resources. The analysis of excavated materials from al-Khayran shows that this process was enabled by and enacted within the context of some degree of

dual-residence mobility with certain village households maintaining secondary habitations within subsistence production loci.

Reconciling Social and Natural Landscape Approaches in the Late Epipalaeolithic: A Case Study from the East Jordanian Badia

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In contrast to the Early Neolithic, landscape has been a somewhat more prominent concept in the study of Late Epipalaeolithic societies in Southwest Asian archaeology. Late Epipalaeolithic landscapes have been primarily viewed as the physical backdrop to human action and cultural change. Terrain, plants, animals, water and stone are usually conceptualised as types of resources available for human exploitation, simultaneously enabling and constraining human activities. In these landscapes of resources, late glacial hunter-gatherers are usually mapped as rational actors who, assessing the cost-effectiveness and benefits of exploiting these resources, adjust their actions on the basis of a rational model of behaviour.

Although this perspective has in some ways been useful in understanding aspects of Late Epipalaeolithic settlement patterns and cultural change, it is also profoundly at odds with contextual perceptions of landscapes among many hunter-gatherer societies. Hence, archaeologists and anthropologists have over the past two decades engaged more and more with the experiential and subjective view of landscape. In the absence of clearly definable and graspable elements (e.g. monumental structures, field systems) in late glacial Southwest Asian landscapes, these approaches have often not fallen on fertile ground.

In this contribution we present an attempt to bring together the empirical understanding of the physical landscape with an attempt to better understand the social, symbolic and ritual aspects of the Late Epipalaeolithic landscape in the context of ongoing fieldwork in the Shubayqa area of East Jordan’s Badia.

**The Other Landscapes: Integrating the
Hunting-Pastoral Exploitation of the
Jordanian Badia with Neolithic Agricultural
Communities (Invited)**

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For nearly a century prehistoric archaeological research has followed various versions of type-site approaches to the understanding of the development of human involvement with the environment. Sweeping syntheses of individual Neolithic site reports have been undertaken to look for similarities and disparities in cultural patterns within local areas and in larger geographic regions, but little attention has been paid to how such communities actually intermingled in near and more distant socio-cultural relationships, leaving us essentially with isolated populations that strangely imitate or else differ from each other. Within the past decade several new intensive areal research projects have begun in Jordan's eastern and southern badia that are specifically focused on the hunter-pastoral exploitations of arid landscapes and how these were integrated into networks with contemporaneous settlements in arable territories in better watered terrain. It is clear that the part-and full-time Neolithic (and later) residents of the badia were instrumental in vital economic and communication networks across the entire Levant.

SESSION 8
EXPERIENCING MOBILITY: MOVEMENTS
OF PEOPLE AND OBJECTS IN THE ANCIENT
NEAR EAST IN THE 1ST MILLENNIUM BC

**Asterisk for presenting authors, if more than one author is listed*

Movements of People in Mountainous
Environment: the Case of the Zagros in the
1st Millennium BC

Silvia Balatti
 GS HDL, Kiel University

As has been shown by archaeologists, the intermountain valleys and plains of the Zagros Mountains have been constantly inhabited since the establishment of the first villages in the Neolithic. Nevertheless, it should be noted that with the expansion of Assyria at the beginning of the 1st millennium BC the important contribution of written sources became significant and support the information provided by the material remains to reconstruct the dynamics of interaction between people and the environment in the Zagros. It seems that the particular environmental conditions of this mountainous territory led local people to develop specific strategies of adaptation, in which mobility played an important role. Uphill and downhill movements were not only an essential part of the local mode of subsistence and production, but they also influenced the entire way of living (and fighting) of the ancient Zagrosian people.

The aim of this presentation is to investigate some recurrent strategies of movement adopted in the mountainous environment of the Zagros in the 1st millennium BC. This analysis, which is mainly based on the information given in the texts produced by the imperial authorities (Assyrians, Persians, Macedonians, and Seleucides), cannot be unbiased and complete. Nevertheless, the presented perspective offers an opportunity to discuss questions of the representations of "others" and their "unusual" behaviours. Furthermore, it was exactly the aforementioned ability of the people of the Zagros to move within its own environment that enormously contributed to the prevention of the establishment of a firm control over the region by ancient empires.

Arab-Muslim Expansion in the 7th Century
Fertile Crescent and Beyond: Causes and
Repercussions

Lutz Berger
 Islamic Studies, Kiel University

This presentation will discuss the social and cultural conditions that led to the migration of a significant number of Arabic speakers from the Arab peninsula to the Fertile Crescent. It will discuss the causes of the success of the Muslim Arabs in gaining control of great parts of both the Eastern Mediterranean and the highlands of Iran within the greater picture of social, cultural, and political change in the late antique world. It will also address the tensions that the process of migration and (re)settlement caused within the emerging Arab community.

Hellenistic Art on the Iranian Plateau:
Movement of Objects, Movement of People
(Invited)

Pierfrancesco Callieri
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The complex theme of mobility is well illustrated by the diffusion of artefacts of Hellenistic technical and stylistic character on the Iranian plateau. This diffusion has its origins both in the movements of objects linked to trade on international routes, and in the movements of craftsmen following the establishment of art workshops using the Hellenistic language in the Asiatic satrapies. The stylistic language of the Hellenistic Mediterranean *koinè* can, in fact, be mastered only through direct craft transmission for, unlike iconographic models, it eludes simple imitation. From sculpture to numismatics and glyptics, artefacts using this language are consistently of a high technical level and show a naturalistic vision marked by a peculiar illusionistic conception of space, quite different from artefacts stemming from other traditions in local languages, not only in Asia but also in the Mediterranean basin.

The association of these artefacts with the political and social elites, evidenced by their undeniably aulic character, is in fact to be considered one of the fundamental elements for a correct evaluation of this 'lingua franca', which knows neither ethnic nor cultural boundaries. On the Iranian plateau, therefore, the presence of Hellenistic art is largely linked to courtly clients of the Greco-Macedonian élite as well as Iranian ruling classes, who acknowledged the exceptional role of this expression as the language of power until the end of the 1st millennium BC.

It is rarely possible to attribute the presence of a Hellenistic artefact on the Iranian plateau to import or to a local workshop. An overview of the problem will be presented and will illustrate some of the instances which

particularly represent the different types of mobility. The concept of craft tradition will be maintained, which plays a fundamental role in the diffusion of the approach employing the naturalistic style.

Four Inlaid Jewellery Pieces from Hatra. An Unusual Case of Study between Mesopotamia and the Caucasian Area

Enrico Foietta
Department of Historical Studies, University of Turin

The important city of Hatra is located in the Jazirah (North Mesopotamia), 50 km from Mosul. The ancient city flourished in AD II–III with the erection in stone of the main sacred temenos and the construction of the vast sub-circular curtain wall. The city survived two Roman sieges: the first one led by Trajan in AD 117, and the second one led by Septimius Severus in AD 197–198. Hatra was finally destroyed in AD 241 by the Sassanian army and was never reoccupied.

Only four jewellery pieces found in the city show an inset of semi-precious stones. This archaeological evidence stands in contrast to the richness of the inlaid jewelry represented in the corpus of Hatra's statuary, which expresses an extraordinary ornament selection. The first of the four jewellery pieces is a semi-preserved band in gold foil with an insertion of a 'cabochon' garnet. This gem-setting technique was very common and it belonged to the jewelry tradition of the Ancient Near East and the Hellenistic tradition. The other three preserved jewels, two earrings and probably a buckle, show a cloisonné technique. It is surprising to already observe this practice in Hatra in AD II–III, almost two centuries before the best examples typical of Late Roman and Medieval times.

The main purpose of this study is to make synchronic comparisons between these three inlaid jewellery pieces and other ones belonging to different sites in order to improve their dating and comprehend the spread of this technique in the period. This survey started from the Syro-Mesopotamian region and it was progressively extended to other territories due to the lack of occurrences. Contemporary jewellery similar in materials, colors and style were found in the Caucasian area. This district, which corresponds to the ancient Armenian kingdom, was an important commercial and geopolitical crossroad between Sarmatians, Romans, Parthians and, afterwards, Sassanians. According to Shchukin and Bazan's theory, this is probably the area where the cloisonné inset technique, in which the use of red and green colors is predominant, arose. Despite the sparsely available data, it is possible to assume that the northern Mesopotamian area was one of the first places in which this practice was exported and locally developed.

Set in Stone: Archaeological Remains of Mobile Societies in Jordan's Black Desert

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Faculty of Archaeology, Leiden University

Archaeological remains of highly mobile groups are notoriously elusive in Near Eastern archaeology. Only the best preserved archaeological landscapes may reveal remains of past mobile societies. The Jebel Qurma Archaeological Landscape, situated in the stony Black Desert of Eastern Jordan, is such a landscape, as it contains a rich archaeological record which has been exceptionally well-preserved, often even above-ground. The archaeological remains include camp sites, corrals, hunting installations, funerary monuments, and so on. They were most likely left behind by relatively mobile groups that mainly relied on hunting and gathering and/or herding, from prehistoric to sub-recent times. These well-preserved remains provide an excellent opportunity to find out more about how mobile groups exploited and eventually shaped this landscape. They were investigated in relatively high detail through high resolution satellite imagery and aerial photographs, and through additional surface surveying. In this paper, I will address how both environmental and cultural factors may have influenced patterns of mobility within this desert landscape. In particular, the usefulness of Susan Kent's concept of anticipated mobility for explaining the archaeological dataset will be explored. Special attention will be paid to the role of Bronze/Iron Age funerary monuments and 'Safaitic' inscriptions from Hellenistic/Roman times in the formation of socially meaningful and persistent places in the Black Desert. It will be shown that the relatively static nature of the studied landscape does not only provide excellent archaeological preservation, but was also of key importance in the behaviour of past mobile societies inhabiting this landscape.

The Voyage of a Dwarf God: Bes Amulets in the Achaemenid Empire

Sarah Kiyarad
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Bes, commonly known as the most famous Egyptian dwarf god, eventually originated in ancient Sudan or Ethiopia and found his way to Egypt in the Twelfth Dynasty. In Egypt, the deity firstly became an important protector of the family of the pharaoh and then, in the course of time, turned into a multi-functional god, offering his magical qualities to broad levels of society.

As with other Egyptian or Egyptianized deities, Bes iconography was rapidly used for popular amulets. Amulets were an integral part of the Egyptian society, accompanying its members in the form of pendants and small statues from the cradle to the grave. The Bes amulet was especially meant to protect children and women, but as Bes was also seen as a sorcerer, war god and finally

as kind of a prevalent sun god, his amulet was by no means restricted to this group. As a result, Bes amulets could easily be adapted in neighboring societies as well. These amulets, either in form of a naked dwarf with an – occasionally crowned – leonine face or representing its head only, entered the Syro-Phoenician realm at an early stage, i.e. the second millennium BC. In Phoenicia, Bes was presumably identified with the local healing god Eshmun and its iconography influenced the depiction of the Greek Heracles by mediation of Phoenicia. Bes amulets lastly reached Mesopotamia and thus Iranian lands in the first millennium BC.

However, the spread of Bes amulets in the first half of the first millennium BC was by no means comparable to the importance they gained in ample parts of the Achaemenid Empire. Kamyar Abdi was the first researcher who extensively investigated the diffusion of Bes iconography in the Achaemenid realm. Yet, his investigations only discuss amulets as one case of several different objects comprising Bes iconography. By investigating the spread, use, form, material and meaning of Bes amulets within the borders of the Achaemenid Empire, the current paper tries to contribute to a better understanding of a hitherto neglected share of Achaemenid material culture(s) and religious beliefs as well as processes of cultural transfer within the Achaemenid Empire. The question whether acculturated Bes amulets can or cannot be reasonably understood as Mitra amulets in some parts of the Achaemenid realm is a further key issue.

Greeks Working for the Achaemenid King: The Case of Persepolis

Chiara Matarese
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The case of Persepolis furnishes a very good example of how foreign communities were successfully integrated in the economic system of the Persian Empire under the Achaemenid dynasty. The practice of deporting groups or communities defeated on the battlefield was the most important factor which determined the presence of manpower from abroad in the Empire.

In this paper I will refer just to Greeks for two different reasons: on one hand, to delimit my research, on the other hand, because it is the best documented case, for which I can count on different sources of different quality.

This presence is testified as by Classical sources as by local material, literary sources and archeological founding. These contradict the legend of Persepolis as a holy city, closed to foreigners.

On one side, Classical sources testify the presences of so called prisoners working for the Persian kings. On the other side, Tablets from the Archives of Persepolis in Elamic and Aramaic reported allowances and payments given to Greek employers, as men as women. The picture is completed by the only known Persepolis Tablet in

Greek, some graffiti and Greek inscriptions from Kuh-i Rahmat, some elements of the residential complex in Persepolis, which appear to be cut by a Greek hand: it may indicate a network of Greek artisans present in the city and its surroundings.

The available sources testify how significant the presence of Greeks in the economic system of the Achaemenid empire was. Furthermore, it also appears that the foreigners were not discriminated and could also get important assignments from the imperial authority.

Macedonians Abroad: Strategies of Commemorating Alexander's Expansion

Sabine Müller
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Conquering a world empire during a few years, Alexander was forced to consider ways to turn his immediate military successes into structures that guaranteed stability and permanence. Administrative measures and the foundation of cities formed part of his policy to make his conquests last. But it is also interesting to analyze his strategies of making his conquests visible in the landscape. This paper examines Alexander's methods of commemorating his expansion by setting up monuments, demonstrating his rule by ostentatiously using the resources of his newly conquered empire and influencing the mental map of his contemporaries by his court historiography. The presentation will also scrutinize the memory of Alexander's commemoration policy visible in the court poetry written at Alexandria during the Early Ptolemies.

Brain Drain: Foreign Scholars at the Assyrian Imperial Court (Invited)

Karen Radner
History Department, University College London

The Neo-Assyrian Empire (9th-7th century BC) routinely used mass deportations as a key tool of establishing and maintaining its control over its holdings. Who hasn't heard of the Lost Tribes of Israel? But deportation was by no means a blanket strategy. The deported population groups were carefully selected to include craftsmen and specialists. Most of them were relocated in the Assyrian heartland (today North Iraq) which was developed into the unrivalled economic and cultural centre of the Middle East.

Within this context, my presentation will focus on the "brain drain" experienced by the peripheries of the Assyrian Empire, including regions such as Egypt, Babylonia and Anatolia, and the resultant golden age of scholarship and patronage at the Assyrian imperial court.

Nomads, Barbarians and Scythians: Idealisation and Cultural Difference (Invited)

Charlotte Schubert
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Leipzig

The perception of 'the Other' in connection with the differentiation of the self and the ethnogenesis of the Greeks in the context of the construction of ethnic identity and alterity have previously been thoroughly discussed. Mostly, the antithesis of Hellenes and barbarians, which later became a classical one, has been regarded as a typical case of ethnocentric, devaluating typification. Yet, in recent years, explaining the stereotype of this dichotomy based on the Greeks' encounter with foreign peoples or even working with the image of stereotypes at all has become an issue of discussion. The main argument revolves around the question whether Greek ethnicity evolved out of differences – through the reception of and differentiation from other peoples – or out of the idiosyncratic process of the construction of common ancestry and kinship. In the course of this discussion the processes of cultural diffusion and interaction, especially with regard to the northern Black Sea region, have also been increasingly put into focus. In this presentation terminological assignments play an important role and shall be described by means of the terms used by the Greeks for barbarians and nomads. In these terms we can recognise concepts of a particular perception of the world, which include cultural as well as ethnographic and political dimensions.

Serinda and Da Xia: Central Asia's Role in the Bidirectional Knowledge Transfer between Europe and China during the 1st Millennium BC

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The first millennium BC saw the rise of two great civilisations on opposite edges of the Eurasian continent: the Greco-Roman culture in the west and the Chinese culture in the east. Hardly aware of each other, the thinkers of both civilisations have always been fascinated by what lay beyond their frontiers and speculated about the features of land and people in these unknown territories.

Within these speculations, verifiable information about the civilisations on the continent's respective other edge can be traced, although so far no direct contacts between the two cultures or their members could be reconstructed. The key to solving the mysterious existence of this knowledge lies in Central Asia. In the context of long-distance trade along the so-called Silk Roads that existed from as early as the Bronze Age, traders not only transported valuable goods from east to west and vice

versa, but also knowledge about their producers. Due to a frequent lack of a written tradition among the Central Asian peoples, this knowledge generally had an oral character that enabled additions and alterations as well as adaptations of the original motifs to various languages. In this way, some facts became blurred or were lost, while other elements were preserved and found their way into the traditions of Ancient Greece and Early China.

This presentation will focus on the development of the earliest of these images on either end of the Silk Roads during the 1st millennium BC, and will consist of two parts. First, the early Greek images of China as well as the early Chinese images of Greece will be extrapolated from the written sources and compared to the historical civilisation they depict. It will thus be possible to separate sustained historical facts within these ideas from later, mostly mythological additions by Central Asian people or European and Chinese travellers. Moreover, the motifs identifiable within the added information will allow assumptions about the route along which the images were handed on. Second, the effects of the new images on the receiving cultures as well as their incorporation into the existing world views will be discussed.

SESSION 9
TRANSITIONAL LANDSCAPES? SPATIAL PATTERNS, STANDARDISED BURIALS, AND INTENSIFIED COMMUNICATION IN THE THIRD MILLENIUM CAL BC IN EUROPE: GLOBULAR AMPHORA, CORDED WARE AND BELL BEAKER COMPLEXES IN CONTEXT

**Asterisk for presenting authors, if more than one author is listed*

Empires and Revolutions in the Third Millennium: Supra-Regional Rule and Extra Economic Compulsion as a Causative Background of Widespread Cultural Phenomena

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The archaeological phenomenon of the A-Horizon of the Corded Ware resp. Battle Axe complex (CWC) is unique within all of European pre- and protohistory. Concerning totality, geographic extent and obviously also its speed of extension, it exceeds all the other comparable cultural complexes as, for instance, the Lusatian Culture of the East Central European Bronze Age, the Latène Culture of the Early Iron Age or early medieval Slavonic cultures. Therefore, it can be described not only with terms such as communication, trade connections, diffusion or imitation.

We can observe such a kind of far-reaching cultural uniformity first of all under conditions of hunting and gathering or nomadic cattle-breeding socioeconomic systems with an extremely low density of population. Examples include the Inuit, the buffalo hunters of the North American Plains, the Mongols or the early Polynesian Lapita culture. But the hypothesis of a nomadic character of the CWC is commonly accepted as obsolete. Archaeological research of the last decades obviously shows that the final Neolithic settlement density seems to have been not less than that of the Bronze and the Iron Age and it can have possibly reached the medieval pre-industrial level. Under these conditions, such uniformity is a fundamental contradiction to all sociopsychological and sociocultural normality. It can be enforced against natural strong resistance only by means of political and military violence in connection with a strong and radical ideology. Such a revolution must be caused and prepared by preceding economic developments and their social and demographic results. Such changes start in the Late Funnel Beaker (TRB) period and lead to the formation of the Globular Amphorae Culture (GAC) within the TRB East Group. The rise of the CWC could be considered as

a revolution within the already imperialist but rather acephalous system of the GAC. A hypothetical picture of the mentioned and the further developments to the late CWC groups and the Bell Beaker Culture will be sketched and illustrated with the help of examples mainly from 19th century Africa.

Cultural Choices and People during the 3rd Millennium BC: the Petit-Chasseur Site in Sion (Valais, Switzerland) (Invited)

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The Petit-Chasseur site located in the Swiss Alps in Sion (Valais, Switzerland) was the subject of systematic excavations from 1961 to 2003. This archaeological field has yielded one of the most complete cultural sequences of the Valais and even of the whole Alpine region for the Neolithic period and the beginning of the Bronze Age. The occupations date back to the beginning of the Neolithic period during the 4th millennium BC, lasting up to the second Iron Age, around 500 BC. But there is no doubt that the international renown of the site owes itself to the megalithic necropolis, chronologically associated with the end of the Neolithic period. An impressive set of anthropomorphic steles has been excavated. The megalithic necropolis is made up of twelve monuments, named MI through MXIII, which have various shapes and variable dimensions. The cultural horizons include the Valaisian Final Neolithic period, the Bell-Beaker Culture, and the Early Bronze Age. Nine phases of occupation can be distinguished.

Cultural choices (artefacts, anthropomorphic steles, architecture of tombs) and a characterisation of the buried individuals will be presented through archaeological and anthropological analyses.

Social, Economic and Cultural Transformations in the 3rd Millennium BC between the Oder and the Vistula Rivers

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In this presentation some crucial features of social, economic and cultural transformations in the 3rd millennium BC between the Oder and the Vistula Rivers will be discussed. The focus will concentrate on selected aspects, such as ways of creation and manifestation of group and personal identity, changes in cultural landscape and economic diversity. During the 3rd millennium BC fundamental changes took place concerning all three aspects.

At the beginning of the period some groups dominated that continued local Neolithic traditions: the Late Funnel Beaker culture and the Globular Amphora culture. Against this background new ideas appeared in connection with the Corded Ware culture and then in connection with the Bell Beakers. Both of these units are characterized by the dominance of single burials in the funeral ritual, in spite of customs which had reigned in Europe so far that preferred the collective burial. Furthermore, the number of adult men, who formed the most influential part of the societies, definitely prevailed in the highest valorized group. The equipment of the graves emphasizes the two main functions of the elite, which were fulfilled: their role as warriors and hunters, as evidenced by the most important and the permanent element of their equipment in the form of weapons. The second regular element of grave equipment was represented by beakers, which show the ritual character of the elites. The vessels illustrate that buried individuals were incorporated into a community forming a specific social and religious structure, which for sure had also its political dimension, as a specific executive, a forum for making decisions important for all the community. Finally, the strongly interconnected Corded Ware culture and the Bell Beakers were crucial for the establishment of the Early Bronze Age in the area in question. However, a bit later some traditions stemming from the local Late Neolithic were revitalized and perhaps even incorporated in the new Bronze Age ways of life.

Multi-Dimensional Networks in the Late Neolithic: Uncovering Globular Amphorae, Corded Ware and Bell Beaker Linkages within Regional Contexts

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The 3rd millennium BC in Europe is often described as a time of large homogenous archaeological units, very much in contrast to the preceding periods. A closer look at the archaeological materials in question reveals that there is much less uniformity involved than previously claimed, when one compares Globular Amphorae from the Ukraine to Switzerland, Corded Ware pottery and axes from Russia to the Netherlands, Bell Beaker graves and settlements from Portugal to Denmark, Norway and Hungary. Rather than an expression of a uniform complex, these phenomena instead represent a distribution of distinct tool or vessel types, and these objects likely functioned as dynamic symbols that engendered meanings and action in larger pan-regional networks that were simultaneously embedded in regionally varied contexts. The question pursued here is whether it is possible to infer assumptions on the nature of the networks and the semantic core of the sign-systems from the patterns of those signs and their varying contexts.

Interrelations among Corded Ware and Bell Beaker? Material Cultures and Identities within the 3rd Millennium

Ralph Großmann
GS HDL, Kiel University

Up to now so far, the Corded Ware and the Bell Beaker cultures have been regarded as phenomena with similar but different material and ritual evidences existing side by side – at least in Central Europe. But the degree of communication between those appearances has been considered as low and scientific studies took place separately.

In contrast, this paper tries to highlight the interrelations and similarities between phenomena.

On the basis of data from the Rhine- and Thuringia basin, this study discusses changes concerning the material and ritual culture as well as their spatial distributions.

First of all, the presentation paper focuses the burial custom of the Corded Ware and Bell Beaker cultural phenomena in general. It will be questioned to what extent how far the traditions affected to each other and what this does that means for the spatial distribution of both “cultural” phenomena during the 3rd millennium. Changes of the spatial distribution could be accompanied with changes concerning the social spaces.

Moreover, similarities of vessel decoration and the transition of motives from one phenomenon to another will be examined. In this context, ornamentation is a way of communication and an expression of interrelation among the Corded Ware and Bell Beaker phenomena. By references to semiotic theories, ornamentation and motives can be regarded as symbols and thus as a means for communication and for creating identities.

A European Union of Ideologies or the Cattle-isation of Europe? Globular Amphora, Corded Ware and Bell Beaker Pottery Users in an Interconnected Europe 3,500–2,000 BC (Invited)

Volker Heyd
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A long-term process of individualisation, gender differentiation and internationalisation unfolds from the mid fourth and throughout the third millennium BC that fundamentally changes the face of the European Continent. In the archaeological records we observe it in the emergence of so-called cultural phenomena, hence super-regional and integrative, ideologically driven expansionist systems, that incorporate with huge distribution areas region after region of the Central and northern parts and then the west and the edges of the European continent. Their representatives are people and populations forming and using the emblematic, widely

unified pottery we call Globular Amphoras (north of the Carpathian bow and in Central Europe, c. 3300 – 2700 BC), Corded Wares (from the Rhine to the Volga, from the Alps to Norway, from c. 2800 BC) and Bell Beakers (from Central-eastern Europe to Portugal, from Scotland to northern Africa, from c. 27/2600 BC). However, probably the precedent Cernavodă III-/Boleráz (c. 37/3600 to 3300 BC) and the Baden sequence (contemporary to Globular Amphoras, c. 3300 – 2700 BC) in southeast Europe and the Carpathian basin also need to be seen in the same context.

We can only approach the reasons why prehistoric people and populations from regions across Europe, which were no more than marginally in touch before, join in the same pottery, new drinking habits, similar burials customs, same ostentatious display of weapons and other paraphernalia, and thus common values. Certainly factors like mobility and migration, advanced social and economic strategies involving mobility, such as exogamy and transhumance, generally higher levels of communication and enhanced exchange play a significant role in these unification processes. Here, I will particularly argue for the importance of the Pontic steppes and a 2000 years lasting interaction scenario of infiltrating Suvorovo-Novodanilovka, Nizhnimikhailovka-Kvityana and Yamnaya people and populations with their more sedentary contemporaries in southeast Europe, northeast of the Carpathian bow and in the Carpathian basin.

A crucial part of this interaction – besides others, and perhaps in combination with adaptations to a changing climate – is the forwarding of innovations in the sphere of economy and subsistence. We see this archaeologically in a further importance of animal husbandry, with larger herds, specialised breeding and new forms of herding management in particular for cattle. This obviously sets in motion a substantial shift in general mobility patterns and of communication networks. More than this; such a profoundly transformed human-animal-relationship, beyond Andrew Sherratt's 'Secondary Products Revolution', must have had an impact on the whole settlement organisation and people's way of life, in consequence probably fundamentally affecting the basics of societies and thus challenging the whole system of ideas, imaginations, morale, symbols and terms – a new world-view.

Does the Spatial Subdivision of Large Corded Ware Cemeteries Reflect the Socio-Political Organisation of Final Neolithic Societies?

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In this presentation, the subdivision of large Corded Ware cemeteries of Bohemia and also other parts of Central Europe into several groups of burial mounds constitute

the issue to be addressed. The main question inquires to what extent this subdivision reflects the social and socio-political organisation of Corded Ware societies. The subdivision of the cemeteries seems to point to 'segmented societies' constituted by lineages. Spatial analyses of such cemeteries show, in some cases, clear differences between such groups of burials, regarding the effort for the construction and the equipment of burials as well as regarding the 'anthropological composition' of the buried group of persons (e.g. sex and age composition). Grave groups with concentrations of richly equipped and costly constructed burials, which were identified in some cemeteries in Bohemia, could represent burial sites of political leading families. The higher than average number of burials of women and children in these grave groups could point to the hereditary status of these families.

Traditions and Transformations – Eastern Denmark in the Third Millennium BC

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As the TRB tradition ceased and new Corded Ware societies appeared in most parts of Northern Europe and Southern Scandinavia during the early third millennium BC, Eastern Denmark displayed an insignificant and blurred cultural development. The question to be posed here inquires whether the end of the TRB caused a period of decline, a de facto 'Dark Age', or if continuity and a steady cultural development led to the Late Neolithic and the earliest Bronze Age?

Discussing this matter, the chronology and the duration of the Late TRB become central issues. From ca. 2850 BC, Corded Ware communities spread throughout most of the Jutland Peninsula, introducing individual interments covered by small burial mounds, curved cord-decorated beakers and new battle axe forms. These far reaching changes appear to have only influenced the cultural development in Eastern Denmark to a small degree where few single graves, battle axes and Corded Ware beakers occurred no earlier than ca. 2600 BC.

The available ¹⁴C dates indicate that the final TRB (the Store Valby phase) in Eastern Denmark formed a rather lengthy period and not only a brief epilogue, lasting from ca. 3000 – 2600 BC. Thus, the TRB tradition continued in Eastern Denmark and overlapped considerably with the Corded Ware horizon of Western Denmark. At the same time, material culture related to the hunter-fisher-gatherer based Pitted Ware complex occurred in parts of Southern Scandinavia.

In spite of great cultural changes in the region, the archaeological record of Eastern Denmark shows no abrupt changes but instead a continuous development with a gradual incorporation of new material elements. Furthermore, the TRB tradition of using megalithic

tombs was upheld in preference to the new single burial custom.

Differences concerning ideology, hierarchy and economic practice definitely cut through South Scandinavia in the third millennium BC. This is most clearly visible in the dissimilar continuation of the TRB tradition and the adoption of new Corded Ware customs. However, no 'Dark Age' followed the TRB in Eastern Denmark. Instead, a steady process of transformation took place in which the old tribal society was altered and remodeled, preparing the way for new social elites characterizing the Early Bronze Age.

Landscapes, Socioeconomic Organizations and Funerary Customs of the Jutland Peninsula during the Final 4th and the 3rd Millennium BC: Understanding Travels in Life and Death?

Niels Johannsen

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Recent research has investigated the character and symbolic themes of the so-called stone heap graves which were constructed in the northwestern part of the Jutland Peninsula during the period from ca. 3100 – 2800 BC. This investigation has connected the form of this particular burial custom with symbolic trends occurring on a much larger geographical scale during the final 4th and the early 3rd millennium BC.

While this effort has brought some clarity with regard to the burial custom itself, much work remains to be done on the socioeconomic context within which it emerged and thrived. This paper presents a collaborative research project which is currently investigating the settlement pattern, economy and social organization of the people who constructed these graves, including the initial results of the project and how they may be understood in relation to data from previous and later periods, and from neighbouring areas. Tentatively, these results do indeed indicate that certain cultural developments on this part of the Jutland

Peninsula during this period constituted initial stages of socioeconomic trends that become particularly visible during subsequent periods, not least during the Early Bronze Age.

Different Landscapes – Different Lifestyles?

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The European wide expansion of what has been called the Bell Beaker phenomenon remains an enigma of European prehistory. While most of recent research stresses the ideological aspects of using Bell Beaker material culture, here we take a regional and economical perspective from the Western Lake Constance region (SW Germany). We look for the chronological relationships and the economic choices of the Bell Beaker phase and of its closest neighbours in time and space: the Late Neolithic Corded ware and the Early Bronze Age.

We focus on the regional archaeological settlement history, we present the hitherto richest European Bell Beaker associated collection of palaeobotanical macro-remains, and we use our high-resolution palynological work on annually laminated lake sediments. These different lines of evidence are tied together by an absolute chronology derived from new radiocarbon AMS dates (now more than 200) and from the dendrodates from the World Heritage wet preserved pile dwellings.

We show the preceding Late Neolithic, the actual Bell Beaker, and the following Early Bronze Age economies each relying on different agricultural strategies that focus on distinct parts of the landscape. There is no obvious link between the Late Neolithic and Bell Beaker, but between Bell Beaker and the Early Bronze Age. Related to different modes of production, differences in ideology become visible in food preferences as well as in other parts of the material culture.

We conclude that the Bell Beaker economy represents a re-orientation of the mode of production focusing on single, rather small farmsteads which often did not leave a distinct signal in the archaeological record.

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Corded Ware Settlements in the Low Countries: Late Neolithic Behavioural Variability in a Dynamic Landscape

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The Low Countries are situated on the western fringes of the Corded Ware culture distribution. A long and established research tradition exists on this culture. Here, as in many other countries, burial mounds have been the main object of study. However, in the Holocene tidal area of West Friesland in the north of Holland, several unique settlement sites have been found. These settlement sites provide a wealth of data, as both inorganic and organic remains are well-preserved. Careful excavations in the late 1980s and early 1990s have uncovered various types of settlements, lots of waste and cultural debris and even several inhumation burials. These remains are all embedded in a well-studied environmental setting, of which pollen records, macro-botanical studies and palaeogeographical reconstructions exist. A thorough four year study of the forgotten excavation records of three sites (Keinsmerbrug, Mienakker and Zeewijk) and the analysis of large numbers of finds from these sites was carried out, and has only just been completed. An interdisciplinary team of academic researchers and several companies focused on various artefact categories (stone, flint, amber, ceramics, bone, macro-remains and chemical residues) and the spatial analysis of finds and features. Their results give, for the first time, a comprehensive picture of the daily life of the Corded Ware culture. This is a great opportunity for archaeologists aiming at understanding aspects of social organisation, communication and group identity in the 3rd millennium BC. Earlier work on these themes, which rested mainly on the study of barrows and on various partly unpublished site reports, can and will now be re-evaluated. In this paper, results from several specialist analyses will briefly be outlined, according to which the Corded Ware culture settlement variability, subsistence and social organisation in the North Holland tidal landscape will be synthesised. Finally, this model will be confronted with the present state of knowledge regarding the Corded Ware culture in The Netherlands.

Long-Range Contacts in the 3rd Millennium as Exemplified by Stone and Metal Weapons

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A unique and rarely discussed find of two stone axes, resembling battle-axes of the Corded Ware cultures from Ai-et Tell, Israel, is the starting point here to present the interrelations of the Eastern Mediterranean (especially Troy) and the Pontic area with the Central European Beaker groups. The relevance of these finds is still unclear as well as the way which other information could have been attached to the artefacts. While daggers and axes can be shown to have vast distributions and connect people on an individual level, important technological innovations like copper swords or early war chariots were not transported. This is even more striking because innovations from the Pontic area were already easily diffused within less than a century in the 3rd millennium, as the repartition of oxen-pulled wheeled vehicles demonstrates. Why then are there hardly any such contacts visible in the 3rd millennium and why is there such a remarkable contrast to the early urban societies of the Near and Middle East? Several options will be presented and discussed. The possible reasons are manifold and vary between the possibility of archaeological filters, a technological inability of a specific mode of exchange possibly bound to a new form of social structure. I will argue for the latter and formulate criteria for the specific mode of long-distance communication in the "Beaker-Age".

Social and Spatial Patterns at the Beginning of the 3rd Millennium cal BC in Eastern Czech Republic (Moravia): Case Study Corded Ware Culture

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 Department of Vegetation Ecology, Institute of Botany ASCR, Brno

During the beginning of the 3rd millennium cal BC, the Copper Age society in Moravia, known as the Corded Ware culture, underwent a major transformation, as can be seen by the change in burial rites. In contrast to previous centuries, which have nearly no regular graves, in this period well-equipped burials, often covered by barrows, constitute most of the archaeological record. However, several important questions must be answered, as the graves and burial rites do not clearly mirror the true social make-up of the Corded Ware using groups. Based on detailed quantitative and qualitative analyses of the archaeological record (sites, graves, artefacts, ecofacts) from more than 800 contexts this paper discusses different social identities (e.g. gender, warrior, craftsmen) and their possible institutionalized forms, which were closely related to power organization and its regional

representation. One of the main aims of this paper is to suggest and discuss models of social structure with close connection to regional communication and exchange networks in the area lying at the borders between the Corded Ware culture sphere and the nascent Bronze Age cultures situated in the Carpathian Basin.

Transition to the Bronze Age: Networks along the Danube in the 3rd Millennium BC

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In the territory of the Carpathian Basin, the end of the Copper Age and the beginning of the Bronze Age was connected to the appearance of various groups arriving from the East (Yamnaya), West (Bell Beaker) and South (Vučedol, Somogyvár–Vinkovci, Nagyrév, Maros). The changes introduced by these times are best demonstrated in the transformation of the ceramic styles and in the appearance of new types of finds.

The area of Budapest was an important, strategic site in the beginning of the Bronze Age. The reconstruction and analysis of the almost complete Europe enclosing connection network of the North Africa to Norwegian reaching Bell Beaker also present in this area is still an important international research topic. The possibility that the Budapest area was a meeting point of the Southeastern European and Central European regions always offered huge research perspectives. In our lecture we examine the connections of this period's Budapest area to Lower Austria/Czech-Moravia, to the Maros area and to the North Balkan based on new cemetery finds and research results.

There are many different analytical aspects of the network architecture and the temporal and spatial dynamics of the 3rd millennia BC Carpathian Basin. The main driving force behind the continuity/stability or the changes of connections is the accessibility and the obtainability of different raw materials and other natural resources. The most important evidence of the geopolitics-based cultural network is the large-scale geographical availability of similar type and style pottery and metal objects. With the analytical extension of the ordinary typo-chronological methodology and with the latest material analysis results we can enrich our knowledge about the 3rd millennium BC interaction zones. With the help of anthropological and geochemical methods further data can shed light whether real population movements were present behind the interregional connections or not. Hopefully, our results will hook into the web of the ever refreshing and tirelessly new idea seeking international research.

The “One” and the “Other” – Reconstruction of Communication Structures Based on the Distribution of Funnel Beakers and Globular Amphorae in Megalithic Graves in Northeastern Germany

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In order to differentiate between communication structures which become apparent in two different pottery shapes, eponymous vessel types of the Funnel Beaker and Globular Amphora pottery were investigated with regard to the diffusion of their forms and decorations in northeastern German megalithic graves between approximately 3300 and 2800 cal BC. The theoretical basis is set by the hypothesis that similarities and dissimilarities of pottery design reflect the intensity of communication of the makers or users of the pottery, independent of the fact which social group(s) made or used the pottery.

The network, which can be recognized on the basis of decorations on funnel beakers, was most pronounced from approximately 3300 – 3100 BC and then clearly lost importance. The nodes of the network were located either on the sea or along rivers (the Warnow and the Peene). The network, which is mirrored by Globular Amphora pottery, was less strongly associated with waters. This network was quite loose and widespread between approximately 3300 and 3100 cal BC and became significantly denser and small-scaled between approximately 3100 and 2800 cal BC.

Three communication centers were observed in the study area of which not more than two existed simultaneously. These communication centers were located on the Warnow and the Peene Rivers from approximately 3300 to 3100 cal BC. The center on the Peene existed further from approximately 3100 to 2800 cal BC, whereas the center located on the Warnow was abandoned. In exchange, a further center in the north-central region of the area of study existed near Liepen and Gnewitz between approximately 3100 and 2800 cal BC. Within these communication centers, funnel beakers and globular amphorae were registered together in association and overlaps of the networks, which are discernible in the decorations on the globular amphorae and the funnel beakers, suggest a blending of both pottery styles.

This picture can be interpreted as a hint that funnel beaker and globular amphorae were used between approximately 3300 and 3100 cal BC by two different social groups with differently structured communication networks. Between approximately 3100 and 2800 cal BC there seems to have been a change. The spatial organisation of the distribution of funnel beaker and globular amphora pottery no longer shows differences. This can be interpreted as a sign for the use of both pottery types by the now one and the same social group.

This social group using both pottery styles may have developed from the two previous ones.

Global Bell Beakers or a Mosaic of Regional Social Spaces: An Evaluation of Different Concepts?

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Apart from similarities in material culture, the whole Bell Beaker "world" is characterized by differences: different settlement patterns, different access to metal sources, different burial places, and even different burial customs. In general, the whole phenomenon could be reduced to a mosaic of regional entities, which are only linked by the bell beaker itself. In consequence, a dissimilar pattern of social interaction may be reconstructed.

The Beginnings of Mobile Husbandry in Mountain Periphery. The Late Neolithic Transformations (Funnel Beaker and Corded Ware Cultures) in South-East Poland and Climate Change

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This presentation focuses on the transformations of economy and social organization during the Late Neolithic and the beginnings of mobile husbandry in Southeastern Poland.

The area of Southeast Poland provides us with a comprehensive range of habitats and landscape types. This area consists of six main zones with highly differentiated landscapes. The northernmost zone stretches over (1) the semi-lowland area cover by glacial and fluvioglacial deposits. The most favorable zone for Neolithic settlement and agriculture is (2) the loess upland belt covered by fertile brown and black (chernozem) soils, an area with altitudes up to 250 m a.s.l. In respect of altitude and soils the East Carpathian Foothills can be divided into two parts. The first part (3), is covered by silty or loess-like deposits with fertile soils, reaching an altitude of 450 m a.s.l. The second part of the foothills (4) is covered by less fertile soils and the altitudes range up to 550 m a.s.l. The Jasło-Sanok Depression (5) forms the natural corridor through the deeper part of the East Polish Carpathians (Bieskidy and Bieszczady Mountains) (6).

Significant changes of human activity (settlement patterns, economy, social organization) in Southeast Poland took place between ca. 3200 and 2500 BC. A Sedentary (Funnel Beaker culture: zone 1) and a semi-sedentary (Funnel Beaker culture: zones 1 and 3) way of life had been gradually replaced by mobile husbandry (Funnel Beaker and Corded Ware cultures) and

pastoralism (Corded Ware culture). Moreover, for the first time during the Neolithic, high zones of landscape (between 400 and 800 m a.s.l. and up to 1200 m a.s.l.) were used (Funnel Beaker and Corded Ware cultures). The exploitation of deeper parts of the mountains is confirmed by both archaeological (single finds of chipped artifacts and campsites) and palynological data from this area (openings within a woodland and clearing of forests). This paper analyses the importance of the periphery (zones 4 and 6) in the processes of social and economical transformations during the Late Neolithic and the emergence of new social and economical systems.

Among the important issues of prehistoric research are questions concerning where, when and to what extent climate was an influential factor in changes of human ways of life. Results of the archaeological and palynological investigations carried out during the last decades in Southeast Poland can be strong grounds for a discussion on these problems.

This paper focuses on the Late Neolithic transformations within the relatively small area of the East Polish Carpathians including the foothills, the Lower Beskid Mts. and the Bieszczady Mts. This area should be considered as a selected area of research, but it should be emphasized that settlement, economic, social and cultural changes in Southeast Poland are connected with major transformations that encompassed most of Europe.

Gaasemosen – A Contribution to the Study of the Economic Strategy of the Single Grave Culture

Uffe Rasmussen
Moesgaard Museum

The presence of the Corded Ware Culture in Jutland (Denmark) – here known as the Single Grave Culture – is well documented through the many small mounds and also stray finds in large parts of the peninsula, but the settlements are still few in numbers in our archaeological record compared to the other Neolithic cultures. From the sparse number of excavated settlements and house structures, the agrarian and faunal remains are often missing due to poor preservation making it difficult to get a clear picture of the settlement pattern and in particular the economy.

Palynological evidence points toward a pronounced clearance of the forest in the central and western parts of Jutland which together with the flimsy settlement structure have led to the conclusion, that the economy was based on pastoralism – the Single Grave people constantly moving around in the extensive cleared landscape with large herds of cattle – never creating significant traces of settlements.

A recently excavated coastal site from the Single Grave culture in the former fjord of Gaasemosen,

Eastern Jutland, has contributed to the present state of research with faunal material indicating a mixed economy of hunting, fishing and husbandry. The site adds to a number of similar finds from the coastal parts of Jutland. Certain sites from the inland of Jutland can also be interpreted within a hunting perspective. Parallels in neighboring regions are seen, for example, in Mecklenburg-Vorpommern.

On that background it seems reasonable to include hunting, catching and fishing to some extent as relevant parts of the Single Grave economy. This is a distinctive change of the economic strategy compared with the Late Funnel Beaker culture, but in accordance with the strategy of another contemporary cultural unit in Scandinavia – the Pitted Ware culture.

To what extent did the hunting activities contribute to the economy of the Single Grave culture? Are these activities regional phenomena or a general trend of the extensive changes in the third millennium?

Lost in the Third Space: Hybridization of Late Eneolithic Identities in Eastern Serbia

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This presentation aims to discuss the process of the hybridization of physical manifestations of Late Eneolithic identities in Eastern Serbia. This region was a vivid transitional landscape between two great Late Eneolithic cultural complexes: the Cotofeni culture to the east and the Kostolac culture to the west. After more than three decades of uncertainties regarding the definite cultural attribution of the sites in this area, Serbian and Romanian archaeologists agreed on a definition of a somewhat unique, region-specific and polygenetic cultural group named Kostolac-Cotofeni or Cotofeni-Kostolac. The categorization of a new cultural group was carried out following traditional cultural-historic premises, and was mainly based on identifying the cultural origin of decorated ceramics. So, if the excavated settlement contained more pottery decorated in Cotofeni manner it was attributed to this culture. If the necropolis 5 km away contained more Kostolac pottery it was attributed to Kostolac culture. If basic statistical analysis showed equal presence of pottery characteristic for both cultures, then the site was ascribed to the so called Kostolac-Cotofeni group.

Besides mere cultural attribution of the finds, the area in question remained theoretically undisputed. The human background of the analyzed material culture is still quite vague. I argue that the region in question has enormous interpretative potential for the employment of various theoretical discourses, especially those inherited from the post-colonial studies dealing with socio-cultural traditions of communities living in transitional spaces. Eastern Serbia was a true third space during the

Late Eneolithic with influences from both Kostolac and Cotofeni culture areas. Such a geographic position led to the establishment of unique modes of production of space as well as to the creation of exceptional physical manifestations of material culture. I will try to show that complicated processes behind such archaeological evidence operated on the community level, and that the formation of specific group identities should be considered through the acts of inclusion or withdrawal from the current socio-cultural and economic milieu by means of acceptance, rejection and negotiation on both a micro and macro-scale.

Eastern Destinations of the Globular Amphora Culture: Central European Patterns in New Landscapes of Eastern Europe

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The Globular Amphora culture (GAC) had its deepest roots on the Central European Plain, but in the course of time, it became a phenomenon that bound societies settling different regions of the borderland between Western and Eastern Europe. On the basis of material evidence, the GAC can be described as a supra-regional structure of certain mutual elements of material culture and social behaviour (especially ritual and economic ones). Thus, it is the structure of common traits that defines the GAC on a general level, but on the other hand, its wide dissemination resulted in its multiregional character. From the latter point of view, it is possible to explore not only various regional backgrounds of the origins of the GAC, but also its different historical role and directions of changes in each region. The occurrence of the GAC in Eastern Europe may serve here as a very good example.

Taking a historical view, it can be claimed that GAC societies marked a successive stage in the exploration of ecological and cultural environments located along the borderland between Western and Eastern Europe (after Danubian cultures and the Funnel Beaker culture), a stage of a far greater range and diversification as regards the use of the landscapes. The data base is abundant and varied as traits linked to the GAC have been found across the western part of Eastern Europe: from the Baltic in the north to the Black Sea in the south, while in the east they are discovered as far as the Western Dvina - Dnieper line. While the presence of GAC populations in the areas settled by them, bounded by the Western Bug, Teterev and Upper Boh Rivers and located between the Seret and Prut Rivers, took on characteristics of stabilization in the course of the 3rd millennium BC, outside of these areas, in particular on vast areas of the steppe, one can identify evidence of varied formulas of cooperation between the populations and other cultural groups.

Well-evidenced, the traces of the settlement representing Central European GAC traditions testify to the large capacity to adapt to the varied natural landscapes (mainly in the forest and forest-steppe zones) of Eastern Europe.

From Grave Compositions to Cultural Constellations: Spatial Analyses of Burials from Vikletice in Northern Bohemia

Jakob Westermann
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The compositions of the graves from the Corded Ware culture (CWC) in the Vikletice cemetery are analysed using multivariate analysis. It is examined how body culture and death ritual reflect aspects of cultural and social identity. This study seeks to nuance the view of the graves by analysing their spatial compositions.

The placement of the artefact in the grave, and its relation to the corpse is termed “corporeal placement”. The artefacts may be seen as an extension of the body, referring to actions and symbolic meaning in the living world.

The grave material is divided according to variations in their state of preservation, which reduces the material but also ensures substantiation. Graves and artefacts (relating to corporeal placement) constitute the two datasets in the correspondence analyses.

The spatial analyses support the already acknowledged pattern that male and female graves are clearly divided, but interesting new points are revealed. The types of work axes can be differentiated according to corporeal placement. This observation indicates that the symbolic meaning and function of the thick bladed axe type may be closely associated to patterns regarding battle axes and mace heads.

Bowls and “status objects” (battle axes, mace heads and objects of personal adornment) do not occur in the same graves. Furthermore, their distribution in the cemetery is separated. The bowl is inferred as an “alternative status marker”, perhaps a marker of special roles in the community or a marker of ethnicity.

Whetstones have a specific corporeal placement, behind the head. This area, especially in male graves, is “reserved” for several objects: corded beakers, blade knives, whetstones and thin-bladed working axes. This leads me to suggest that artefacts in the area behind the head relate to the same symbolism as seen in the Bell Beaker culture (BBC), where craft related objects are seen as a “production package”.

The analyses show differences in stringency in the compositions of the graves concerning males, females and children. Common rules as well as variations among the different grave groups on the cemetery are detected. I see great potential in incorporating these kinds of

“micro-structural analyses” on a larger material basis from both the CWC and the BBC.

Cultural Heterogeneity of the Western Globular Amphora Culture as a Result of a Complex, Cascade-Like Expansion Process

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The Western Globular Amphora culture forms a relatively heterogeneous cultural complex, which is characterized by the coexistence of regional and supraregional elements in all spheres of material culture. The key ceramic forms, the flint industry and distinct male status symbols as well as cultural rituals (eg. deposition of teams of oxen) and a new subsistence strategy, which is reflected particularly in the settlement system, all belong to these supraregional elements. In contrast, there are, at a regional scale, significant differences in the grave constructions and burial customs as well as in the spectrum of artifacts.

The key to understanding this complex situation was provided by the clarification of the spatial and chronological differentiation of the ceramic ornamentation sequence in combination with the individual assessment of the cultural contacts with existing local cultural groups. This seems to indicate that the interaction with the local communities has been primarily responsible for the spatial variation of the Western Globular Amphora complex. This interaction manifests itself in different regions in different ways, ultimately, in some cases, leading to the formation of cultural hybrid groups. Interestingly, this tendency to cultural interaction is observable as a supraregional characteristic of the Globular Amphora culture. The chronological clarification of three regional ornamentation styles and the cultural interactions, within the supraregional ornamental sequence, offered the possibility to develop a model to explain the origin, spread and end of the Western Globular culture. According to this model of a cascade-like expansion, both migrations of small groups as well as cultural fusion constitute the mechanisms of this process.

Thus, the Globular Amphora culture has spread from its formation in Kuyavia, successively westward to Brandenburg and beyond. Due to the integration of new, local communities, the Globular Amphora culture is subject to a continuous transformation process, which is reflected most clearly in the development of cultural hybrid groups. In parallel, the persistence and emergence of supraregional characteristics can be observed. This suggests the existence of a large-scale communications network at the turn of the 4th Millennium BC, which connected the region between the river Elbe in the west and the river Dnieper in the east.

SESSION 10

“SETTING THE BRONZE AGE TABLE”: PRODUCTION, SUBSISTENCE, DIET AND THEIR IMPLICATIONS FOR EUROPEAN LANDSCAPES

*Asterisk for presenting authors, if more than one author is listed

Spatial Distribution of the Cultivation of Spelt *Triticum Spelta* within the North European Bronze Age Culture

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der Bronzezeit”, Schleswig

In summarizing archaeobotanical data from The Netherlands, Northern Germany, Denmark and Southern Sweden, the following facts can be stated: barley *Hordeum vulgare* and emmer wheat *Triticum dicocum* were main crops during all Bronze Age periods. Einkorn *Triticum monococum* has never been of any importance in the north other than naked barley *Hordeum vulgare* nudum. Both species became rare in the younger Bronze Age. In this period the cereal spectrum was enlarged by oats *Avena spec.*, millet *Panicum milliaceum* and spelt *Triticum spelta*. The region can be geographically differentiated by oats, which tended to occur in the western part and millet, which was particularly cultivated in the east. On Jutland in Denmark, emphasis was placed on wheat *Triticum* species.

In particular, the distribution of spelt is striking. There are very early finds in Rothenkirchen, Rügen (Northeastern Germany) and in Southern Scandinavia, whereas this cereal is missing in the coastal areas of the North Sea. Schleswig-Holstein forms the terrestrial link between these both regions and the question arises, whether agrarian innovations were communicated via this land bridge. First evidence of spelt in cultural layers covered by a grave mound in Bornhöved in the district of Segeberg gave a hint that the agrarian system in Schleswig-Holstein was aligned in an eastern sphere of communication, which can be verified now by the current investigations in Brekendorf in the district of Rendsburg-Eckernförde.

Spelt wheat was a subdominant crop in Brekendorf. Postholes of five three-aisled houses have been excavated. Radiocarbon dates indicate the coexistence of the buildings. Spikelet bases of spelt occur in the three big houses, only. The distribution pattern offers indications of different social structures within the settlement.

Food Production and Diet during the Late Bronze Age in the Upper Seine Valley (France)

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The study of food production and consumption on Late Bronze Age settlements located along a 40km stretch of the Seine valley (about 100 km south-east of Paris) has revealed quite important differences from one site to another, underlining the great variety of foods that were available during this period. Social factors seemed to have played an important role in these differences. Most of the settlement sites in this area are small family farms where evidence suggests that food production systems were maintained on a local level with the rearing and consumption of domestic cattle with a feeble input of game (less than 10%) and the growing of a wide range of plants such as various types of wheat (including New Glume wheat), barley, millet, lentils, poppy and the gathering of wild fruit and nuts. In complete contrast, at the fortified site of Villiers-sur-Seine hunting played an important role in the settlement's day to day existence, as 17% of bone found on the site is from large game, mainly red deer and wild boar. Also, a high representation of pig in the domestic fauna is evidence of probable periods of large scale communal feasting in winter and spring. We aim to draw on these two very different contexts of food production and consumption in order to try and determine how natural resources and domestic livestock were managed, as well as the agricultural techniques used to produce such a wide variety of cereals and plants.

Cultural and Climate Interactions in the Last 5.5 ka Vegetation History from the Garda Lake Region (N-Italy). A Comparison of New Palynological Records from Three Small Lakes

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The glacial amphitheatre constraining the Garda Lake at the southern border of the Alps preserves many small basins formerly occupied by closed lakes. During the Bronze Age, 50 pile-dwelling settlements were built up on these ponds and along Garda lakeshores. Astonishingly, this massive inhabitation ended up almost entirely in the XIII-XII century BC and was followed by an abandonment phase until a subsequent land reclaiming, dated to the Late Iron Age and mostly to the Roman Age.

By comparing the palynological and lithostratigraphic records from three different lakes settled by pile-dwellings (Lucone di Polpenazze, Lavagnone di Desenzano, and Castellaro Lagusello) we reconstructed the regional vegetation history during the last 5.5 ka BP within a while of 400 km square. Furthermore, we provided a first synoptic frame of lithostratigraphic changes.

A first, remarkable event of hornbeam expansion at 5.3-5 ka cal BP is apparently synchronous at centennial scale in all sites. The record of anthropogenic plants during the Copper Age is weak but local differences occur among sites. The onset of Early Bronze Age in the XXI and XX century BC is marked by an abrupt fall of Arboreal Pollen, and the first appearance of several archaeophytes which expanded in the following 700 years of pile dwelling history. The end of this anthropogenic phase is followed by a second, sharp peak of hornbeam, suggesting forest recovery, i.e. pioneering by coppiced woodlands. Although the precise age of this event has not yet been established, it seems still framed within the late part of the Bronze Age. Coeval lithostratigraphical changes from gyttja to carbonate mud occur in near-site positions, but they are less visible in off-site positions. The organic component supply in the off site sedimentation is strongly enhanced both by the occurrence and the proximity of lake settlements. Indeed, a fourth lake with no evidence of Bronze Age inhabitation (Paul di Manerba) recorded carbonate sedimentation all along the last 5.5 ka cal BP.

Late Bronze Age Land Use in Aeolian Landscapes of Thy, Northwest Denmark

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Near the North Sea coast of Thy, Northwest Denmark, Bronze Age settlements and fields are sometimes found on raised marine deposits covered by aeolian sand and characterized by extremely sandy soils and a high ground-water table. Evidence from excavations in such landscapes at two locations, Bjerre Enge and Østerild, will be presented summarizing agricultural techniques, including the layout of fields, ard-ploughing, and waste dispersal as part of the manuring during the Late Bronze Age (1100 – 500 BC). Macrobotanical investigations demonstrate the importance of naked six-row barley as the dominant crop supplemented by spelt and emmer. Also the cultivation of gold of pleasure took place during the Late Bronze Age, and the seeds from Bjerre site 7 constitute the earliest large find of this species from Denmark. By far the greatest quantity of gold of pleasure seeds was found at Bjerre 7 in an activity area where there was virtually no grain. This suggests that the processes involving gold of pleasure seeds were not connected with normal food preparation. Instead, there could have been extraction of the oil from the seeds.

The use of the flat raised seabed in Thy for fields, grazing grounds and settlements can be compared with other sites along the North Sea coast, demonstrating widespread similarities in subsistence and landuse during the Bronze Age.

The Environmental Context and Function of Burnt-Mounds: Production Technology and Landscape in the Irish Bronze Age

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Burnt mounds or *fulachta fiadh* as they are known in Ireland are probably the most common prehistoric site type in Ireland and Britain. Typically dating from the Middle to Late Bronze Age (although both earlier and later examples are known), they are artefact-poor and rarely associated with settlements. They generally consist of a low mound of stones often showing signs of fire-exposure arranged by, or around, a pit or trough which may be unlined or lined by wood or stone. The function of these sites has been much debated with the most commonly cited uses being for cooking, as steam baths or saunas, for brewing or textile processing. A number of major infrastructural development schemes in Ireland in the years 2002 – 2007 revealed remarkable numbers of these mounds often associated with wood-lined troughs, many of which were remarkably well-preserved. This offered an opportunity to investigate these sites as landscape features using environmental techniques – specifically plant macrofossils, pollen, beetles and multi-element analyses. This paper presents the results from nine sites from Ireland and compares them with burnt mound sites in Britain. The *fulachta fiadh* which are generally located in clusters are all groundwater-fed by springs along floodplains and at the bases of slopes. The sites are associated with the clearance of wet woodland for fuel and have predominantly 'natural' beetle assemblages found in wet woodlands. At 7 out of the 9 sites evidence of nearby agricultural (arable) activity was revealed and all sites revealed, some but not high levels of grazing. At one site (Cahiracon), both pollen and coleoptera suggested that oak galls or leaves were brought onto site, at another (Coonagh West) both pollen and macrofossils suggested that alder was being used on site and at a third (Jigginstown) the pollen of two dye plants (purging flax and knapweed) was recovered. Multi-element analysis at two sites (Inchagreenoge and Coonagh West) revealed elevated heavy metal concentrations suggesting that non-local soil or ash had been used in the trough. This evidence, taken together with the shallow depth of all the sites, their self-filling nature, attempts to filter incoming water, the occasional occurrence of flat stones and flimsy stake structures at one site (Inchagreenoge), suggests that the most likely function of these sites was textile processing, involving

both cleaning and/or dyeing of wool and/or natural plant fibres. This can be regarded as a functionally related activity to hide cleaning and tanning for which there is evidence from one site (Ballygawley) as well as from other Irish burnt mound sites. Whilst further research is clearly needed to confirm if *fulachta fiadh* are part of the 'textile revolution', we should also recognise their important role in the rapid deforestation of the wetter parts of primary woodlands and the expansion of agriculture into marginal areas during the Bronze Age.

Subsistence, Settlement and Society in the Late Bronze Age of Southeast Hungary: The Case Study of the Fortified Settlement at Csanádpalota-Juhász T. Tanya

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Recent research has demonstrated that around 1300 – 1100 BC, the southern part of the Great Pannonian Plain (Csongrád and Békés counties in Hungary, Arad and Timiș counties in Romania) is characterized by the emergence of a series of massive fortified settlements (e.g. at Cornești, Sântana, Orosháza, etc.). This substantial change in settlement patterns – the appearance of a two or three-tiered hierarchy – indicates important social and economic transformations in the region, the nature of which, however, remains unknown yet.

In 2011 and 2012 preventive excavations preceding the construction of the M43 highway between Szeged and Arad were carried out in the vicinity of the town of Csanádpalota, on the border between Hungary and Romania. Here the track of the highway passes through one of these large fortified settlements, passing by its centre, enclosed by an oval ditch and rampart, but cutting through a series of other, partly concentric, partly linear systems of ditches. The fortifications are clearly visible from the air and in satellite images. The size of the whole enclosed area is around 300–400 ha.

The function of these settlements is debated to some degree, as they have not yet yielded substantial domestic remains, and their interpretation as refugia or ritual centres is also possible. We would like to address this issue through the analysis of the remains of the subsistence economy. During the excavations soil samples were collected systematically from every archaeological feature and were subsequently wet sieved for archaeobotanical and other microremains. We will present the preliminary results of the palaeobotanical analysis, complemented with the analysis of the faunal remains and the study of agricultural lithic implements.

The combination of these results will shed new light on the agricultural activities and subsistence economy of this community, and will ultimately provide new information on the function and nature of the settlement.

This then will be investigated within the framework of a wider, microregional settlement network and will be interpreted in terms of the socio-political make-up of these Late Bronze Age polities.

Social Change and Subsistence Production in the Iberian Peninsula during the 3rd and 2nd Millennium BCE (Invited)

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During the 3rd and 2nd millennia BCE, crucial changes took place in the way communities lived and organized production in the south of the Iberian Peninsula. The relatively mobile and permeable communities of the Copper Age with a highly productive economy were submitted to a state organisation during the Early Bronze Age, known as the El Argar society. This entity collapsed around 1550 BCE and gave way to a social reorganisation of the productive forces during the Late Bronze Age. These historical changes are expressed in different spheres of social life, including funerary practices, the control over natural resources and the modes of production. One sphere in which the effects of these changes are more clearly evidenced is subsistence production, as consumption habits and food processing technologies are deeply rooted in the economic, social and ideological structure of society.

This presentation proposes a comparative study of the consumed and stored food remains that reached the archaeological record, on one side, and the labour instruments that permit the processing of food, on the other, in order to recognize deep transformations in the way of life of different prehistoric communities. Faunistic and botanic data stemming from different prehistoric sites shall be evaluated against the technological information obtained through the analysis of several thousand macrolithic artefacts that have been studied during the last two decades. This interdisciplinary approach is developed in order to assess questions about quantity, quality and intensity of subsistence strategies and the way food resources were managed in a specific social and political context. The correspondence between qualitative and quantitative results, supported by analytical procedures (i.e., use wear analysis, tribology, spatial analysis, etc.) will be used to characterize the different socio-economic systems that developed during Iberian Later Prehistory. One key issue to be addressed is the way in which social asymmetries and economic exploitation affect and are reproduced through subsistence technologies

Scurvy – Malnutrition in the Caucasian Bronze Age

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The reconstruction of diet and food production of Bronze Age populations from the Northern Caucasus is one of the leading topics in this field of research: Do different subsistence strategies reflect the high range of differences of environmental conditions? Mainly based on animal resources, the lifestyle of Bronze Age people living in the steppe region, the foothill area or in the higher mountains differs from lifestyles ranging from traditional pastoralism to sedentary settlements – this is the status quo in actual research.

The human organism is not able to produce its own vitamin C. Required for functional collagen synthesis, humans rely on an appropriate diet in order to ingest it in the necessary amount. After two months of total absence or six months of reduced intake, the deficiency leads to significant symptomatic disorders and consequently to death. This malnutrition is well known as scurvy. To ingest an adequate amount of vitamin C, fresh vegetables, herbs or fruits should be part of the daily diet – today and in former times. Milk and meat contain only very small amounts of vitamin C, especially when prepared or stored.

Manifested as calcified subperiosteal bleeding, scurvy can be diagnosed within human bones. It is most often described in young children across almost every time period and geographical region. Such pathological changes have also been observed on skeletons from two different sites, Marinskaya-5 (steppe region, Middle Bronze Age) and Kudachurt 14 (foothill area, Middle to Late Bronze Age).

According to the consideration of animal based food production, these populations obviously had problems to provide an adequate diet. Plenty of plant species rich in vitamin C occurred in the mentioned regions. Hence, a lack of fresh food could have been caused by general or seasonal food strategies. But there are further questions to answer: What role did geographic origin, age or physical workload of the affected individuals play? And what does this tell us about health consciousness and social-economic organisation? These investigations are the first attempt to gain information regarding the life conditions of the almost unknown North Caucasian Culture from human remains.

Setting the Table in the Eastern European Steppes

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During the Early Bronze Age the West Eurasian steppes were widely inhabited by the Yamnaya and subsequently the Katakombnaya cultural communities. For various reasons, including an imbalance between burials and permanent settlement structures, an increase of cattle in the bone assemblages and environmental preconditions, these archaeological communities are largely thought to have led a semi-nomadic lifestyle related to mobile pastoralism.

Within the framework of a collaborative project between the Cluster of Excellence 264 TOPOI at the Free University of Berlin and the University of Bristol, ⁸⁷Sr/⁸⁶Sr and ^{δ18}O isotope analyses were performed to gain an insight into mobility patterns of the Early Bronze Age steppe communities. In addition, we also performed ^{δ13}C and ^{δ15}N analyses on a data set of 54 Eneolithic and Early Bronze Age human individuals from sites in the West Pontic and North Pontic regions, as well as from Southern Russia. Our results extend the set of stable isotope data in this study region, complementing previous work by M. Lillie, K. Privat and N. Shishlina. In this paper we will present the results of our ^{δ13}C and ^{δ15}N analyses, and highlight spatial and chronological differences which can be connected to changes in diet.

Back to Good Shape: Biological Standard of Living in the Copper and Bronze Age (Invited)

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Body height has been put forward in the field of economics as a substitute measure of welfare in times and regions when usual proxies like GDP are not reliable or available. Using skeletal remains, the concept can be applied in archaeology, too. Taking earlier approaches (e.g. Jaeger et al. 1998; Köpke 2008; Siegmund 2010) further, a database of relevant long bone measurements is currently assembled within a research project entitled “Living conditions and biological standard of living in the prehistory of Europe and Southwest Asia (LiVES)” involving prehistoric archaeology, prehistoric anthropology and statistics.

Besides general methodological problems arising from the reconstruction and comparison of archaeological body height data as a proxy for the biological standard of living, research in later prehistory is additionally hampered by the increasing occurrence of collective burial and cremation. When properly circumvented

using statistics, however, a preliminary sample shows diachronic as well as regional trends in the Neolithic and Bronze Age between the Near East and Europe. They suggest that the Old World body height pattern of tall northerners and short southerners known since the Roman Age is not a constant phenomenon, but probably evolved during the Copper and Bronze Age after a general Neolithic body height decline.

Looking for causalities, analyses have to consider nutrition, work and disease load as well as social status in multivariate models. They also have to overcome problems in the operationalization and correct interconnection of independent and dependent data. Moreover, possible metabolic changes in some prehistoric populations have to be taken into account before LIVES can establish themselves as the "rating agency" assessing the outcome of Copper and Bronze Age subsistence strategies.

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Tumulus Culture and Economical Change (Moravia, Slovakia)

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This paper is based on two independent studies. The first of these is a complete work on Middle to Late Bronze Age site (Přáslavice, Moravia), the second is a complete archeobotanical work from the Bronze Age in Slovakia. Both studies independently came to the conclusion that, in the Middle Bronze Age, there is a clear change in the economic strategy. From the combination of observations a shift in food production and a resultant economic change is proposed. For well-known EBA settlements, deep storage pits of piriform shape are typical. Neolithic crop storage appears to have continued and the use of the same arable practices is suggested. In the MBA, with the rise of the Tumulus Culture in Moravia, settlements in higher positions decline and there is a pronounced movement to unfortified settlements on the plains. This hasn't been known for long, it was even thought that the Tumulus Culture was nomadic; however field research from the 1990s brought extensive evidence of settlements. The Přáslavice site in central Moravia is a young Tumulus Culture and early Urnfield Period site, this is demonstrated by horizontal stratigraphy. Precise

statistical analysis of the fragmentation and typological traits shows the development of economic structures over time. In the time of live Tumulus Culture settlement, we find smaller cylindrical pits. Just with the material of old Urnfield Culture, we find in other part of the settlement typical piriform shape storage pits once again.

Archeobotanical data for the MBA shows a widening range of crops and on the basis of weed analysis bigger field sizes and a gradual transition to long-term fallow. The most significant change was in the cereal stores, where millet was discovered. Millet differs from the previously cultivated cereals mostly in its short growing season, relatively high and reliable yields, even under poor conditions and wider ecological plasticity. The availability of this crop could have affected the form (smaller size) of grain pits; and caused a wholesale change in the range of crops and shifts in the organization of farming and the rise of the society at the end of Tumulus Culture.

Bronze Age Crop Production – General Tendencies in Europe from Early towards Late Bronze Age

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Current archaeobotanical work concerning Bronze Age excavations at Tossene-Tanum in Sweden, Legård-Thy in Denmark, Lossow-Frankfurt/Oder in Germany, Százhalombatta-Földvár in Hungary and La Bastida-Totana in Spain inspired us to review crop production in whole Europe.

For the general overview on plant cultivation in Bronze Age Europe, 229 archaeobotanical site reports of nine well-investigated regions were evaluated in a semi-quantitative way using a newly created Representativeness Index (RI), reflecting the importance of crops in cultivation and use. The results, presented as circle diagrams for cereals, provide comparable data sets for the different regions in the Early/Middle Bronze Age and the Late Bronze Age. Differences in regions and time periods for the main crops can be easily detected.

Barley is a dominant cereal in all investigated parts of Europe, as is emmer (the latter especially in Italy, but with little importance in the Iberian Peninsula), while einkorn is subdominant in southern and south-eastern Europe. In the Late Bronze Age, millets become a main crop in south-eastern Europe, the Pannonian Plains, the Alps and their foreland, as well as in western central Europe. While in the Early/Middle Bronze Age spelt was mainly grown north of the Alps, in the Late Bronze Age it spread from there towards the Alps, the Pannonian Basin, Italy north of river Po, and Greece, while being completely absent in the Iberian Peninsula. Free-threshing wheat was a main component in Bronze Age agriculture in present-day Spain and France. Oats and rye

were already on the verge of becoming cultivated crops in the Late Bronze Age, but their main phase of spread as intentionally cultivated crops, especially in northern Europe, happened later.

The diversity and importance of legumes was high in the southern and eastern parts of Bronze Age Europe. The use of fruit trees was limited to the Mediterranean area, where the first stages of their domestication might have been initiated. Oil plants are well recorded from south-east Europe and the North Sea coast, but due to their low ability to survive carbonisation, the representativeness of their remains is only weak.

Subterranean Grain Storage and Management of Food Surplus at the Early Bronze Age Site of Vráble, Southwest Slovakia

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The scale of pitting activity at the Early Bronze site Fidvár bei Vráble (Southwest Slovakia) is remarkable. Geomagnetic prospection and aerial photography revealed extended areas with clusters of oval negative features both inside the inhabited area and on its perimeter. Excavation trenches in several locations exposed large pits with bell-shaped cross-sections. Numerous ancient sources, ethnographic and ethnohistorical accounts describe the use of such pits as grain storage facilities. Until recently, identical storage installations were common in many parts of the world, for example in Africa, South America, the eastern Mediterranean, and the Middle East. Ethnography and experimental replication demonstrate that their shape was specifically designed to minimize spoilage and loss of grain. This paper presents a preliminary study of the chronology, stratigraphy, relation to domestic structures, distribution, numbers, and capacity of the bell-shaped storage pits at Vráble and addresses the social and political implications of the storage practices at this site. Does large-scale subterranean storage in specialized facilities imply that grain production regularly exceeded subsistence needs, providing surplus grain for trade, exchange, or feasting? Was storage of surplus a communal or a household activity? Why were subterranean storage facilities so ubiquitous? The preference for concealed facilities may imply the need for removing surplus food from circulation or general insecurity, as opposed to large and conspicuous above-ground granaries signalling centralized control and socially acceptable demonstration of wealth.

The Reflection of Bronze Age Settlements in Pollen Diagrams from Brandenburg, Eastern Germany

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Two pollen diagrams from Sacrower See and Großer Krebssee in Brandenburg, eastern Germany, show the development of woodland and the history of settlement from the Late Neolithic period to the Early Iron Age. It can be shown that settlements from the Early Bronze Age are reflected in both pollen diagrams much less distinctly than those from the Late Neolithic, Middle and Late Bronze Age or Iron Age, as it is the case in the whole Brandenburg area. The reason for this feature might be a specific mode of agriculture in the Early Bronze Age, but there is still need for discussion.

Archaeobotanical Results as a Key to Understanding Social and Political Status of Middle Bronze Age Settlements in Southern Ireland

Penny Johnston

Ballintubber, Carrigtwohill, Co. Cork

This poster will present the archaeobotanical results from two Middle Bronze Age round house sites in southern Ireland. Although the sites are superficially similar – they include more than one round house and they are both situated within the rich farmland of north Cork – the archaeobotanical results (the only palaeoeconomic information available from the site) are surprisingly different.

At Ballynamona the archaeobotanical analysis revealed an extraordinarily rich assemblage of naked barley and emmer wheat grains. These were interpreted as a processed, stored harvest, the products of crop processing. They were probably burnt in one, catastrophic fire. Artefacts found at the site included quern and rubbing stones, typically associated with crop processing. The evidence suggests an ability to mobilise labour for both gathering in the crop and processing it at one of the busiest times of the year (i.e. the harvest). This hints at social organisation that is more complex and hierarchical than that of the nuclear family.

In contrast, at Mitchelstown, the remains were primarily from weed seeds. These were initially thought to have represented a collected wild food, but retrieval of charred cereal chaff in some samples suggests that such of the charred remains at the site were crop processing by-products. This now suggests that the weeds and chaff represent the remains of piecemeal crop processing. Such activity is indicative of an economy that is subsistence based, and social organisation in such

economies is usually considered to be centred around the nuclear family.

The archaeobotanical results therefore suggest great social and economic differences in the way these sites were organised. It is possible that these differences reflect a growing degree of social organisation within the Middle and into the Late Bronze Age. The disparity in the archaeobotanical results, and the social and economic interpretations derived from them, therefore broadly coincide with the interpretations of Irish pollen diagrams from the period (Plunkett 2008).

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Table Culture at the Bronze Age of Tell-Site of Százhalombatta-Földvár, Hungary

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The tell-site of Százhalombatta is located on the western bank of the River Danube, thirty kilometres south of Budapest. It developed during the Early-Middle Bronze Age (circa 2,000–1,500 BC) with the Nagyrev phase followed by the Vatyá phase. It is one of the best excavated and understood tell-sites in temperate Europe with a well-documented pottery chronology and typology. Whereas plenty of studies have been made on the technical and creative aspects of the Vatyá-Kozider pottery, the study of vessel use has been absent. This paper focuses mainly on the use of table ware and on bridging the archaeobotanical and zoological data with the pottery assemblage. That is, putting food on the table.

The Contribution of Gathered Plants to Daily Diet in the Bronze Age

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Gathered plants have always contributed to people's daily diet in the past. However, with the beginning of farming in the Neolithic, a shift towards the growing of crop plants as a basis for nutrition has been observed. Nevertheless, gathered plants were a welcome addition to daily nourishment. Since farming was introduced, we can separate three modes of plant gathering. There is the gathering of wild plants in more or less natural stands, the gathering of semi-wild plants that most possibly were grown in protected zones or managed stands and the gathering of the semi-wild weed species in arable fields.

A number of questions must be posed. With the further establishment of farming communities in the Bronze Age, was there still continuity in the use of gathered plants? Which were the most important gathered plants in the Bronze Age? Is the establishment of new crop species in the Northern European Younger Bronze Age linked to an "upgrading" of former gathered weed species to much appreciated crop plants? What are the social implications of plant gathering? Ethnographic studies on the social sphere of plant gathering combined with the archaeobotanical record may come up with models for the social and cultural differentiation within Bronze Age food production systems.

The Plant Economy of Feudvar, a Fortified Bronze and Iron Age Settlement on a Loess Plateau at the Confluence of Tissa and Danube

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Feudvar is a famous site at the confluence of the Tissa and the Danube, on the Pannonian Plain. The site lies on a loess plateau, overlooking the Tissa River. The loess plateau is surrounded by fossil and recent oxbow lakes and by the streams of the Tissa and the Danube.

The economy of the Early Bronze Age was very complex. Feudvar had six cereals: Agriculture was dominated by Einkorn (small spelt), sown as a winter crop. Barley was the second important cereal. Emmer, sanduri, bread wheat and spelt were cereals for special purposes, sown in small fields and harvested and processed in a way that differs considerably from that of einkorn and barley. Millets were of no importance at the beginning of the settlement. At the end, broomcorn millet was a main crop together with einkorn and barley. The increase of millet proceeded over three steps designated as low, medium and high.

Feudvar also featured six pulses: lentil was the most important, bitter vetch and pea were also frequent. Grass pea and broad bean were always available, although in very low numbers. Chickpea was rare.

Feudvar also had six oil plants: gold-of-pleasure was the main crop, whereas minor crops included opium poppy and *lallelantia*, an old oilseed with no modern name, nowadays still common in the Near East. Linseed /flax was an oil plant as well as a fibre plant with an increase in find density in the younger phases. The seeds of hedge mustard and giant *scabious* were observed in low numbers in all phases. A mass find of hedge mustard hints at the use of this plant.

Feudvar also exhibited six major fruits and nuts: strawberry, water chestnut, danewort, blackberry, sloe and oak. Pear and apple, wild grape vine, and cornelian cherry were completely unimportant. Hazelnut was not present due to the surroundings of the site.

Finally, Feudvar had six major useful plants for several purposes: Germander, vervaine and mallow were 'good remedies' for everything. Sowbane and henbane were 'bad drugs'. Gromwell provided red colour for many purposes, for example, to colour the skin, walls and fabrics.

In sum, the highly developed Early Bronze Age settlement of Feudvar can be regarded as a precursor of the Late Bronze Age economy, e.g., of the Urn Field culture in Central Europe. A high diversity in crops corresponds with a developed kitchen and table. They had beer but no wine.

Prehistoric Expansion of Animal Husbandry and Environmental Changes in the Northern Alps – An Integrated Archaeobotanical, Geoarchaeological and Archaeological Approach

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Alpine animal husbandry (*Alpwirtschaft*) and cheese production is known to be an important economic factor in the Alps since the Middle Ages. Archaeobotanical, geoarchaeological and archaeological evidence suggest that even in the climatically unfavourable high mountain regions of the Northern Alps agro-pastoral activity played an important role since the Early Bronze Age.

Our results from three different sites at Bartholomäberg (Austria), Gargellen (Austria) and St. Antönien (Switzerland) indicate that prehistoric people did not merely use the alpine mats for transhumance, but also lowered the timberline by clearing the subalpine spruce forest to gain pastures. Pollen diagrams from the sites in Switzerland and Austria reflect large clearances in the subalpine region and rising grazing and settlement indicators accompanied by increasing fire frequency. Archaeological sites (abris, remnants of huts, stock enclosure) evidence the seasonal presence of shepherds living in the subalpine summer pasture regions throughout different epochs. Our interdisciplinary study allows to reconstruct different phases of occupation and grazing activity of varying extent. According to our results the expansion of pasture land in prehistoric times can be regarded as an active process. There was the possibility or the need to supply food on the basis of animal husbandry in extreme areas such as the high mountain regions.

Bronze Age Land Use and Food Production in Southwest Germany according to Botanical Off-Site and On-Site Data

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In recent years, in the Laboratory for Archaeobotany of the Landesamt für Denkmalpflege in Hemmenhofen several high resolved pollen profiles from lake sediments in the pre-Alpine lowlands and in the Black Forest were worked out. This was done in three research projects supported by the Deutsche Forschungsgemeinschaft. The time window focused on is generally from 5000 B.C. cal. to 0 B.C./A.D., in some cases even to Modern Times. The sampling was done without gaps, taking 1 cm or 0.5 thick samples. The time resolution, depending on the sedimentation rate, is between 30 and less than 10 years per sample. The time models are based on 20 radiocarbon datings in each profile on an average. Additionally, as a result of the daily work of the laboratory, big sets of on-site data concerning plant macrofossils exist and can be evaluated in terms of land use and agriculture. The combination of both data types give new insight in the quality and extension of Bronze Age land use and its differences to the Neolithic period before and the pre-Roman Iron Age afterwards, as well as in developments during the Bronze Age itself.

Changes after the Revolution: Uniformity or Diversity in Late Neolithic and Bronze Age Diets?

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Food as a marker of the transition from the Mesolithic to the Neolithic is well researched in many regions (e.g. Schulting 2011), whereas changes in dietary habits from the Neolithic to the Bronze Age have not received much attention yet.

It has been assumed that cultivated cereals played merely a minor or symbolic role in food production and consumption after their introduction in Europe (Thomas 1993), whereas an economy based almost exclusively on cultivated plants and domesticated animals occurred only in the Late Neolithic or Early Bronze Age (Entwistle/Grant 1989; Milisauskas/Kruk 1989). Isotopic data support this picture to some point (Eriksson et al. 2008). They indicate that diet was still opportunistic in some regions until the Middle or Late Neolithic as it was derived of a mixture of terrestrial and marine resources.

The aim of this presentation is to look for variations or homogeneity in Late Neolithic and Early/Middle Bronze Age diets in order to display possible alterations in dietary habits as a marker of subsistence changes. This will be done on a larger regional (Northern Europe to

Southwest Asia) as well as on an intra-population scale, using published isotopic data (C and N) combined with information from other affine disciplines like physical anthropology and archaeozoology.

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Kazburun Burial Settlement Complex of Southern Transurals: Paleo-Landscape and Ancient Communities of Srubny and Andronovskay Cultures of the Late Bronze Age

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The block of archeological objects of the Late Bronze Age, located in Southern Bashkir Transurals, included in Ural and Volga region, differs considerably from analogous and single-cultures objects of neighboring regions. Probably this territory, being a contact area, at the same time was a periphery of settlements of members of Srubny culture as well as members of Andronovskay ancientries.

Currently scientific analyses complex was carried out at sites of Kazburun burial settlement complex (Kazburun I – III barrow burial grounds, Muradymovo and Usmanovo I and II settlements and also Usmanovo III settlement found out in July 2012).

Preliminary materials of radiocarbon dating showed that differences in chronology of functioning of burial and settlement objects are not considerable. The metallographic analysis provided similar data.

Based on the results of the paleopedology analysis we can conclude that ancient citizens, that left the Kazburun burial settlement complex, could be migrants from more Southern territories – from dry steppes, almost semi-deserts, and brought traditions of gypsum housebuilding. On Muradymovo settlement the gypsum used to dissolve

and flew into the river as concentrated salt solutions. At the sites of Usmanovsky I, II, III settlements analytical works have just started, but general view of the territory with typical humps of gypsum salinity lets suppose that there was analogous situation. Furthermore gypsum dissolving in ground waters and settling in the soil leads to improving of growth of meadow and gramineous vegetation that for the tribes of the Late Bronze Age with house cattle breeding could play a crucial role.

Due to farming activities ancient inhabitants of the valley of Urshak changed considerably paleo-landscape, surrounded their settlements. Stream waters near Muradymovo settlement acquired bitter-salty taste due to high mineralization with sulfated salts. Living conditions became impossible, the settlement was abandoned.

Due to the fact that the settlements Usmanovo I, II and III were located directly at the bank of Urshak River but not at its affluent as Muradymovo settlement, such catastrophic salinity didn't occur there.

Thus, ancient people in the process of farming could totally change even chemical composition of water close to the place of living. It may have either reversible nature (Usmanovo) or almost irreversible nature (Muradymovo).

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Food for Thought: Plant Macro-Remains and Spatial Organisation

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Charred plant macro-fossils are one of the characteristic archaeobotanical traces of the Bronze Age in Europe. In addition to revealing much about past diets and subsistence strategies, plant macro-fossils also offer the potential at some sites to gain insights into how daily activities were organised spatially. Using the case study of the Middle Bronze Age tell of Százhalombatta-Földvár, Hungary, this paper will demonstrate how the study of food-plant remains can be used to test assumptions and conclusions reached intuitively during the excavation of a settlement. In this example, two areas of the site were compared to see whether their on-site designations of "open area" and "midden area" could be supported by the evidence gleaned from the plant macro-fossils. In this way, this particular proxy can be viewed as a means of connecting the wider landscape within which the settlement was situated and from where the food and weed plants originated, and the smaller-scale "social landscape" of food production within the settlement.

Preliminary Results of the Anthropological Analysis of the Late Bronze Age Cemetery Müllrose in Brandenburg

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Charité Human Remains Project, Berlin

The cemetery was excavated with modern methods at the end of the last century. And also the urns were removed in the laboratory under good conditions. These are the best qualifications for a complete analysing of the human remains.

It should be investigate the demography of the population – how many adults and how many children were buried. In the most of other cemeteries is a big children-deficit. Mostly neonates and babies are buried in another place, often near the houses. It seems that in Müllrose these very young individuals belong to the “normal” population because there are real a lot of graves with very small babies.

Another important point shows in the graves of the adult. Some of them were relative tall. This can be an indication for a good and rich diet.

All this together can be understood as an indication that the graveyard from Müllrose is something special.

Grave, Pig and Pine – Animals and Plants in a Lusatian Urn Field

Verena Tiedtke
GS HDL, Kiel University

As widely known, graveyards provide an opportunity to observe the lifestyle of the entombing society. By studying the cremated corpses, the incineration and the organic grave goods in detail, nutrition habits and resource management become visible.

Using the example of the Late Bronze Age cemetery Müllrose in Brandenburg, faunal and zoological species involved in the burial rituals will be shown.

Furthermore, it shall be clarified, whether several social and demographic groups of the deceased also differed in their use of animals and plants.

Fish in Bronze Age West-Frisia, The Netherlands

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My project is one of four subjects in the larger research project ‘Farmers of the Coast’, which is being carried out at Leiden University (www.westfrisia.com). In this project, all elements related to and needed for the interpretation and reconstruction of the Bronze Age societies in West-Frisia, The Netherlands, are being researched.

My research project revolves around the reconstruction of the subsistence economy. Besides crop cultivation and husbandry practices, my project first focuses on the contribution of wild animals to the lives of West-Frisians.

Of the wild animals that have been found (i.e. birds, fish, small and large mammals), I will highlight in this paper the importance of fish to both aquatic landscape reconstruction, habitat exploitation and the contribution to the Bronze Age diet.

For the aquatic landscape reconstruction, specific fish characteristics were used. The preferred ecological habitat types of each species provided insight into the water types and water connections that were present in the surroundings of the sites. The water salinity tolerance of each fish species furthermore, showed where fresh, brackish, and saltwater will have existed.

The aquatic landscape reconstruction formed the basis for interpretations of the human exploitation of habitats surrounding the sites. Within West-Frisia, clear differences existed between the western and eastern sites. In the west, people exploited brackish to saline intertidal habitats whereas in the east, a fresh to lightly brackish environment existed. Both habitat types will have had their own effect on people’s lives, both for food production and obtaining food from the wild.

Fish – as well as the other wild animals researched – showed that people exploited habitats close to their settlement, since no fish were present from habitats that were not expected for each region.

This shows that people did not travel long-distances for this kind of animal resource or traded on a noticeable scale. Fish represented an additional source of nourishment within the Bronze Age subsistence, but fishing seems to have been practiced per site, for each site.

Dismissing the exploitation of wild resources in the Bronze Age appears to be a too restricted view of the subsistence economy in West-Frisia during this period.

Investigation of Italian Bronze Age Dietary Patterns: An Anthropological and Multi-Element Stable Isotope Approach

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The complexity of dietary practices in Prehistoric Italy has always been questioned because of the specific and varied Italian scenery. The study of food patterns is a mean of investigating both the social and environmental factors affecting the economic choices of farmers and herders. As the Mediterranean area, and in particular Italy, is characterized by high biodiversity and a mosaic of ecosystems and landscapes, the study of human dietary habits is fundamental to gain a better understanding of food resources management and dietary variability

in these populations at a specific period of productive economy.

The analysis of stable carbon and nitrogen isotopes of human and animal bone collagen preserved in ancient skeletal remains represents a direct and individual method to investigate the diet of past populations. Stable carbon and nitrogen isotopes as past human dietary indicators have proved very successful in archeology. First results of stable sulphur isotope are presented as well. Sulphur values are completely unique for an ecosystem because influenced by the environment, predominantly by geology and hydrology of the area. Combining these three isotopes we could investigate paleo-environment, freshwater fish ecosystem, terrestrial and marine resources, evaluate specific proportion of different food consumed and identify possible immigrants.

Several Bronze Age sites in the centre of the Italian peninsula were selected and stable isotope investigation was carried out on human and associated animal remains. The results show differences due to local environmental, social complexity and probably different purposes of the area chosen for the necropolis. The sites considered, cave of the Scoglietto, on the Tyrrhenian coast, in Tuscany, Misa cave and Felcetone, just a few kilometers from the sea, in Latium, show different trend of dietary patterns, particularly the community of the Scoglietto, even if they are in the same area and are coeval.

SESSION 12

SOCIAL AND ENVIRONMENTAL CHANGE IN PRE-HISPANIC LATIN AMERICA

**Asterisk for presenting authors, if more than one author is listed*

4200 Years of Environmental and Social Change from the Cuzco Region, Peru

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A continuous multi-proxy record from the heartland of the Cuzco area is presented of societal and environmental changes during the last 4200 years, based on the lake sequence of Marcacocha. Separating natural and anthropogenic signals is not always possible, but the record here appears to show sustained droughts linked to cultural changes occurring prior to the rise of the Inca Empire (c. AD 1400 – 1533) at intervals of approximately every 400 – 500 years.

Laguna Marcacocha (3350 m altitude), situated in a highly anthropogenic, ancient landscape, is a particularly sensitive site for registering environmental changes. Located only 12 km upstream from the Inca settlement of Ollantaytambo, the small 35 m diameter lake (now infilled wetland) is set within an area of pasture alongside a pre-Incan trading route that still connects the selva and the sierra.

Our proposed synthesis re-visits the previously published pollen sequence derived from a 6.3 m core of well-dated, highly organic sediments, which provides a high-resolution (40 – 100 yr) environmental and agricultural history during the last 4200 years. This record is now combined with new geochemical, macrobotanical, charcoal and oribatid mite data (at sub-decadal resolution).

Abundances of detritivorous oribatid mites in the sediment are used for the first time as indicators of levels of livestock excrement, possibly reflecting the frequency of llama caravans and/or the intensity of pastoralism. Preliminary data will be presented on the oribatid mite ecology and taxonomy as part of an ongoing investigation to understand their role as detritivores and how their abundances may be linked to large herbivore density on the landscape.

The Collapse of Nasca on the South Coast of Peru: Reconciling New Perspectives (Invited)

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Cambridge

Ideas of environmentally induced ‘collapse’ have pervaded archaeological interpretations worldwide, but perhaps nowhere more so than in one of humanity’s rare independent hearths of agriculture and ‘pristine’ civilization — the Andean region. Here, culture change has long been explained by a model of ‘punctuated equilibrium’, driven by the pulse of short-lived El Niño climatic perturbations, or indeed by longer-term climatic changes. In so doing archaeologists have sometimes glossed over the considerable difficulties that attend juxtaposing an archaeological record with various lines of proxy evidence, each of which have very different spatial and temporal resolutions.

In this presentation I look again at the case of Classic Nasca, which flourished along the riverine oases of the arid south coast of Peru, until c. 500 AD. I present geoarchaeological and archaeobotanical data from research in the lower Ica Valley, which does indeed include evidence for major climate disruptions at around the time of Nasca’s collapse and fragmentation. Yet it also uncovers a sequence of more gradual, human-induced events that underlie this supposedly catastrophic collapse: in particular, the clearance of Prosopis woodlands to make way for maize, cotton and other crops.

I suggest that the coastal valleys of southern Peru remained densely forested well into the Nasca Period, attenuating the impact of El Niño events and supporting hitherto underappreciated agro-forestry adaptations. Gradual deforestation eventually breached an environmental threshold, however, dramatically increasing river and wind erosion, and precipitating local desertification. Moreover, this gradual process fed back into, and culminated in, the subsequent Middle Horizon (c. AD 750), a period of marked cultural change on the south coast.

Such a vision of ancient human environmental impact does not, of course, negate the potential importance of climate as a driver of cultural change. Rather, I would argue that they are complementary: each inducing the other through self-enhancing feedback mechanisms.

From Foragers to Producers: Exploitation of Wild Plant Species and Desert Gardening at the Archaic Site of Quebrada de los Burros, Peru

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Research works at the Peruvian Archaic site of Quebrada de los Burros (Dep. of Tacna, Peru) evidenced a very early settlement of fishermen and shell-gatherers on the desert Pacific littoral. The campsite has been occupied during Early and Middle Holocene, between 10'000 and 6000 BP.

Excavations revealed six successive occupation levels, with living floor layouts, hearths, specialized activity areas and accumulations of food waste of marine origin mixed with bones of terrestrial fauna and plant remains.

Two phases of occupation were characterized, the first during Early Holocene (ca. 10000 to 7000 B.P.), the second during Middle Holocene (ca. 7000 to 6000 B.P.). Our analyses suggest, for the first phase, a succession of short occupations and possible contacts with high lands and, on the contrary, a more intensive occupation, nearly all year round, for the second phase of occupation.

As a whole, the organic remains indicate that, since the beginning, the inhabitants not only relied on ocean resources but also exploited the surrounding vegetation. In particular, phytolith analyses show that the settlers changed drastically their direct environment over the time. They also indicate that these inhabitants used food plants, both wild ones and domesticated ones.

These results fit with other early finds in the Andes, such as Quebrada las Pircas in Northern Peru, or in Waynuna in South-Central Peru. However this is the first time that such an early direct human impact on vegetation could be identified through phytolith analyses.

We will detail these vegetational changes and discuss the presence of early plant use within their cultural framework, the Chinchorro tradition, and the theoretical framework for the Atacama desert human occupation.

The Effect of Pre-Hispanic Agriculture Practices on Soils in the Western Cordillera of the Peruvian Andes (Region Laramate, 14.5)

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An integrated geoarchaeological study focuses on a group of three archaeological sites. This study comprises soils on pre-Columbian artificial terraces against their nondisturbed pedological context. Six terraces and three soils lacking of archaeological evidence and actual use,

are examined to identify morphological and geochemical features generated by the sustained agrarian use. Aim is to understand the land-use and pedological history of the Laramate region, as an agricultural center in pre-Columbian times.

Preliminary results show recurrent sequences within the terraces, characterized by two edaphic cycles: a poorly developed Ap modern topsoil with marks of human activity (mainly plow signs) is underlaid by one well-preserved 2Ah paleosol. Low C/N-ratios (2.3-10.7), CECpot up to 20.9 cmolc/kg, base saturation levels of 96.85% or more, beside a gradual increase and decrease with depth of bulk density and organic matter respectively, show prehispanic terraces as a sustained agricultural system. Marked by its use and position, higher availability of nutrients and deeper soils, are found at agricultural terraces, located over a debris cone. Significant charcoal fragments for radiocarbon dating at Ayllapampa and Sihulca archeological sites, with a minimum age for terrace construction of Cal 1 sigma AD 675 – 766 and 782 – 893 respectively.

There is no evidence that the terraces have alternated between periods of cultural decline and boom. Rather, reconstructions or modifications to the original structure and the absence of paleosols, address to a continuous use until its abandonment.

The Hydrology of Ancient Peruvian Terracing: Tombs and Amuna Acquifer Recharge Systems at Awkismarka (Huaylas, Peru)

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Andean farming systems are famous for complex terrace irrigation, but the creation and management of artificial wetlands – *bofedales* or *oqukuna* – in the pre-colonial past, have only recently come to the attention of scholars. This paper presents an assessment of their potential as a source for terrace irrigation at the archaeological site of Awkismarka, a major necropolis and ceremonial centre at the headwaters of the Lullán Valley, in the Cordillera Blanca region of northern Peru. In this paper, hydraulic works are described and their relation with tomb clusters and ceremonial enclosures discussed in the context of the temporal distribution of locally available water resources. Inferred practices of watershed management and the development of the hydraulic system at Awkismarka are contrasted with current patterns of water use, and the feasibility of rehabilitation put forward as a potential strategy in the search of rural development in the Andes highlands

***Tillandsia* Macrofossils Record Changes in Fog Moisture in the Peruvian Coastal Desert**

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Several species of *epiarenic Tillandsia* (*Bromeliaceae*) occur in the coastal desert of southern Peru. Because they are entirely dependent on fog moisture for their water and nutrient uptake, their occurrence is restricted to the altitudinal range of the fog belt where they can form large stands (*tillandsiales*). Within as well as outside of their present range, *Tillandsia* plant macrofossils can be found, often embedded in aeolian sediments. Radiocarbon dates of these macrofossils document that the distribution of *Tillandsia* during the late Pleistocene differed from that during the late Holocene, indicating changes in fog moisture availability. Archaeological finds in the spatial context of *tillandsiales* show that, during the Holocene, they were part of the resource base of pre-Hispanic cultures.

The Role of the ENSO System for the Creation of Pre-Hispanic Landscapes in Southern Peru

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In pre-hispanic southern Peru, several societies as the Paracas, Nasca, Huari or Tiwanaku signify limited periods of prosperity. As the Andes and the coastal desert of Peru are harsh environments, climatic changes affected the abundance of natural resources and triggered some of these changes between cultural rise and demise.

Notably, boom times were systematically out-of-phase, why we tested the concept of climatically determined cultural dynamics, studying the El Niño-Southern Oscillation (ENSO)-system of a regional scale. This contribution wants to emphasize that the ENSO system is much more for the Andean environments than heavy rainfall inland the north Peruvian coast and a temporal loss of marine resources. In fact, the dynamics of ENSO during the pre-hispanic past provided the basics for a regionally and temporally differentiated creation of landscapes by man.

Prehispanic and Colonial Landscape Dynamics and Transformation in the Basin of Mexico

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Situated in the Trans-Mexican Volcanic Belt stretching E-W across the central highland region, the Basin of Mexico experienced continual expansion by permanent agricultural settlements from at least 1200 BC. Prehispanic populations in the northern subregion were generally

well-adapted to a semi-arid climate regime, although early or late frosts and insufficient precipitation represented unpredictable risks for agricultural production while torrential seasonal or atypical precipitation could provoke disastrous flooding.

In this presentation, some aspects of a case-study in the Teotihuacan Valley in the NE Basin are described, in which a detailed sequence of buried soils and subsequent erosion events, as well as vegetation change, is associated with periods of population decline and reorganization of the regional settlement system. Three specific periods are highlighted, during which significant impacts on the landscape in the NE sector of the Basin, reflecting variable dynamics of the corresponding socio-natural systems are apparent: 1. AD 100 – 650 (Teotihuacan period); 2. AD 1350 – 1520 (Aztec period); and 3. AD 1520 – 1800 (Colonial period). Several decades of paleoenvironmental and geoarchaeological research in the region contribute to understanding the ways in which human communities changed the regional landscape.

While large prehispanic populations heavily exploited the available natural resources, evidence for resource management is apparent as well. Hand-tools and labor-intensive cultivation techniques were likely sustainable at a regional scale, particularly during the two periods in which major prehispanic urban centers dominated the political and economic scene. However, during the years of Spanish domination, the socio-natural system underwent significant transformation. Conflicting worldviews, disregard for traditional productive systems (including the introduction of new crops and domestic animals), substantial reduction of indigenous population due to disease, and the forced resettlement of part of the population into more centralized communities all contributed to this transformation.

The colonial transformation of the landscape had long-term consequences for the Basin of Mexico. Massive deforestation of surrounding slopes led to increased flooding and deposition of silt in the lake system. A long-term drainage scheme was initiated to control flooding (much of which originated in the Teotihuacan Valley), the legacy of which has played an important role in the modern environmental problems faced by Mexico City and its metropolitan area.

Exploring the Value of 3D Landscape Visualizations for Investigations of Ancient Maya Socio-Environmental Dynamics

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This paper explores how 3D landscape visualizations can help researchers to think about the spatio-temporal processes that shaped ancient Maya socio-environmental dynamics. 3D visualization (reality-

based, procedural modeling and computer graphics) of archaeological artifacts, sites and landscapes is increasingly commonplace (Chase et al. 2011; Mueller et al. 2006; Remondino et al. 2009), but their research value is still questioned. In contrast, Geographic Information Systems (GIS) are a mainstay in archaeology for performing complex spatial analysis that provides insight into ancient human behavior (Connolly and Lake 2006; Wheatley and Gillings 2002). These two technologies – 3D visualization and GIS – are being brought together by the MayaArch3D Project, and this paper represents a phase of this project that focuses on environmental data and seeks to understand the potential of georeferenced 3D visualizations for innovative research on ancient architecture and landscapes.

The case study is the ancient Maya polity and UNESCO World Heritage site of Copan, Honduras. Located on the southeast periphery of the ancient Maya world, Copan's multi-ethnic history offers a unique perspective on social and environmental interaction. For much of the Preclassic (1300BC – AD250) Copan's population was non-Maya (Fash 2005); however, ca. AD150, Maya populations immigrated to Copan (McNeil 2009). In AD 427 (Early Classic period), Copan's 1st dynastic ruler, a foreign-born Maya noble, was seated (Price et al. 2008; Stuart 2000). In the Late Classic period (ca. AD600-900) Copan remained a multi-ethnic polity (Canuto and Bell 2008, 2010; Gerstle 1987; Maca 2009) – the degree, however, of ethnic heterogeneity remains unclear. Moreover, we know little about how the polity's multi-ethnic history may have impacted interaction with(in) the physical and social landscape. To address this issue, we explore how 3D visualizations (derived from paleoenvironmental data and ethnographic and other archaeological information on land-use practices) can be used to compare hypotheses about land-use, resource management, and levels of deforestation at Copan (Manahan 2003, 2004; Manahan and Canuto 2009; Webster 2002, 2005). The objective is to investigate relationships between ethnicity and spatio-temporal processes that shaped ancient Maya landscapes. Ultimately, we seek to develop new methods that assist archaeologists in studies of socio-environmental dynamics.

Teotihuacan as a Socio-Ecological Phenomenon (Invited)

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Teotihuacan, founded in the Basin of Mexico around 150 BC, was an early and ostentatious experiment in state craft and urbanism – a pre-industrial city that lasted for centuries and housed a population in the order of 100,000 individuals. Debates among archaeologists regarding the relative merit of explanations for the emergence of large, complex cities like Teotihuacan based

primarily in the ideational vs. the material (and above all the environmental) domains have led to a division of labour; many researchers occupy positions fairly close to either an ideational or materialist pole, with too little cross-talk. In this presentation, I attempt to characterize this situation, and consider how tighter integration of investigation reflecting broader perspectives would yield deeper insights and understanding.

Peruvian Beach Ridges: El Niño, Landscape Alteration, and Population Dynamics since the Mid-Holocene

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The beach ridge plains of Peru's northern coast are landscape features of such a scale that they are not usually associated with the geomorphic influence of pre-industrial societies. However, their stability has been affected not just by modern human activity but also by prehistoric occupation, and as such they may have utility as a proxy for prehistoric population of the region. Five large beach ridge plains emanate from the mouths of the Santa, Piura, Chira, and Tumbes rivers and from quebradas at Colán. Each plain has 8-9 large ridges; ridge formation began in the mid-Holocene following sea level stabilization and has prograded the coastline by as much as 5 km. In this desert environment, ridges form from earthquake-generated debris that is washed into rivers or quebradas during torrential rainfall associated with El Niño events, transported to the shoreline, distributed north by longshore drift, and shaped into ridges by wave and/or eolian action. Long-term human use of the ridges has varied. At Santa, for instance, the cobble ridges did not offer an appropriate habitat for productive mollusk beds and human occupation of this section of coastline ceased for several millennia, until a canal was constructed about 2,000 cal BP. In contrast, the Chira ridges are entirely sand that hosts highly productive mollusk habitat. Intensive and continuing foraging for mollusks led to extensive lag deposits of shell that protected the prehistoric ridges from deflation. Following massive depopulation of northern Peru as a consequence of the Spanish Conquest, shells were no longer deposited on the active ridge and it is not being preserved. We also observe an earlier episode of non-preservation of the ridge at 3000 BP that may reflect regional depopulation at a time of rapidly increased El Niño frequency.

Breaks and Continuities in a 3,000-Year Cultural Sequence in Southern Peru. Did Climate Cause Cultures to Vanish?

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When an archaeological culture “disappears”, it has to be asked what happened to its bearers. Did they radically change the design of their material culture? Did they migrate or even become physically extinct? Were they expelled by foreigners or did they leave for economic reasons? A number of scenarios may explain the phenomenon and has to be tested against the archaeological evidence. The desertic Pacific coast and western slopes of the Andes constitute a fragile landscape where already slight changes in precipitation and temperatures can convert fertile fields into barren wasteland or the other way round. It has thus repeatedly been proposed that climate change had been the prime factor in causing prehispanic societies to collapse, resulting in drastic population decline and changes in the material culture. However, the evaluation of a broad base of archaeological data covering a long cultural sequence is needed to reliably test this hypothesis.

Such data is now available from the DAI-led project “Andean-Transect” and its precursors. Its study area in the northern Río Grande de Nasca drainage on the west flank of the southern Peruvian Andes has a long cultural history reaching back to at least the 9th millennium BCE. It is located at the junction of the most important cultural areas of the Central Andes and thus its history also sheds light on the cultural developments of the broader geographic context. This study concentrates on the prehispanic sedentary farming societies from about 1500 BCE to the Spanish Conquest in 1532 CE. Cultural phases are compared for architectural features, burial patterns, settlement hierarchy and distribution, and population size. It has been found that, although climate surely had a strong influence on land use and population density, most significant cultural changes are more likely to have resulted from political factors and have to be seen in the context of pan-Andean rather than local developments.

JOINT SESSION 13-14 MODELLING INTERACTION AND DATA MANAGEMENT

**Asterisk for presenting authors, if more than one author is listed*

Revisiting Space-Time Systematics and Neolithic 'Culture' Areas

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For over a century, European archaeologists have made use of the concept of the archaeological 'culture'. This unit has typically been defined by the co-occurrence of cultural traits, such as shared regional ceramic styles, and at its most extreme, has often been treated as the main historical protagonist in archaeological narratives (the "culture-historical" approach). In this paper, we address the relationship between cultural areas, population dynamics and long-range resource procurement, asking questions such as: is there a relationship between increasing population density and the average size of cultural areas? Is an episode of perceived cultural fissioning from a larger group into several smaller groups due to insulation arising from decreasing populations? Under what kinds of demographic circumstance do hitherto separate cultures appear to merge?

We use the Prague atlas (Buchvaldek et al. 2007) as a standard mapping of culture areas, drawing upon the work of a team of regional experts. From these maps we measure and compare areas covered by archaeological cultures and the geographical distances between them. We trace the development of these relationships over time and relate it to a demographic proxy derived from summed calibrated ¹⁴C dates. We thereafter evaluate our findings via a second line of evidence that is totally unrelated to the concept of archaeological culture: fall-off in lithic raw material abundance with distance away from its source. The latter seems to be an appropriate measurement of interaction amongst communities and raw material sources. We use a wide range of raw materials with known sources to evaluate areas of cultural contact and compare them with both regional demographics and traditionally-defined culture areas.

The work is part of the EUROEVOL project (ERC Advanced Research Grant #249390).

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"Survey2gis": Open Source Software for Processing 3D Survey Data into GIS Data

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Survey2gis is a simple, stand-alone software capable of producing GIS vector data from structured data produced with total stations or other surveying devices. Input consists of one or more simple text files with one point measurement per line. Output consists of one or more 2D or 3D ESRI(tm) Shapefiles containing points, lines and polygons in separate files. Complex geometries such as lines and polygons (incl. multiple parts and holes) are automatically assembled from simple point records by evaluating user-provided attribute data. The processing can be adapted to numerous workflows and input data structures via a freely configurable parser.

The software is user friendly, features verbose logging and has been optimised to support efficient field recording workflows. As opposed to many CAD-based solutions, it will produce topologically clean GIS data (incl. snapped polygon boundaries) in standard formats, suitable for subsequent data analysis. The software is completely free and distributed under an open source license. It runs under Windows, Mac OS X and Linux operating systems.

The development of survey2gis has been sponsored by the State Heritage Management Authorities of Baden-Wuerttemberg, Germany.

Pathways to Seamless and Low-Cost 3D Data Acquisition and Management (Invited)

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Among the many innovations that the Computer Age has brought to archaeological field practice, 3D digital data acquisition must be considered one of the most spectacular. Hardware-based 3D recording solutions, such as terrestrial laser scanners and structured light scanners, have been used to great effect in archaeology. Light-weight and software-based approaches, such as image-based 3D reconstruction, 3D surveying and 3D interpolation of layers from core samples, provide alternative and complementary tools. Highly detailed digital site models are the base for the derivation of essential products, such as ortho-rectified images, schematic cross-sections and elaborate virtual reconstructions.

However, the fact that full 3D site recording and reconstruction are still not part of the "archaeological routine" indicates that the impact of new technologies is limited by a range of factors other than mere technological problem solving. These include the cost and efficiency

of 3D-capable hardware and software, as well as their intrusiveness to established workflows, regarding both data acquisition and management. Significant faultlines still exist between 2D traditions and 3D technologies. The question of “best 3D practice” remains to be answered, and any suitable answer must also include considerations of the archivability and barrier-free dissemination of data.

This contribution discusses innovative, lean and low-cost approaches to the 3D documentation of archaeological sites and objects of interest. It focuses on solutions that integrate seamlessly with existing workflows and thus provide added data value at small operational overhead. It discusses some selected, freely available software tools that have been designed with archaeological end users in mind. The integration of these tools into real-world field work is illustrated using case studies. Technological aspects include the interplay of 3D data with other software (in particular GIS and topological data models), and some thoughts on long-term storage (archivability) and data dissemination.

OpenInfRA – A Web Based Documentation System for Archaeological Research – Concepts and First Prototypical Implementations

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Information systems play an important role in archaeological research and building archaeology. Increasingly, they complement or replace traditional forms of documentation, such as maps, image archives and catalogs. They provide enhanced capabilities for analysis and publication as well as cross-project and interdisciplinary exchange and comparison of research data.

However, adequate solutions for a consistent and project independent documentation, provision and archiving of digital research data are still missing in historical research. Usually domain-, project- or institution-specific systems are created and used individually. As part of a joint research project between the German Archaeological Institute, the BTU Cottbus and the HTW Dresden a web-based documentation system is currently being developed, which can easily be customized to meet the needs of different projects, especially those collecting raw data during field seasons, with individual scientific concepts, methods and questions.

Core of the system is a generic data model that represents a wide range of topics and methods of archaeological work. By the provision of a concerted and flexible initial data model a cross-project analysis of research data will be possible. The development of

enhanced search and retrieval capabilities will simplify the processing and handling of large data sets. To achieve a high degree of interoperability with existing external data, systems and applications, appropriate interfaces will be integrated. The analysis of spatial data will be possible through the integration of web-based GIS functions. As an extension to classical geographic information systems, customized functions for processing and presentation of 3D geometries are to be developed.

As part of the contribution the developed concepts and requirements of the first project phase will be presented and discussed. A particular focus will be on introducing the data model and the definition of an initial data base template. The research work on enhanced search and retrieval capabilities will be illustrated by prototypical developments, as well as concepts and first implementations for a web-based 3D GIS for OpenInfRA.

Archaeological Data Management in an Interdisciplinary Environment

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¹Institute of Botany of the Academy of Sciences of the Czech Republic

Managing archaeological data in an interdisciplinary environment has its specific challenges. Most importantly, archaeological data must be collected and stored in a manner that is compatible with others disciplines, which have their own specific traditions and requirements for data management.

This poster will present the methodological issues connected to creating and integrating four various geodatabases in an interdisciplinary project dealing with long-term woodland development in the eastern Czech Republic (Moravia, ca. 27,000 km²). The four databases are based on vegetational ecological, written historical, archaeological and palynological data. The archaeological database of the project collects all available records of human activities (living, burying, mining, etc.) in various forms of community areas (settlement, burial ground, quarry, pottery workshop, hillfort, etc) from the Mesolithic–Neolithic transition (ca. 7000 BC) until the 13th century AD. The most problematic issue in this research is the various spatial and temporal resolution that the disciplines have: vegetation ecology has fine spatial and temporal resolution; history provides large amounts of precisely dated data in low spatial resolution; archaeological data are copious and spatially exact but temporally less well-defined; and palynology provides detailed information but for only a small number of sites. In addition, the temporal coverage of the various disciplines is obviously different. The poster will introduce how and why, considering the constraints that existing conditions imposed on the research, the cadastre was chosen to be the basic geographical unit of the archaeological and historical databases, and what

consequences this has for the interpretation of the results.

The integrative interpretation of the databases raises further issues. Of special importance is the compatibility of models from various disciplines. Are archaeological models of settlements distribution compatible with current landscape models derived from palynology (LOVE and REVEALS) or with vegetation models based on GIS interpolation of historical written data? By analyzing a sample area in the south of the study region, the poster will illustrate some of the challenges connected to these issues.

Data Base 2.0: How Web- Based Solutions can Improve Archaeological Data Processing

Martin Hinz
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Data base systems for medium to large joint projects are faced especially with the problem of complexity: On the one hand they have to be detailed enough that every specific subproject can enter its relevant data, on the other hand multiple layers or branches of data storage have to be provided. This is necessary due to the range of archaeological material (ceramics, stones, features, architectural units) on the entry side for the complete recording.

On the retrieval site all this information must be available to all users of the system to analyze a complex matter, be it a large scale excavation or a whole joint program. Moreover, for a the analysis the information flow between the different analysts must be maintained, and the context information should be available at hand, without overwhelming the individual scientist.

In this paper I would like to show, how this challenge can be met by using a web- based solution for data recording and processing. Beside the fact, that the web was originally designed to link information, and is therefore the choice for such problems, it offers the possibility to collaborate on a shared dataset.

Two examples of such data base systems will be the background of the argumentation: the data base of the DFG project Eythra and the common data base of the priority programme SPP 1400. These two projects shall provide examples for the difficulties and their solution. With them I would like to show how easy a "bespoke tailored" web- based data storage system can be developed using a web application framework, and how a data base can be turned into an archaeological information system.

Transportation Systems in Late Iron Age und Roman Period of Gallia Narbonensis – Data Mining in Networks and Dealing with Uncertain and Imprecise Data

Katrin Kermas
BerGSAS/ Landscape Archaeology and Architecture, HU Berlin

How communication between the settlements occurred and resulted in interactions, is an important object of study in the archaeological research of the settlement. Paths and roads form the main basis of spatial interaction in prehistoric and early historic time. Residential development, the political dynamics, long-range trade relations, as well as specializations in agriculture and production are in a reciprocal relationship with the development of transport networks. The use of roads and the construction of roads effectively changed the landscape, leads to the development of new spaces and favors the expansion of settlements on important transport hubs. The aim of the project is the development of a model for prehistoric and protohistoric transport systems on the basis of multivariate network. Economic, social and political factors as variables are integrated in this network in addition to the environmental parameters. The underlying intention is to model the temporal genesis of the transport network and to demonstrate the development of the settlement landscape. How can be visualized and evaluated the distribution channels of the goods on the network? What conclusions can be drawn to the importance of the infrastructural situation of settlements?

Research area is the Drôme Provençale and adjacent areas in France. The change of the Iron Age settlement landscape by the Roman occupation and the subsequent consolidation of the province of Gallia Narbonensis offers an interesting field of research. Dealing with large amounts of data in the creation of a network of paths will be presented through the automation of least cost path analysis. Furthermore introduces considerations for dealing with uncertain and imprecise data on the creation of the network on the basis of the available data. It is based on the methods of probability theory and possibility theory. So, depicted the different data quality and a theoretical basis for the differentiated weighting of sites. The lecture demonstrates the methods based by the Iron Age settlements in a local settlement area.

Modelling Hats – The Spread of Lid-Ornamentation

Jutta Kneisel
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This presentation demonstrates short- and long-distance communications between the Baltic Sea and Southern Europe during the Early Iron Age based on the example

of face-urn lids. Short-distance contacts become obvious by analysing the distribution of pottery lids of anthropomorphic urns of the Pomeranian Culture. The lids are often found together with face-urns and were decorated with complicated patterns. They represent simplified headgear or helmets. The ornaments enable a very fine differentiation according to decoration types, styles, and forms. By buffering the distances and a definition of daily march distances, some of the exchange models of Polany could be tested.

Contrary to the expected distribution models, the accumulations are incoherent. The GIS-analyses revealed directional exchange routes from the Baltic Coast southwards to the Warta and

Noteć Rivers. This distribution pattern is all the more astonishing, since numerous cemeteries are found offside these linear communication lines with lid decorations that are quite different. Based on these lids, we are able to trace the routes that might be connected with raw materials such as amber, but also show wider exchange through import finds such as glass or cowry shells.

Modelling Spread and Diffusion of Cremation Burials in the Bronze Age Using Radiocarbon Dates

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The transition from the Middle Bronze Age to the Late Bronze Age is connected with fundamental changes in cultural, social and economical conditions. We aim to investigate the spatio-temporal shape of the emergence of the Late Bronze Age by using radiocarbon dates and several modelling techniques. Cremation burials seem to be a good proxy for the complex characteristic of Late Bronze Age communities. We will concentrate on the following points:

1. Velocity of diffusion

- a. Which mean value and variance does the velocity exhibit?
- b. Is the velocity constant or specific for regions?
- c. What influence is exerted by topographic elements?

2. Path

- a. Which connections/pathways were used?
 - b. Can we identify obstacles which hindered spreading?
- #### 3. Structure
- a. Is a hierarchical or continuous structure of spreading observable?

Two modeling concepts were compared and evaluated:

Concept 1

The empirical model is gained by applying a moving window filter for the first occurrence of cremation burials. Theoretical models were constructed by applying a diffusion process starting at the most ancient

occurrence of cremation burials. Additional components representing obstacles and friction areas are possible. The comparison of empirical and several theoretical models enables the disclosure of relevant parameters.

Concept 2

A kernel density estimation and a selected contour-line is used to detect and delimit possible cultural areas. The first occurrence of cremation burials is assigned to these areas. Afterwards, a network is constructed between the centres of these areas which serves as an empirical model. The theoretical model is gained by applying a spatial constrained diffusion process inside the network. In this case, additional components can also be included. While concept 1 has a universal applicability, concept 2 has some limitations.

On the other hand, concept 2 is advantageous because of the limited number of interregional connections which allows a far more detailed study of single connections. The methodological question is whether concept 2 is sufficient for studying the diffusion of cremation burials in the Bronze Age or not. Additional models of spreading can be constructed by including all dates (e.g. Hågerstrand model) or a comparison with the latest burial mounds.

The Human Factor: Measuring Man-Made Errors in the Input of Large Databases

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Despite any attempts at cross-checks, pre-defined values and drop-down lists, it is naive to assume that it is possible – if humans are involved – to generate large amounts of totally error-free data. This is also true for archaeological information management systems. Therefore, it is not the question if an archaeological database contains any errors, but how many and how severe these are. Surprisingly, at least in an archaeological context this issue has been seldom, if at all, addressed. This is in accordance with a general tendency in archaeology to project and implement data-bases on a rate like blossoming mushrooms, without, however, properly documenting them.

The data-base of the project “Reconstruction of Late Neolithic settlement structures in Central Bosnia”, which has recently come to an end by reaching its publication state, is a “normal” archaeological data-base in as much it has gradually evolved over a period of roughly ten years. Now, it resides on a PostgreSQL-Server, containing around 200 tables, the largest of which holds about 25000 records. The tables include information about the finds and their contexts and any additional data generated during the excavations and the post-excavation process. With this data-base as an example, we want demonstrate how to measure the amount of error which necessarily entered the data during the man-(and woman)-made input in the field or the laboratory. For this, we will

mainly use the information on the spatial relationships between finds and contexts, on the one hand, and on ceramics, on the other.

Diffusion of Innovation – Thoughts about Arrows, Packages and Communication Corridors (Invited)

Sabine Reinhold
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During the last decade a discussion about the Diffusion of Innovation has more and more replaced traditional concepts of Kulturtransfer. Wide reaching archaeological phenomena are meanwhile discussed under such an agenda. Yet, a spatial perspective as the backbone of any diffusion is still outshined by the debate of social mechanisms in transfer processes. As is the potential of mathematic modelling, be it predictive or retrospective.

Unlike modern studies on innovation which aim to predict future or reflect on ongoing diffusion processes, the archaeological view has a decidedly backward perspective. It is a story of achieved successes passing negligently over other innovations, which had failed. Its argument is the chronological mapping of specific traits – first metal, first wheels, first Greek pottery etc. –; its operational tool is the arrow drawn on the maps of Europe or Eurasia. On the other hand, an intellectual engagement with recent modern innovation theory has widened the perspective towards the actual social mechanisms of such diffusion. What in fact had to happen, when a new technology, a new style or a new ritual concept is to be implemented into a social system?

For a long time migration of actual users was appreciated as the most important factor behind the diffusion of novelties. Geographical theory terms such process expanded diffusion if the techniques remain in use in the origin area or relocated diffusion, if the complete set of techniques shifts with their users from region to region. As an alternative, in the mid 1960's a bundle of new cultural traits was epistemologically shaped into the concept of the package. The package metaphor took off on its victory lap in European prehistory – the Neolithic package, the Bell beaker package and recently the Jamnaja package are widely accepted concepts in a discussion about diffusion of technology or cultural values. But what makes such a package? How is it diffused? Can it be mathematically modelled? And, was the packing of several new aspects an intellectual necessity for success in prehistory, or is a package not like the arrow a backward looking interpretation of an archaeologist looking on Zeitgeist phenomena?

As an alternative, innovation diffusion can be epistemologically reconsidered from a spatial and thus geoinformation point of view. The necessity to pass novelties from one community to another introduces social space beside social interaction to the transfer process. The Swedish geographer Thorsten Hägerstrand

developed in the 1950's mathematical models to calculate innovation diffusion. Recently this concept is revitalised in geography. Despite their basic character, in combination with modern potential of geoinformatic science like the integration of modern innovation theory, such ideas could open quiet new perspectives. Modelling communication corridors using GIS technologies and linking them with statistically modelled expansion processes have the potential to direct the archaeologist's attention towards the paths, innovation transfer has taken. It allows speculating about time-frames, and reshaping the question of the social interaction and their nodal points.

Documentation and Data Storage Strategies: Old Concepts and Old Media

Christoph Rinne
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Archaeological sciences aim to preserve the past from oblivion and to recover information thought to be lost. Every responsible archaeologist bears this in mind on his excavations and, therefore, big efforts aim to fulfill these goals with an appropriate and optimal documentation of destroyed historical traces. According to the various analog excavation and documentation strategies, there are several digital techniques and documentation strategies. Two quality characteristics of lower importance for a discussion of analog documentation have, in contrast, great significance in digital documentations: retrieval and archiving.

With reference to this significant difference we would like to present a model and digital implementation of an old proven analog documentation strategy called "Rheinische Stellenkarten System". Data storage is reduced to a minimum of tables and fields. The resulting structure and documentation is, therefore, simple and facilitates archival and retrieval tasks. The addition of information fields and values needs no changes concerning structure or user interface. Thus, the system is easily modifiable, easier to archive and provides easy accessibility for retrieval.

IANUS – A New Centre for Research Data from Archaeology and Ancient Studies

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¹IANUS – Deutsches Archäologisches Institut, Berlin

The poster will present IANUS, a new research centre in Germany which addresses different issues concerning the management of digital data in archaeology and ancient studies. It is a project funded by the DFG and is in its first conceptual phase. The poster will present the key facts about the project and its mission statement, give background information about the data-life-cycle and

the related services planned so far, the stakeholders and the current actors.

Although still being in the planning phase the paper will present some current ideas concerning the outlined aspects of managing data quality. One focus will be the new IT-guidelines which comprise both accepted standards and best-practice examples and which IANUS is going to host and to promote within the German community. Hopefully these will help data producers to improve the data handling and to enhance the consciousness for the data quality within research projects. Another issue will be the quality of deposited data that needs to be archived. Especially the integrity and homogeneity of the documentation and metadata submitted along with files themselves it is one key element in order to make digital information reusable in future times by new, unfamiliar users.

Grave Goods As a Marker of Communication and Exchange. The Cemetery of the Late Roman Iron Age and Migration Period from Jänschwalde, Lower Lusatia

Deborah Schulz
Institute of Prehistoric Archaeology, FU Berlin

The dissertation project investigates a layer graveyard of the Late Roman Iron Age and Migration Period (3rd – early 5th century) in Lower Lusatia near the river Neiße. The cemetery is situated within and on top of a dune. The cremation graves are mainly built in thin layers which are separated by drifting sands that were accumulated during the main occupancy of the cemetery. These drifting sands made it possible to separate single graves and develop a chronology of the site. This situation of single graves within drift sand layers is rare. For this period and type of cemetery the site is in an exceptionally great preserved condition.

The differentiation of the graves due to the preservation within the dune make it possible to research communication and interaction of native people with adjacent populations during the Late Roman Iron Age and the Migration Period in the region of Lower Lusatia. The project investigates items like pottery, metal, glass, bone and antler objects that are found on the grave site. Fibulas are the most important object group to learn about cultural drifts or exchange with other cultures. In this cemetery around 100 fibulas in about seven main groups and lots of variations help to determine the age of the single graves and layers. The objects are influenced from West and East Germanic areas. Western culture of the middle Elbe, the eastern Przeworsk culture, and the northeastern Wielbark culture are significant for the Region of Lower Lusatia. Influences may be reflected not only in grave goods, but also in grave type. Furthermore, the exceptional preserved graves make it possible to reconstruct and assume burial rituals. Statements about

tendencies in regional changes and influences can be made due to the analysis of graves, grave goods and burial rituals, and similar sites of this region.

The talk will demonstrate methods and first results of the research based on the cemetery of Jänschwalde, Lower Lusatia.

Conceptualizing Cultural Encounter in Archaeology

Philipp Stockhammer
Institute for Prehistory and Early History, Heidelberg University

We are currently witnessing a continuing epistemological gap between the vivid discussion on the phenomenon of cultural encounter and transculturality in cultural anthropology and the reality of methodological approaches in archaeological interpretation, in spite of the fact that notions of cultural encounter play an important role in Prehistoric Archaeology. In order to appropriate cultural encounter for archaeology, I will break down the complex anthropological discourse and transform it into a methodological approach for archaeological sources by differentiating between material and relational entanglement (cf. Stockhammer 2012). In the following, I will exemplify the potential of my approach on the basis of a case study, namely the appropriation of Aegean-type pottery at the Southern Levant in the 13th and 12th centuries BCE and the hybrid phenomena that emerged during the process of appropriation. Intercultural interaction and goods exchange in the Late Bronze Age Eastern Mediterranean have been the focus of archaeological research for years. So far, however, form, function and meaning of an object have always been understood as an inseparable entity. I argue for a transcultural approach which forces us to refocus archaeology's approach towards items coming from the outside. Therefore, the significance of the foreign object does not derive solely from the transfer as such, but rather from the ways in which it is used and contextualized in the receiving culture (Maran & Stockhammer 2012). I will focus on the pottery's integration into discourses and practices and the creation of new hybrid frameworks of meaning that neither conform with what had previously existed in the receiving society nor in the areas of origin of the objects in question.

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Pottery, Flints and Axes – Markers of Social Organisation, Trade and Cultural Exchange in the Neolithic in the Dyje/Thaya River Catchment (Moravia and Lower Austria)

František Trampota

Institute of Archaeology and Museology, Masaryk University, Brno

Past human cultures created and spreaded artefacts. Artefacts now create perception about the past people. There are so many ways (paradigms) how understand them. One of the ways is to follow spatial distribution of the artefacts. In East-Central Europe, pottery has been traditionally studied as a chronological marker and stone raw materials were used to identify e.g. distribution networks. In this paper I try to use old data with new questions and new way of analysis to create model of social organisation, trade and social exchange in the Neolithic (in Czech terms, ca 5,600 – 4,000 BC) in the Dyje/Thaya river catchment.

I focus on three items of the Neolithic material culture: pottery decoration and the raw materials of the chipped- and polished- stone industries. Every item is basically understood as a specific reflect of contemporary sub-culture (sub-culture of potters, flint distributors, axe producers etc.). Based on results from quantification and spatilal analysies of studied items, I discuss what sort of material culture refers to what social action or how far relevant are the sub-cultures of particular archaeological item.

The proxies comes exclusively from settlement sites to prevent individual histories or particular events (graves, hoards) when studying structures society in general. Time frame is discussed here based on very basic relative chronological frame or fewer based on C¹⁴ dating.

The main themes I discuss are:

The relative chronological systems are doubted, what does particular pottery (sub-) phases, as a specific groups, refer about? Can we understand them as a social groups?

How is the relation between distribution of pottery decoration styles and distribution of raw materials of flints and axes?

Following the distribution of the three mentioned items, can we consider how was the change in social organisation from the times of LBK to Stroked Pottery and Lengyel cultures?

Cultural Identities and Interactions between the Rhine and Rhone Valleys from the 10th to the 5th Centuries BC

Laurie Tremblay Cormier

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This PhD is aiming at understanding the cultural and economic dynamics in eastern France, southwestern

Germany and western Switzerland at the very end of the Bronze Age and the Early Iron Age. This study takes place between two major socioeconomic transitions during European Protohistory: the changes from Bronze to Iron Age schemes and the collapse of the hallstattian civilization to the benefit of the La Tène new socioeconomic systems.

In order to approach such issues, a methodological framework has been created and applied to thearchaeological data. Deeply inspired by geographical sciences, its goal is to provide elements of “cultural geography” and economics. Metalwork has been chosen as an indicator of cultural and economic dynamics. Indeed, its various forms and deposition contexts (graves, hoards, rivers...) greatly depend on cultural legacy, customs, technical knowledge, and so on. Therefore, the first step was to find a way to manage this information which, for such a vast area and chronological span, quickly led to a towering amount of data. The creation of a relational database with a simple – but effective – design resolved this problem.

The second step was to define groups of common forms and deposition contexts in the study area, to determine their geographical extent and their interactions with one another. After a first empirical evaluation, the indicators presenting sufficient interest (quantity and/or geographical disparity) were included in a statistical study. This crucial part of the work was conducted using GIS and Factorial Correspondence Analysis. The results showed statistical groups of indicators, named facies, and their affinities. When given a spatial extent, these facies became entities. By confronting these results with other studies like ceramics or funerary practices, cultural groups could finally be put forward.

The third and last step of this work was to weight and to modelize long distance exchange networks between the study area and other regions. Linear projections of the importations, depending on their origin, allowed visualizing the various incoming of imported metalwork and its chronological variations from Late Bronze Age to the end of the Early Iron Age.

DARIAH: On the Road towards a Digital Research Infrastructure for Archaeologists

Armin Volkmann

Digital Humanities , Julius-Maximilians-Universität Würzburg

Digital data infrastructures for the arts and humanities are currently being developed within the framework of various projects in Germany and Europe. Among these projects, DARIAH (Digital Research Infrastructure for the Arts and Humanities) is one of the largest projects. And it is designed as a long-term project. DARIAH focuses primarily on philology and history. But the project is open to other disciplines. So DARIAH is also conceptualizing a data infrastructure for archeology. The

cooperation with other infrastructure projects (such as IANUS at the German Archaeological Institute - DAI) is a key component in the architecture of the digital data infrastructure for archaeologists. Furthermore it should be taken into account the collaboration with the project CLARIN (Common Language Resources and Technology Infrastructure). This data infrastructure project is geared to linguistic needs. Within the network of the different data infrastructure projects, DARIAH could be aimed to harmonize the national activities on the EU level. International data networks of archeology are desirable in related regions such as the North and Baltic Sea coast to go beyond existing administrative boundaries of research.

But what are the specific needs of archaeologists to a digital research data infrastructure? Is it even possible to implement a centralized research data infrastructure (that is accepted by the researchers) in the very heterogeneous landscape of archaeological sciences in Germany? Therefore, it seems very important right from the start of the project to involve as many partners as possible in the conception of the infrastructure. The structure of federal states in Germany did not enable the foundation of a national archaeological data service, such as in the Netherlands or the UK. The political conditions are contrary to centralized efforts. Thus, a decentralized architecture of the data infrastructure represents a solution to the existing problem. The cooperative project with equal partners should bring together both: the research at the universities as well as at the national archives of administration. It makes mutually accessible the respective databases for all partners. Furthermore the DARIAH service will provide a redundant long-term binary data storage with sovereign rights of data privacy and security requirements.

SESSION 15**THE ARCHAEOLOGY OF POLLUTION**

**Asterisk for presenting authors, if more than one author is listed*

Polluting the Peripheral Landscapes: Spatial Behavior and Socio-Economic Development of the Tripolian Populations between the South Bug and the Dnieper

Aleksandr Diachenko

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Archaeologists from all over the world are interested in Cucuteni-Tripolye studies, mainly because of its giant-settlements. The largest sites, belonging to the Westerntripolian culture, are located at the Eastern Periphery of the Cucuteni-Tripolye cultural complex, in the South Bug and Dnieper interfluvium (c. 4100 – 3400 calBC). It should be stressed that the term “periphery” does not have socio-political or economic meaning in this case. Both the empirical studies (Ryzhov 1993; 1999; 2007; Gusev 1993; Tkachuk, 2005 et al.) and demographic analyses found that the rapid changes in material culture of the Westerntripolian populations in the Middle Bug region and the South-Bug and Dnieper interfluvium were caused by the immigration of the Westerntripolian populations from the Middle Dnestr and the Upper Dnestr regions (Diachenko, 2010; 2012; Diachenko and Menotti, 2012; Tarapata, 2013).

The “attractiveness” of the territory between the South Bug and the Dnieper to the migrants, probably, was caused by a high amount of the “no-man’s land”. Two main trends in the settlement systems development were indicated. The first trend was typical for the settlement systems, characterized with the decreasing of the largest settlement in size, accompanied with the formation of the small settlements, over time (Diachenko and Menotti, 2012; Tarapata, 2013). The second trend lies is represented with the increasing of the largest settlement in size over time. However, both trends resulted in the formation of the single-occupation sites.

These data raise the important issues related to correlation between the pollution of the environment and the influence of the migratory behavior and their impact on the formation and decline of the social complexity. A high amount of the “no-man’s land”, allowing the populations re-settling instead of economic intensification, in the result led to impossibility of an adequate response to ecological risks. Ecological management of the populations of the Vladimirovskaya, Nebelevskaya, Srednebugskaya and Kosenovskaya local groups caused in decline of the settlement hierarchy.

Populations of the Tomashovskaya local group could not adapt to the aridization, probably, strengthened with the pollution of local environment over few centuries, at the end of Tripolye CI.

Is There Any Pollution in Prehistory?

Walter Dörfler

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Pollution and over-exploitation are side effects of the use of natural resources well known from modern times. Limits of growth are discussed since the late 1960s but no general trend for more sustainability is visible in the global economy. Are people able to learn from mistakes and to accept personal restrictions for a common wealth or is sustainable behaviour intuitively evolved without an understanding of the causal relation between source and outcome? Did environmentally conscious and healthy behaviour evolve by chance or can we assume an intentional operation? These questions are hard to answer.

As the term ‘pollution’ is a judgement we have to ask if people in prehistoric time have been aware of contamination of the environment and, if not, if they could perceive any pollution. By this it is questionable if pollution existed for prehistoric people or, if it was just another plague people had to cope with. How did people manage to survive environmental change either self-made or induced by natural alteration?

If we accept alternatively the concept of pollution as ‘things being not at the right place’ we can assume an awareness of ‘pollution’ even if no understanding of coherence is presumed. Examples from palaeo-ecological records for eutrophication and exhaustion will be discussed with the potential consequences for people’s economy and perception.

Tribal Wastelands? Addressing the Topic of Pollution for Neolithic South-Central Europe

Detlef Gronenborn

Römisch-Germanisches Zentralmuseum, Mainz

The archaeology of South-Central European Neolithic societies has largely focused on detailed and fine-grained chronologies, and on various economic aspects. Much less researched have been topics of the intermediate field between sociology, ecology and economy. Pollution is such a topic.

Landscape and site-based analyses of how the various societies act on and interact with the environment allow first hypotheses on management strategies on various levels of chronological resolution. Case studies from the Early (LBK) and Upper Neolithic (Michelsberg Culture) will be discussed.

Detrimental Waste Disposal Behaviour as a Trigger for Social and Economic Change? A Case Study from the Central Bosnian Neolithic (5,200 – 4,300 BC)

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Our case study is concerned with the waste disposal behaviour in settlements of the Late Neolithic in Central Bosnia and with the possible consequences it had for their inhabitants. In Central Bosnia after 5,500 cal. BC, a new settlement form characterized by large, densely populated villages emerged which in turn was triggered by fast demographic growth. Analyses of find distributions in the settlement Okolište have shown that most of the accruing waste was disposed of in the immediate vicinity of the houses and that only a small part was deposited in peripheral areas of the site. Together with the co-occurring disposal of human cadavers in a ditch surrounding the settlement this waste disposal behaviour implies a considerable not only olfactory and visual, but probably also hygienic pollution which must have diminished the quality of life of the inhabitants of Okolište.

This in our opinion non-sustainable behaviour raises the question whether or not the local and regional settlement development was influenced by this pollution: In Okolište a clear decline in population size occurred after 4,850 BC while at the same time a more dispersed settlement pattern developed in the region. Finally, around 4,700 BC Okolište was abandoned altogether and probably replaced by a settlement founded some hundred metres away.

Case Study Bruszczewo – The End of an Early Bronze Age Central Settlement Due to Ecological Mismanagement?

Jutta Kneisel

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This presentation will focus on the Early Bronze Age Settlement Bruszczewo in Greater Poland. The long research history and a interdisciplinary team of the researchers allows to reconstruct the environment from the beginning of the settlement to its end about 1,650 BC. The sudden abandonment of this central settlement and the lack of any material culture remains for the next 100–200 years rises a lot of questions: What happened to the settlement? Where are the people gone? And why this formerly dense settled area be devoid for some hundred years. Palaeobotanical analyses – macro remains, dendrological as well as palynological investigations – gave us information about the change of the environment. But also changes in the social structure

and in the economies seemed to accelerate the end of this Únětice settlement.

Prehistoric Societies between Over-Exploitation and Sustainability: Examples, Meaning, Context

Thomas Knopf

Institute of Pre- and Protohistoric Archaeology and Archaeology Middle Ages, Eberhard-Karls-Universität Tübingen

With this lecture I want to present some archaeological examples of over-use (especially of soil) and of sustainability. I will try to put them in a more general context or “theory of environmental behaviour” and to work out the concepts behind the examples and the interpretations.

With respect to their environment prehistoric societies are mostly seen between two extremes: an inconsiderate over-use or a sustainable management. Like the myth of the “noble/evil savage” both views are not correct but contain some elements which have to be discussed. We find indeed archaeological features of over-exploitation (of animals, soil etc.) and we also see a long-lasting use of landscapes without major negative changes of the environmental parameters. But how do we judge a situation where neolithic lake-dwellers polluted the water (by dung and eroded soil), cut a lot of trees, removed the cover of vegetation for cultivating cereals etc.? All this actions resulted in an increase in species-diversity (which is highly estimated today ...).

The first question is: Can we transfer the modern concepts of pollution and sustainability to prehistoric societies?

In this context we have to think about the general perception of nature by prehistoric people. Similar to non-western, traditional societies there probably was no distinction between nature and culture in prehistory. What does that mean for pollution and over-exploitation and their perception?

The second question is: How can we interpret distinct examples of pollution, over-use or sustainability or rather put them in a context?

When we study the consequences of a particular economy on the environment of prehistoric people we find behaviours like relocation of settlements or cultivated areas, a change of economy etc. But the meaning of environmental problems in everyday life e.g. decrease of soil fertility, less game to hunt, probably went hand-in-hand with religious beliefs, social rules etc. So, there is a need for a more general theory of environmental behaviour before discussing sustainability etc. of prehistoric people.

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Non-Symbolic Waste and the Possible Reinterpretation of Ritual Sites

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In many cases, the reconstruction of rituals in archaeology is based on the overinterpretation of utilitarian features by western archaeologists, who are fascinated by ritual activities which do no longer exist in western post-modern societies. Examples of modern waste deposition in different countries of the world will be compared to archaeological features, for which a ritual background was originally reconstructed.

Adapting to or Modifying the Environment: Changing Strategies Between the Neolithic and Bronze Age Settlements in Kırklareli

Eylem Özdoğan
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The sites of Aşağı Pınar and Kanlıgeçit are located at a short distance from each other, directly south of the city of Kırklareli in Eastern Thrace. The first of these two sites, excavated together as part of the Kırklareli Archaeological Project, dates to the Neolithic-Chalcolithic period, and the second to the Early Bronze Age, each being characteristic of its respective period. Aşağı Pınar represents the first appearance of agricultural societies in the region, while the second that of "urbanization". In these two sites, the interaction with the surrounding environment is in keeping with the general behaviour of early farmers and early urban societies. At Aşağı Pınar, there is no obvious human intervention either in terms of interaction with the natural environment or in the formation of the settlement, and we see a settlement that is in harmony with the environment. At Kanlıgeçit, however, the process developed in a different way. The society that came to Kanlıgeçit in the mid-3rd millennium BC, bringing strong influences from Anatolia changed the topographic structure of the site and re-shaped the mound. This differentiation is witnessed not only in these two sites uncovered in Thrace, but also in contemporary settlements in Anatolia. It is therefore possible to generalise this difference between forms of behaviour in the two periods to a wider geography.

Valuable Waste: Refuse Disposal at Çatalhöyük West (ca. 6000 – 5500 BC) (Invited)

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The people of the Çatalhöyük West Mound (ca. 6000–5500 BC) disposed of unwanted artefacts and materials by depositing them in their abandoned buildings, providing a rich archive for multi-scalar archaeological research. The paper will discuss the complex formation processes of room fills excavated in Trench 5, which are the result not only of alternating phases of rapid and slow deposition of refuse but also of ephemeral activities performed in these midden-like areas. The West Mound room fills consist of both ubiquitous household waste and valuable items whose disposal seems surprising and challenges the concept of 'waste'. At Çatalhöyük, behavioural change related to waste conception and management can be studied over ca. 1000 years ranging from the well studied middens at Çatalhöyük East to the seemingly wasteful consumption on the West Mound. Using ethnographic research about concepts and treatment of refuse this paper will explore the social organisation behind the change in refuse behaviour as well as the meaning these materials and their handling might have had within the larger West Mound communities.

Waste Disposal in the Neolithic Enclosure Hundisburg-Olbetal

Kay Schmütz
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The depositional processes in different features will be analyzed with the help of sherd assemblages and their distribution.

First, the possibility of determining activity or waste deposit zones in an occupation layer will be investigated. The usual practice of using spatial analysis, for example, density or hot spot analysis, will be tested. The results will be compared to the distribution pattern of sherd assemblages, each of them representing one vessel. When compared that way the viability of the spatial analysis could be validated or falsified. Secondly, the difference or similarity of depositional processes in three different features (occupation layer, storage and rubbish pits) will be analyzed. To compare these, each sherd assemblage is analyzed using the Euclidian distance between each single sherd. By using a minimum spanning tree algorithm, the distribution

of each assemblage can be merged to one single value, which allows a statistical comparison of the assemblages. Thus, the depositional processes in the feature categories can be made visible and tested for similarities or differences.

Salt, Fire, Cress and Fennel – How to Create Pollution (Invited)

Ulrike Sommer
Institute of Archaeology, University College London

Pollution seems a very modern concept, born in the industrial revolution and linked with the unchecked spread of industrial waste. However, pollution can arise from “natural” processes as well. According to Mosaic law, a woman is “unclean” both after her menses and after childbirth, and needs purification in order to enter the normal, i.e. male, world again. Pollution can also be caused by death. Ethnographically, there are numerous examples of houses or settlements abandoned upon the deaths of their occupants.

The pollution of settlements – i.e. the accumulation of refuse – has been the subject of a number of studies. The pollution of landscapes has been of less interest so far. Pollution was mainly linked to industrial processes like mining and overcrowded habitats. However, the France of the Ancient Regime, agriculture as such was seen as pollution, connected, as it was to “unclean” soil and the manure used as fertiliser. This points to the role of human presence as such in perceived pollution. While authors like Barrett have looked at the process of domestication of a landscape in terms of making a home, this may mask a low tolerance of traces of human presence by prehistoric populations. Infestation of gardens and fields by weeds, pests, the increase of transferable diseases and visible environmental change as well as memory-traces manifested in monuments and ruins may have polluted whole landscapes in the perception of early farmers. There are also examples of intentional pollution. When king Anitta von Kuššara conquered the city of Hattuša, he sowed the ruins with weeds and cursed any king who would settle Hattusa again. A similar ritual is described in Assyrian sources. Abimelech, King of Israel destroyed his rebellious home-city Shechem and sowed it with salt (Judges ix 45). Whole sites could thus be either cursed and made either unclean or sanctified - both rendering them unsuitable for future settlement.

According to Mary Douglas, dirt is matter out of place, but, as Ian Hodder has pointed out, the presence of dirt does not necessarily imply perceived pollution. In this lecture, I am going to develop the concept of pollution in relation to whole habitats. The unexpectedly high mobility of populations indicated by some recent studies of stable isotopes and population densities may well be related to the perceived pollution of local environments.

Palaeolimnological Impacts of Early Prehistoric Farming at Lough Dargan, County Sligo, Ireland

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This research provides insights into the intensity and effects of Neolithic and Bronze Age farming practices at Lough Dargan, northwest Ireland, through a multi-proxy analysis of a lake sediment core. Chironomid (non-biting midge fly) subfossils and lake sediment geochemistry ($\delta^{13}\text{C}$, $\delta^{15}\text{N}$ and C:N ratios) were used to assess changes in limnological conditions through time. The limnological data were compared with macroscopic charcoal concentration and pollen data to examine the potential influence that early farmers had on a freshwater lake system within a prehistorically active catchment. Results from the chironomid analysis show that the first substantial period of agricultural activity in the early Neolithic (c. 3730 – 3190 BC) resulted in a temporary shift to more eutrophic lake conditions. There is evidence of animal husbandry with substantial levels of animal waste reaching the lake, leaving an imprint in the geochemical record of increased $\delta^{15}\text{N}$ values and decreased $\delta^{13}\text{C}$ values and C:N ratios during this time. The chironomid community reverted back to its pre-impacted state c. 3190 BC in response to a period of reduced human impact (c. 3390 – 3000 BC) which eventually led to a distinct lull in activity, with possible cessation of farming from 3000 – 2700 BC. A return to eutrophic conditions coincided with the gradual return of agriculture, with more permanently altered conditions dominating from 2400 BC, even during a 250-year period of reduced human activity commencing at c. 1440 BC. Increased sedimentation rate, along with increases in $\delta^{13}\text{C}$, $\delta^{15}\text{N}$ and C:N, the presence of chironomid taxa indicative of erosion, more eutrophic lake conditions and high concentrations of macroscopic charcoal all point to more intensive land use practices during the Bronze Age, and palaeolimnological data exhibited an immediate response to intensified farming (especially pastoral farming) during this time. The results of this study will help inform Neolithic and Bronze Age landuse practice and human-environment relations in the region, and highlight the potential for chironomid-based archaeological investigation.

INDEPENDENT POSTERS OF DOCTORAL FELLOWS AT THE GRADUATE SCHOOL

“The Prehistory of Menorca: Environment and Demography” – An Interdisciplinary Research Project from the Graduate School “Human Development in Landscapes”

Monica De Cet
GS HDL, Kiel University

Archaeological interest on the Island of Menorca (Balearic Islands, Spain) has gradually grown for almost one hundred years ago. Early on, archaeologists paid special attention to the island due to the exceptional monumentality of its prehistoric architecture (Ramis and Ramis 1818; Cartailhac 1892). More recent research has promoted a growing interest in understanding the archaeological sequence, socio-economic development, and identification of socio-ideological transformations in the Balearic communities during later prehistory (Lull et al. 1999, 2002, 2005, 2008; Guerrero and Gornés 2000; Micó 2005, 2006; Gili et al. 2006). The remarkable number of radiocarbon dates and the substantial volume of archaeological, ethnographic, anthropological, and palaeoecological data available for Balearic prehistory provided the opportunity to consider Menorca as an extraordinary case study for the evaluation of complex human development.

This poster intends to illustrate the research design and the final results of my PhD project started in April 2010 within the framework of the GS “Human Development in Landscapes” in Kiel. The major aim of my project was to create a model of long-term demographic and environmental processes in Menorca from prehistory (ca. 2300 cal BC) until the 19th century AD. In particular, the research was based on an interdisciplinary approach and established a database with environmental, archaeological, and demographic data fitted to the purpose of exploring specific topics, such as settlement pattern, site location preferences, socio-economic sphere, demographic development, and subsistence pattern.

Methodologically, the project employed GIS analyses and modelling techniques. Moreover, palaeodemographical calculations and different investigative tools, such as ¹⁴C dating and C and N stable isotopes have also been included in order to reconstruct the Menorcan prehistoric population structure and diet. This project represents a challenging input for the poster session and for the debate regarding socio-archaeological reconstructions through an interdisciplinary approach. Finally, this research provides an interactive background for an accurate visualization and analyses of the Menorcan social spaces in the long-term dynamics of Mediterranean contexts.

The Location of the Hoard: Studies on the Relative Positions of Bronze Age Metal Depositions in Northern Germany

Heiko Scholz
GS HDL, Kiel University

The thousands of Bronze Age metal depositions represent an essential element for the interpretation of political, social and economic conditions at that time. The bulk of them can be considered as a culturally motivated phenomenon. A Bronze Age hoard is more than just an assemblage of objects. The deposition act and its circumstances are part of the hoard and the hoarding places are part of the hoard as well (Scholz 2012a; Scholz 2012b). If the hoards are the result or part of important social rituals, we can suppose that the locations where these rituals took place were equally important. The depositions indicate, at least temporarily, “other”, “special” or possibly “sacred” places. For Bronze Age people, these places were the only visible remains of the ritual and therefore possibly an anchor for their memory. Knowledge of the accurate hoard find places provides us with the extraordinary opportunity to make invisible parts of the Bronze Age landscape layout and cultural memory visible. On the basis of the relocation of the find places, a model of location types could be established. By means of these location types it is possible to describe temporal and spatial patterns in the relationship of the three hoard elements: deposition places, inventories and deposition circumstances (Scholz 2012b). Such culturally determined patterns, also in the choice of the deposition places, can prove the thesis of an intentional background of the hoards. In face of the reciprocal overlapping of different levels of spatial relationships, the patterns can be distinctly depicted. In summary, it is possible to prove three main aspects in the correlation between hoard and space:

- 1) Specific elements of the texture of hoard places became an integral part of the hoard by cultural praxis as hoard elements.
- 2) The hoards did not stand alone, but were rather part or became part of a structured landscape by function and meaning and respectively structured the landscape.
- 3) The hoard elements, place, inventory and deposition practices show patterns in different temporal and spatial distributions, which can be seen as regions of specific cultural behaviour and can be pictured as a hoard landscape.

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Tracing Mobility in Early Medieval Populations Using Multi-Isotopic Analysis – Case Studies from Southwest Germany

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In the second half of the 5th century AD, a new burial practice emerged in Central and Western Europe that entailed the creation of new established burial grounds with inhumation graves oriented in an east-west orientation, and the placement of rich grave goods with interred individuals. There is an ongoing debate regarding the origin and meaning of this burial rite. More traditional interpretations consider the richly furnished graves as remains of 'Germanic' immigrants. Newer perspectives criticize a sheer 'migrational' explanation and argue that this new kind of burial practice is indicative of a cultural reorientation of the local population in response to the social and political dynamics of the time.

These processes are particularly well exemplified in the northern part of the Upper Rhine Valley, where, in the second half of the 5th century AD, settlements and burial grounds were established immediately after late antique graveyards and villae rusticae were abandoned. While elements of the funerary practice show influences from Elbe, North Sea, Thuringian and Alemannic areas, it is still unclear if this indicates the arrival of newcomers, or if mainly the local population – perhaps together with newcomers – developed this new mortuary practice.

This poster presents the results of a multi-isotopic (strontium, oxygen, and carbon) investigation of human tooth enamel recovered from individuals of different early medieval cemeteries in the Palatinate region in Southwest Germany in order to determine if the construction of new cemeteries was connected to the arrival of newcomers during the late 5th and early 6th centuries AD.

Treponematoses in Pre-Columbian Denmark – A Paleopathological, Archaeometric and Historical Approach

Susanne Schwarz
GS HDL, Kiel University

A pre-Columbian existence of the *Treponema pallidum pallidum bacterium* in the Old World is still controversial. While single findings of possible syphilitic lesions

were made all over Europe, syphilis is not mentioned in historical records before the return of Christopher Columbus in 1493. The aim of this paper is to investigate new cases from Denmark that emerged during a study of more than 1,000 skeletons from both German and Danish medieval cemeteries. Six Pre-Columbian individuals from three different Danish burial sites on Funen, Jutland and Zealand suggest an infection with treponematoses. Two of the skeletons show cranial lesions, i.e. stellate depressions on the right and left parietal bone, the other three only display periosteal reactions of varying degrees on the postcranial skeleton. None of the 247 examined subadult individuals showed signs of congenital syphilis. Computed tomography scans showed focal obliteration of the periosteum on long bones as well as on the affected skulls. Radiocarbon dates indicate that three of the four analysed skeletons predate AD 1493 at a level of 95% confidence. Considering climate and geography of the findings, venereal syphilis might be the treponemal disease causing pathologies among these skeletal remains. However, regarding bone lesions, their prevalence and the historical research, it all points to a less aggressive, maybe non-venereal form of *treponematoses*. Consequently the pre-Columbian theory could be rejected.

The Creation of Historical Material Memory Places on the Danish-German Border Region in the 19th and 20th Centuries

Jelena Steigerwald
GS HDL, Kiel University

The creation of the past is an important factor for the creation of identities. As the perception of the past is highly influenced by historical remains, authentic historical remains are a crucial factor. Authenticity serves as a proof in border conflicts, but it is a value which is created retrospectively. Therefore, historical memory places can be used for the conveyance of present values, the legitimation and establishment of ideas and regional or national narratives. Especially at borderlands, where we can observe different interpretations of history and changing authorities, this is a contested process.

Material memory places and their (re)construction are the central aim of this PhD project. It focus is on cultural heritage sites, e.g. burial mounds and buildings, and the perception of authenticity. This PhD thesis aims to study the act of monument emergence and the creation of the past in the changing conditions of a border region. Therefore, the knowledge production of cultural heritage in Denmark, Prussia and especially within the border region will be studied. I research the different scientific methods, e.g. the selection and categorization of places, and the transfer of this knowledge into the society. How are categories formed and how are meanings attributed? What role does cultural heritage play in the border

region? On what terms and for which aims did scientific knowledge production take place? Are there processes of naturalizing attributions which work through scientific images and the creation of material memory places in the landscape? To answer these questions, I combine methods and theory from material culture studies, the history of science, the popularization of knowledge and cultural geography.

Mental Appropriation of Colonial Landscapes by War Correspondents Based on the Example of German Colonial Wars in China, German Southwest Africa and German East Africa

Merle Zeigerer
GS HDL, Kiel University

With the rise of the mass media at the end of 19th century, the German colonial project became a new focus of the public at large. What was worth attention in general, was particularly interesting in terms of increased media attention in times of war. Thus, for the first time newspaper agencies sent so-called special correspondents to the German colonial war theatres in order to be less dependent on official dispatches and to obtain first-hand reports. This dissertation project is located within this context. The proposed investigation deals with the mental appropriation and interpretation of colonial landscapes by war correspondents in the three major German colonial wars. The Boxer War in China (1900 – 1901), the Herero-Nama-War in German Southwest Africa (1904 – 1907) and the Maji-Maji- War in German East Africa will be analysed in a comparative perspective as transnational media events.

With regard to the interdependency of the journalists' pre-existing colonial imaginations, on the one hand, and the 'real' colonial landscapes, on the other hand, the focal point here aims at examining the role of correspondents as transmitters of colonial violence. By focusing on the structural conditions of war reporting as well as taking the journalists' biographies, their publications, and the highly various colonial realities into account, it will be investigated whether and in what way colonial violence found its way back to Germany.

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